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Explorations in the Philosophy of Science. Remembering Francisco Miró Quesada Cantuarias

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Abstract

Francisco Miró Quesada Cantuarias was an intellectual figure of many dimensions. He was part of a generation of Latin American thinkers, with a mainly universalist vocation, that proved that, despite the well-known institutional difficulties, it is possible to make a philosophy of universal relevance from our countries, even producing works that turned into required reading in schools on all continents. In the case of Miró Quesada, this is especially manifest in his works on the theory of reason, philosophy of logic, legal logic, political philosophy, and humanism, but his philosophical contribution encompasses much more. This article concentrates on a comparatively less known part of his work, that which corresponds to his activities and projects in the philosophy of science.

Keywords: Latin-American philosophy, principle of non-arbitrariness, theory of reason, theory of relativity.

1 A thinker in the World and for the World

Francisco Miró Quesada Cantuarias was fully recognized as a multifaceted spirit: intellectual, public figure, and statesman who, like Seneca and Leibniz, devoted preferential time to philosophy. His son Francisco Miró Quesada Rada describes him as "an omnivore of knowledge" [9, p. 349]. According to David Sobrevilla, Miró Quesada was the "most important Peruvian philosopher of any time" [16, p. 835]. Similar praise also came from outside Peru. For example, Hilary Putnam wrote:

> A few years ago I visited Peru and got to know a fine philosopher, Francisco [Miró Quesada][1]. [Miró Quesada] has been an idealist all

[1]Putnam misspells Miró Quesada's first surname, calling him 'Miro Casada'.

> his life, while being, at the same time, a man of great experience (a former member of several governments and a former ambassador to France). I found him a man who represents the social democratic vision in its purest form. [12, p. 186]

He was a promoter of logic and analytic philosophy in Peru, a founding member of the Peruvian Philosophy Society (SPF) and of several major academic institutions such as the Institut International de Philosophie (IIP) and the Academie Internationale de Philosophie des Sciences (AIPS). His work for of philosophy and culture was both enormous and constant from the 1950s until his recent death. From Lima, Miró Quesada managed to engage with many of the best philosophers of his time. At the 19th World Congress of Philosophy (Moscow, August 22-28, 1993), he was a candidate for the presidency of the International Federation of Philosophical Societies (FISP). This initiative quickly translated into expressions of respect and admiration for his work, resulting in Miró Quesada being elected by an overwhelming majority.

One important detail about Miró Quesada is that he and a few other Latin American thinkers were a 'possibility proof' of the philosophical practice in the subcontinent. In the 1940s, with European cultural institutions weakened by World War II, Leopoldo Zea sharply interpreted the Old Continent's tragedy as an opportunity for the equal participation of Latin American thinkers in world philosophical dialogue. The idea became especially intense among 'regionalist' thinkers, who sought to develop a philosophy following the needs of our societies. Arguably, however, those who best realized Zea's ideal in Latin America would come from the 'alternative camp', that is, from thinkers with a primarily 'universalist' vocation. Notably, Mario Bunge, Newton da Costa, Roberto Torretti, Ulises Moulines, and Francisco Miró Quesada Cantuarias produced works that became reading assignments in schools of Europe, the United States, Canada, Australia, and, of course, Latin America. A significant contribution of these thinkers was to establish that, despite our well-known institutional difficulties, it is possible to make a philosophy of universal relevance from our countries. This is clear in the case of Francisco Miró Quesada, especially in his works on the theory of reason, philosophical logic, legal logic, and political philosophy.

My first in-person encounter with Miró Quesada occurred in the early seventies, when he agreed to join the Department of Humanities of Cayetano Heredia University, Lima, where I was an assistant professor in the Department of Physics and Mathematics. There began a relationship of growing friendship and great intellectual benefit for me. In those years, the university environment was more leisurely and enlightened than now, not yet dominated—as it is today—by a too strong focus on economics, on the price of everything

and the value of nothing. In the 1960s and 1970s—in some institutions until the 1980s—university administrations tended to be more idealistic and favorably disposed towards liberal education. At the time of Miró Quesada's arrival, UPCH was a still small university run by a group of medical scientists of strong humanistic sensibilities.

2 Cayetano Heredia University

Shortly after joining the Cayetano Heredia University (UPCH), Miró Quesada agreed to give an epistemology course aimed at graduate students in science and interested scholars, with me always sitting in the front row. The discussions focused on Karl Popper's thought, especially in *The Logic of Scientific Research* of 1934 [11], whose recent reprint had revived interest in the issues at hand. Popper famously criticized the notion that science is inductive, emphasizing its hypothetical-deductive character and presenting the 'principle of falsification' as a criterion for differentiating science from merely pretentious discourses. For a hypothesis to be scientific, Popper says, it must imply empirical statements that are 'falsifiable'. If a hypothesis overcomes severe attempts to prove its falsehood based on wrong predictions, it can be provisionally accepted., but never definitively, since no scientific theory can ever be conclusively established. According to Popper, scientific objectivity rests, not on the explanatory achievements of science, but on the constant critical examination of the results it offers. The greatest danger for any theory, he insisted, is to become an intellectual fad, as in his view is the case with psychoanalysis, Marxism, and astrology. Popper regarded those disciplines as pseudoscientific because of the low quality of the predictions they offer (vague, impossible to refute in practice).

On the other hand, Popper's total proposal includes 'oddities', several of which Miró Quesada brought up for discussion in the class. A hypothesis such as, for instance, 'the probability that a regular coin will land heads is $\frac{1}{2}$' counts as 'metaphysical', since it is not falsifiable in practice (no finite succession of coin tosses can produce results that *contradict* the hypothesis). Denying scientific status to probabilistic hypotheses is an odd move, though. Darwinian biology, quantum mechanics, indeed, most of the typical theories of our time, have central probabilistic components, which would leave them outside of science proper.

In the discussions, Miró Quesada agreed that the empirical sciences start from synthetic a posteriori conjectures (not from rational principles). Scientific theories followed, to a first approximation, the hypothetical-deductive method. On the other hand, Miró Quesada stressed, logic and mathematics have principles to which we seem to access a priori. He admitted nevertheless that,

since the nineteenth century, many paradigmatically 'intuitive' principles had revealed themselves to be open to revision *qua* statements about nature, notably, the Euclidean postulate of the parallels and the law of the excluded middle. In the seminar sessions, Miró Quesada left no doubts about his affection for Plato's philosophy, but he remained open-minded and welcomed discussing some anti-Platonist heresies. One of these heresies—which was common in the UPCH at the time—interpreted *a priori* knowledge in Darwinian terms; the 'apostasy' of deciphering great insights from Western philosophy as cognitive adaptations of mammalian thought, which many traditionalists regarded as a terminal blasphemy.

Miró Quesada tolerated this and worse naturalistic irreverence but always adding careful observations. Some of his reflections were part of the ideas he presented at the end of that year in his successful closing conference of a public series of lectures entitled *Del pez al filósofo* (*From the Fish to the Philosopher*), organized by the UPCH in collaboration with the Municipality of Miraflores. Unfortunately, the text was never published.

3 Foundations of Physics

Another activity led by Miró Quesada in the UPCH focused on a book Mario Bunge had published a few years earlier: *Foundations of Physics* [1]. In the early 1950s, Miró Quesada had singled out physics among his areas of philosophical interest. He had a program that would first focus on the nature of logic, then mathematics. He would then move into the empirical sciences, beginning with physics, then biology and the social sciences, followed by law and politics, culminating in the foundation of ethics.

Now studying physics, Miró Quesada led a reading group apropos of Bunge's book, and the Physics and Mathematics Department organized a seminar. A topic of particular interest was Bunge's presentation of general relativity, which led us to survey and discuss the reasons that motivated Einstein to develop this theory between 1907 and 1915. Miró Quesada concentrated on metaphysical issues, particularly the problem of action at a distance, the ideal of coherently integrating physical theories, and the modern conception of objectivity in terms of invariance.

On the one hand, Miró Quesada noted, there was a question that had been pending since Newton's time: in physical terms, how come objects gravitate around each other, acting on each other at a distance? In Leibniz's view, taking Newton's law of gravitation as a fundamental tenet of physics contravened the intellectual project of natural philosophy. By the mid eighteenth century, the pragmatic success of Newton's theory had made it easy to ignore this difficulty, which nevertheless remained intact. Einstein's special theory of

relativity of 1905 aggravated the intellectual situation. Einstein 'needed' to describe gravitational phenomena in harmony with his new theory. He hoped for a conceptually harmonious physics. If, as the special theory holds, two or more contemporary events in a reference system occur at different times in systems in motion relative to the first, then the simultaneity relationship is a structure relative to reference frames. Hence, gravitational phenomena cannot be formulated objectively (i.e., in the same way for all reference frames) in terms of instantaneous actions in some systems and not in others. Furthermore, special relativity does not apply to all reference systems, but only to 'inertial' ones (i.e., in uniform motion relative to the fixed stars). In non-inertial systems, bodies behave as if they were subjected to forces that do not depend on the neighboring entities present ('global' forces). For example, when a moving car turns abruptly, passengers feel a force that pushes them out; physics describes this phenomenon as an effect of the acceleration of the reference frame

Einstein strove to explain physical motion in terms of laws free of arbitrary limitations. He was looking for laws that were equally obeyed in all reference systems, including accelerated ones. Einstein achieved this, at least for gravitational phenomena, with his general theory of relativity: an abstract proposal in which the objectivity of physical laws comes from their Lorentzian covariance between different reference systems. Explaining how this conception of objectivity works is tricky, but we may catch a glimpse of Einstein's transformative proposal by following how he rethought the peculiarities of free fall.

In an autobiographical manuscript, Einstein recalls how learning about an accident led him to "the happiest thought" of his life in 1908[2]. A painter who fell from a roof reported having sensed nothing unpleasant until he reached the floor. During his brief transit downwards, the painter felt weightless, free, until he hit the ground, and the experience suddenly deteriorated, with him ending up in hospital. This anecdote opened Einstein's mind. In a reference frame in free fall, he reasoned, the painter 'felt' free because gravity disappears in the immediate environment of the falling body—it is abolished at the 'local" level. Today, astronauts on orbiting space stations routinely experience the 'freedom' of Einstein's painter. When the engines are off, the crew 'floats" in free fall. The situation changes when the engines restart and the cabin accelerates: inside the cabin, objects behave as if a mysterious force 'pushes' them in the opposite direction of acceleration, just as if a gravitational field had appeared. Why?

Einstein proposed there was no locally discernible difference between the force induced by acceleration and the force of gravity, a principle that is known as the *principle of equivalence*. This revolutionary idea clarified the hitherto

[2]In the so-called 'Morgan Manuscript', currently in the Pierpont Morgan Library in New York, and quoted by Abraham Pais [10, p. 178].

mysterious force of gravity. No force, Einstein thought, acts on bodies in the phenomena that we call 'gravitational': (a) massive bodies deform space-time and one manifestation of this deformation is physical gravity, and (b) the local form of space-time guides the movement of matter. This explanation exorcises the mystery Leibniz had denounced. One implication is that reference systems are all equally acceptable (at least with respect to gravitation). This reduction of arbitrariness in physics reaffirmed Miró Quesada's confidence in non-arbitrariness as a critical driver of scientific research (see Section 6 below).

The seminar was ultimately a great success. Not only did we look at physics from a broader intellectual perspective, but we also appreciated how the philosophical achievements of Einstein's ideas (relativity, atomic-molecular realism, quanta) had led in the first third of the twentieth century to decisive advances in how to think about nature. The transformative change was especially apparent in the critical revision and generalization of the classical categories of space, time, matter, energy, gravitation, and the persistence of the physical universe.

4 Einstein's Centenary and its Ramifications

The discussion of topics raised in Bunge's book continued in subsequent activities. A few years later, these would spur two cycles of seminars and lectures in celebration of the centenary of Einstein's birth, organized by the UPCH and the Goethe Institute in Lima in 1979 and 1980, respectively.

The activities devoted to the celebration focused mainly on the philosophical impact of Einstein's work. André Mercier (Institute of Exact Sciences of the University of Bern), a theorist of general relativity, gave the first seminar followed by a public lecture on Einstein and the metaphysics of time. Ernst Tugendhat (Free University of Berlin) offered a cycle on philosophical applications of some operationalist criteria invoked by Einstein in special relativity. In the second phase, Hilary Putnam offered two masterclasses and a workshop on the limits of science and scientific realism. He presented his latest ideas on realism, reference, rationality, and the relationship between facts and values.

Putnam's presentations attracted a broad sector of Lima's philosophical and scientific communities, leading to several off-program discussions and informal meetings. Some of the latter took place in a 'museum of curiosities' owned by Enrique Fernández, a distinguished doctor and physiologist who had been the head of the UPCH and who was fond of offering his house as a small auditorium in case of emergencies. Fortunately, the overwhelming additions to the official program pleased the guest. During the weeks that Putnam spent in Lima, he found it productive to go every morning to think near the sea in Miraflores. There, he completed his controversial application of the

Löwenheim-Skolem theorem[3] to the position he called 'internal realism', as he recounted in his book *Reason, Truth and History* [13], published the following year.

These presentations and informal discussions by Putnam had a long-lasting influence on many Lima institutions. Partly as a consequence, within a few months, an informal agreement was reached between Cayetano Heredia University and the University of Lima to launch a course on scientific culture aimed to provide students with some insight into scientific thought, its history, and its methodology. At the research level, the thesis of internal realism that Putnam presented in Lima gave rise to subsequent seminars, both in the UPCH and in the Instituto de Investigaciones Filosóficas (Institute of Philosophical Research), then recently created by the University of Lima under Miró Quesada's direction. The discussions and interactions raised by Putnam's visit deserve a section of their own.

5 Discussions around Scientific Realism

In Lima, Putnam harshly criticized what he called 'metaphysical realism', a position with which he had sympathized in his years as a 'versatile leftist', when he recommended reading Mao's *Red Book*[4]. Putnam's conception of metaphysical realism included the following ideas [13, p. 79]:

1. The world consists of a certain number of external objects (independent of the mind).
2. There is only one true and complete description of what the world is like.
3. The said description is physicalist.
4. Truth presupposes a correspondence relationship between words and signs, on the one hand, and external objects, on the other.

Putnam contrasted this 'externalist' perspective to what he called 'internal realism'—internal because it comprises an 'internalist' position on truth. Putnam argued that it is wrong to think that only the objects described by science exist and that the rest are mere projections of our minds. Externalism

[3] In this application, Putnam focuses his attention on the impossibility of fixing the extensional meaning of symbolic expressions in a system (indeterminacy of reference). Putnam appeals to model theory results to discredit positions of metaphysical realism and verificationism that seek to reduce normative notions of the physical-materialistic sciences (naturalization), e.g., the physicalist idea of reducing psychology to neurology.

[4] In the early 1970s, Putnam gave up the ardor of communism and secularism. He began to approach the Judaism of his ancestors and celebrated his bar mitzvah at the age of 68.

yields paradoxical results, he claimed, because it denies the reality of the world of common sense, the everyday world that "we experience". In the mentioned book, Putnam advocates a broader realism that affirms the reality of the ordinary world of tables and chairs and cats around us, while also recognizing that truth may depend to some extent on personal beliefs. Putnam's proposed internalism is not total, however, because he accepts, like metaphysical realists, that there are external things and that we do not merely legislate the truth. On the other hand, like relativists, he maintained that our assumptions and interests make a decisive contribution to the worldview that we have managed to put together.

One argument Putnam highlighted in Lima focuses on how the way we use words reflects our choice of conceptual schemes and how that choice affects the way we see the world, even concerning something apparently as basic and 'objective' as what is and what is not an object. For the internal realist, he urged, the notion of "object that exists with total independence from our conceptual schemes" is a contradiction. Relinquishing the dichotomy between intrinsic and extrinsic properties is not a concession to relativism. Putnam insisted that, while the conceptual scheme based on which we decide, for example, "how many objects are in a given domain" is a matter of convention, our answer to that question is not. Hence Putman's Kantian motto: "the mind and the world jointly make up the mind and the world" [14, p. 1].

The proposals above had a mixed reception in Lima. How could someone with Putnam's ideas be called a 'realist'? Does not realism imply the separation between our minds and language, on the one hand, and the 'external world', on the other? Neither Miró Quesada, nor Luis Silva Santisteban, nor I found the proposed internalist considerations persuasive. Neither did most of the scientists who followed the meetings closely. Gradually, however, we came to appreciate the idea that truth under a description is all the truth we need in order to avoid subjectivism and relativism. A seminar and a series of special lectures held the following year in the UPCH on the occasion of the bicentenary of the *Critique of Pure Reason*, helped some of us to find a measure of convergence with internalism in fundamental areas of science where the presence of empirical underdetermination limits realism. Theories that describe different worlds but are empirically equivalent in practice often occur, especially in fundamental science. There is underdetermination when the respective ontologies of two or more theories describe different worlds. Yet, they fail to make diverging predictions within the currently available ranges of empirical access. In quantum mechanics, to mention a current hot case, the theories of Everettian many worlds, Bohm's mechanics, and the theory of stochastic transitions by Ghirardi, Rimini, and Weber postulate divergent ontologies, which

describe dramatically different physical worlds at a profound level, but with no discernible differences at technologically accessible empirical levels.

Putnam's suggestions sought to do justice to the criticisms of logical empiricism developed in the 1960s and 1970s. Still, he wanted to avoid extreme views like those proposed by Thomas Kuhn, whose relativistic impact on the humanities he regretted. In the first edition of *The Structure of Scientific Revolutions* [3], Kuhn had evicted the realist and objectivist ideals associated to classical science with arguments that still convince many thinkers. Kuhn's approaches were, therefore, the subject of various activities at the Institute of Philosophical Research (IIF), in particular, a cycle on the uses of Kuhn's ideas in the philosophy of the social sciences, by Osvaldo Guariglia, followed by a more extensive series on scientific objectivity, led by Evandro Agazzi, during his first visit to Peru.

In the early 1980s, other objectivist reactions were gaining strength. In particular, two anti-realist proposals sought to reconstitute objectivism by reinforcing the ideas of empirical adequacy and scientific progress in the context of problem solving. Bas van Fraassen [17] led one of them, and Larry Laudan [4, 5], the other. Both thinkers shared with Putnam the goal of revitalizing objectivism in the philosophy of science, but they did so from perspectives friendly to traditional empiricism. Contrary to embracing those perspectives, another objectivist, Dudley Shapere, sought to achieve a naturalistic synthesis of empiricist and rationalist perspectives. His way of doing this emphasized historical-philosophical analyses that appealed to reasons. Shapere's epistemological moderation and his emphasis on unveiling the work of reasons in scientific change were especially welcomed at the IIF. There, one of Miró Quesada's central projects was to develop a theory of reason he had been working on for some time, focused on the significance of reason in theoretical and practical philosophy. The discussions on these issues at the IIF prospered, leading to a second visit by Shapere in 1989.

The topic of reason is a very relevant one to this discussion, which deserves to be treated at length in its own section.

6 Reason

Miró Quesada called 'reason' our ability to justify the ideas we construct for understanding the world and acting in it. From the beginning of his philosophical career, Francisco Miró Quesada defended the achievements and possibilities of reason against skepticism. He pointed out that reason is opposed to arbitrariness; it is rigorous and broad, its domain ranging from logic and mathematics to historical reason.

Rationalist-minded thinkers have traditionally emphasized 'non-arbitrariness' as a marker of rational judgment. For example, Kepler accepted Copernicus's theory partly because, in it, the order and distances of the planets from the Sun are established without arbitrariness compared to the Ptolemaic system (in which such aspects are a matter of convention). Believing that natural philosophy could do better, one of Kepler's goals was to determine why the distances between the planets and the Sun are what they are, and also why there were only six planets. A century later, Leibniz's principles of *sufficient reason* and of *the best of all possible worlds* would raise the idea of non-arbitrariness to new philosophical heights.

Miró Quesada was never a radical rationalist, but he had longings in that direction. His proposal on historical reason [6] involves developing formal methods that (ideally) allow reaching objective conclusions, capable of solving even political controversies. I think that much of Paco's work can be seen as a defense of the explanatory power of reason and a condemnation of 'impure reason' (by which he meant the self-destructive efforts to demonstrate that reason does not exist). Human reason, he remarked, gropes between two precipices. One is that of impure reason. The second precipice is 'cordial reason' (associated with the temptations of religious ecstasy and hallucinations).

The objections of Miró Quesada against the encroachment of impure reason were not against the critical efforts to discover the limits of rational thinking. He objected to skeptical 'radical' projects by those who tried to deny the existence of a basis for justifying and rejecting proposals in a non-arbitrary manner. In his works, the opposition to radical skepticism rests on two pillars of reason. One is the stability of the logical principle of non-contradiction, its historical persistence, and our inability to deny it globally[5]. The second pillar is the dynamic character of most of the rules of reason, their openness to the possibility of change in the light of reasons emerging from the accepted system of knowledge, rules, and principles. To avoid falling into the indicated precipices, warned Miró Quesada, reason has gradually developed ingenious methods. They include deductive logic, Bayesian methods, abductive thinking, hypothetical-deductive methods, and probabilistic thinking.

These ideas went against some dominant currents in the studies of science. As already mentioned, between the 1960s and the 1990s, in many circles, the idea of dynamic reason ran through relativistic channels. The influence of Kuhn's work was considerable during those decades. Miró Quesada's ideas developed largely outside that trend. His theory of reason developed from a position that he had started in the 1950s. Early on, he acknowledged that the vast majority of the rules of reason were open in principle to the possibility of

[5]This principle might be questioned at the local level, though, in the manner of the varieties of logic called 'paraconsistent', a term introduced by Miró Quesada [cf. 8].

change. To Miró Quesada, however, such changes occurred in light of objective considerations based on the rest of the rules and principles.

Although independently based, Miró Quesada's emphasis on the dynamic character of reason brought his thought closer to some perceptive critics of Kuhn, particularly, to one mentioned in the previous section, Dudley Shapere. Being a prominent defender of the objectivity and progress of scientific knowledge, Shapere was invited by the UPCH and the IIF of the University of Lima to give a course and several lectures in 1982, as already noted. His presentations were related to materials that subsequently appeared in his book *Reason and the Search for Knowledge* [15], published a year later.

Shapere shared Miró Quesada's harsh assessment of impure reason. They agreed that a condition of adequacy for any current philosophy of science is to show how rational change in science is possible; if a philosophy claims that scientific change is irrational at all levels, it must be rejected. Like Kuhn, Shapere rejected the 'inviolability thesis': there is nothing in scientific thought that cannot be questioned and revised in light of future findings [15, pp. xix–xx]. Wary of essentialism, Shapere questioned the existence of any science components we should consider 'essential'. At all times, our available knowledge rests on science's best information, he affirmed, but this knowledge is always open to critical revision. Shapere denied that in order for science to function correctly, research programs need a fixed semantic and conceptual identity. Shapere thought that research programs do not need fixed semantic and conceptual identity to function correctly. He maintained that the criteria of rationality do not need to be universal and timeless. As Shapere put it, through science "we learn *how* to learn" [15, p. 185]. On the other hand, he stressed that the evaluation criteria are not so mortgaged to paradigms so as to make it impossible to claim the rational superiority of a theory over another. Inter-theoretical comparison, he argued, can go a long way based on considerations such as, for example, empirical success and freedom from specific doubts (i.e., properly scientific doubts, as opposed to global or 'metaphysical' ones).

In 1989, Miró Quesada presented his reactions to Shapere's proposal and other contemporary philosophers' proposals in a keynote talk he gave at a colloquium on *Philosophy and the Origin and Evolution of the Universe* at the annual meeting of the International Academy of Philosophy of Science (Lima, August 10-12, 1989). It was an activity organized jointly by the International Academy of Philosophy of Sciences, the UPCH's Faculty of Sciences, and the University of Lima's IIF.

7 On the Origin and Evolution of the Universe

The congress, chaired by Miró Quesada, raised much expectation in various scientific and humanities circles from Lima. The timing of the event, however, could not have been worse, for Lima was in a political revolt. There was a growing fear for the safety of the guests, many of whom considered cancelling their presentations. The police then offered to collaborate by providing escorts for the required transfers in exchange for tickets to attend the associated sessions and seminars. This exotic exchange of services proved successful.

The prominent guests included Evandro Agazzi (Freiburg, Switzerland), Christopher Cherniak (Maryland), Robert Engel (CUNY), Charles Enz (Geneva), Bernulf Kanitscheider (Giessen), Jesús Mosterín (Barcelona), Massimo Pauri (Parma), Dudley Shapere (Wake Forest), Erhard Scheibe (Heidelberg), Roberto Torretti (then in Puerto Rico), and Barton Zwiebach (MIT). Miró Quesada gave the closing lecture, 'Origin and evolution of the universe and mankind', which subsequently appeared in a volume containing the best works presented at this meeting, which was published in English and was co-edited by Evandro Agazzi and me [2]. In this essay, Miró Quesada proposed a critical evaluation of modern scientific-evolutionary thought that distinguishes ideology and science. A theory is ideological, he notes, when it responds to mechanisms external to reason, such as, for example, the social class of the person who offers the theory[6]. On the other hand, he points out, science is mainly a creation of human reason; one distinctive of our age for the contribution it makes to the vision that we now have of ourselves and the technological progress that accompanies it. Miró Quesada concentrates on the philosophical impact of the most significant theoretical programs of current science (especially, the theories of biological evolution and evolutionary cosmology) and the advent of a new conception of humanity.

To this end, Miró Quesada critically comments on Shapere's ideas, according to whom, since the principles and methods of science are historical, what counts as 'a reason' in science can change from period to period; accordingly, even logic and mathematics are open to change if sufficiently compelling reasons arise. For Shapere, rationality is the process of scientific internalization of knowledge, the drive of knowledge towards autonomy (an ideal of reason). From his perspective, we find the true meaning of scientific rationality in the rational transformation of principles and norms. Miró Quesada and Shapere shared the idea that the scope of scientific change is both wide-ranging and of decisive philosophical importance. For example, much of what we now consider 'observable' (such as the Sun's interior, molecules, and atoms) would have been considered beyond the reach of direct observation just a few decades ago. The

[6]However, when an ideology rests upon rational foundations, it is a critical ideology.

extent of scientific change in areas previously taken to be 'meta-scientific' is further illustrated by the acceptance of probabilistic explanation as a reasonable mode of explanation, something whose possibility had seemed unworthy of consideration a few centuries ago.

On the other hand, however, Miró Quesada parts company with Shapere in a few areas. He thought that Shapere's concept of what 'constitutes a reason' is unclear. We need, he argues, a rigorous analysis of the mechanism whereby, in the justification of scientific knowledge, certain parts are considered a 'reason'. Miró Quesada was also concerned about the limits of contingency in scientific rationality, a subject left open by Shapere. From Miró Quesada's perspective, if we analyze the processes that have produced science evolution, there are invariant aspects on which this evolution is based. Miró Quesada argued that scientific rationality is not contingent at all levels. Even in probabilistic explanations, he maintained, there is no explanation or prediction without standard logic.

Miró Quesada admits that logic and mathematics can be modified if sufficiently convincing reasons arise for doing so. However, he pointed to research results on the articulation of alternative logics, according to which—in his view—science evolves through a process of self-construction and becomes increasingly independent. Yet, the resulting self-construction is only possible through rational dynamisms that prove invariant in some crucial respects. On the project of quantum logic, for example, he said:

> Quantum logic is frequently presented as a proof that in the evolutionary processes of science anything can vary, even logic. But, all of quantum theory has been developed within the frame of classical logic. It is true that orthomodular lattices, as extensions of Hilbert subspaces, can be considered as models of certain kinds of propositions of quantum mechanics. But, although following this route it is possible to describe quantum phenomena, quantum logic is unnecessary to develop the whole theory. In any case, if some day, due to new observable evidence, quantum logic would become a necessity, it is clear that this necessity would come from the fact that the mathematical structure utilized to describe sub-atomic reality would impose some kind of non-classical logic. And this imposition, as we have already seen, would mean that there exists a non-contingent relationship between the mathematical structure and logic that would be needed to describe it. However, in the present condition of the theory, this does not seem to be the case. [7, pp. 452–453]

In the article just quoted, Miró Quesada extends his evolutionary position to the fields of ethics and political philosophy. His proposal closely relates rationality, justice, and freedom, offering a rational analysis of the justification of restrictions to personal freedom that leads him to conclude that the only moral limit to individual behavior is the freedom of others. According to Miró Quesada, science has played a crucial role in the evolution of modern society. Most radical changes in humanity's self-awareness, he notes, have been triggered by significant astronomical, physical, and biological discoveries. Philosophy has no less social relevance, he adds, stressing that philosophy of science forums can contribute to the liberation of human thought and the search for a historical orientation towards just and free societies. Miró Quesada envisions, thus, a world where all human beings will live in brotherhood.

Activities like those reviewed in this and the previous sections continued to thrive in Lima, converging in 1995 in a major international meeting on the philosophy of science presided, again, by Miró Quesada and organized by the Faculty of Sciences and Philosophy of the UPCH in collaboration with the University of San Marcos and the City University of New York. The meetings included a congress, a course by Dudley Shapere, as well as research workshops on the development of modern scientific thought with David Gruender (Florida State University) and Dudley Shapere (Wake Forest); the philosophy of general relativity with Harvey Brown (Oxford); the philosophy of quantum mechanics with Jeffrey Bub (Maryland); and several workshops on the pedagogical uses of the philosophy and history of science, led by Nancy Nercessian (Georgia Tech) and Dudley Shapere. Enthusiastic local collaborators helped carry out these activities, especially, the dean Agustín Montoya de la Cadena and junior faculty and students (notably Sandro D'Onofrio and José Carlos Mariátegui). Subsequently, there was a fruitful visit from Rom Harré (Oxford), focused on topics in the philosophy of clinical psychology.

Miró Quesada continued to promote activities in the field until the end of his life. In 1998 he moved to a new and last base, the Institute of Philosophical Research created by the Peruvian University Ricardo Palma under his direction. Important international meetings took place there, including two on the philosophy and ethics of science, held in 2000 and 2004, respectively, with the participation of Evandro Agazzi (Genoa), Michael Devitt (CUNY), Samuel Gorivitz (Syracusa), and Alex Rosenberg (Duke), among others.

8 A Citizen of the World

The episodes highlighted in this article, focused primarily on topics of the philosophy of science, constitute only a small fraction of the broad and diverse intellectual work of Francisco Miró Quesada. Furthermore, I have restricted

my account only to those adventures I was part of, which correspond to just some of Miró Quesada's areas of action, and then only since the early 1970s.

Besides being a great thinker, Miró Quesada was an enormously endearing person, a genuine Renaissance man: distinguished journalist, mathematician, politician, political theorist, linguist, tireless reader of literary delicacies, secret saxophonist, and, in the 1950s, a dance champion. Above all, however, Miró Quesada was a great human being, a citizen of the world, exemplifying the virtues of generosity, good humor, and lucidity as a lifestyle.

For almost half a century, guided by our beloved 'Paco', I managed to glimpse some of the highest spheres of the good life, both philosophical and 'para-philosophical'. Together, in encounters around the world, usually after long and thought-provoking sessions, we would go out in search of benevolent portents in all sorts of places—zoos, planetariums, museums, and circuses. We had such a great fun!

Thank you, Paco!

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