PROCEEDINGS OF THE CONFERENCE

KARL POPPER PHILOSOPHER OF SCIENCE

CESENA, 27-30/1O/1994

Edited by
MARIO ALAI
GINO TAROZZI

Rubbettino

88049 Soveria Mannelli - Viale Rosario Rubbettino, l0 - Te!. (0968) 6664201
www.rubbettino.it

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Part 4. The Philosophy or Physics

PREF ACE

In 1506 the University of Urbino was founded, in 1956 its Faculty of Literature and Philosophy. A small group of scholars in epistemology and foundations of physics was eventually brought together in this Faculty, and since then the University of Urbino has promoted a number of high level activities in these fields.

In the autumn of 1985, from September 25th to October 3rd, the University hosted the conference “Microphysical Reality and Quantum Formalism” in celebration of the 50th anniversary of the groundbreaking paper by Einstein, Podolsky and Rosen, and Sir Karl Popper was to participate. Though his wife's ill health prevented him from being present, he contributed with the paper “Bell's Theorem. A note on Locality”. In early 1988 Kluwer published the conference Proceedings in two volumes edited by Alwyn van der Merwe, Franco Selleri and Gino Tarozzi, and containing contributions by the most outstanding scholars in the foundations of quantum physics, such as David Bohm, Olvier Costa de Beauregard, Giancarlo Ghirardi, Daniel Greenberger, Michael A. Home, Brian Josephson, Bemard d'Espagnat, David Mermin, Mikio Namiki, Yuval Ne'eman, Asher Peres, Oreste Piccioni, Helmut Rauch, Henry P. Stapp, Jos Uffink, Jean-Pierre Vigier, John Archibald Wheeler, and Anton Zeilinger.

Almost ten years later the Faculty of Literature and Philosophy decided to grant Sir Karl an honorary degree in Philosophy for his universally acknowledged achievements, and an international conference was planned in 1994 to study his huge influence on the epistemology of the twentieth century. But fate prevented this too, for Popper died just a month before the event. Thus the conference - held from the 27th to the 30th of October that year and co-sponsored by the Universities of Urbino and Bologna and by the City of Cesena - became a rather sad, though intellectually enriching, tribute to his memory.

Today, on the 500th anniversary of the University of Urbino and the 50th anniversary of the Faculty of Literature and Philosophy, both institutions wish to remember their historical ties with one of the leading philosophers of the last century, and honour his memory by publishing in this volume the proceedings oft he 1994 conference.

The essays collected here therefore provide an exhaustive and panoramic view of the state of studies on Popper's critical rationalism at the time of his death. Their topics range from his theory of knowledge and scientific realism - in comparison with hermeneutics and as opposed to dialectics - to his views. on logic, epistemology and methodology of science; and his philosophy of physics, in particular his criticisms of the Copenhagen interpretation of quantum mechanics.

As editors, we thank all the Authors for their consent to publish works written so long ago, and acknowledge our gratitude to the institutions and individuals whose efforts and cooperation made the Cesena conference possible. In particular we would like to express our warmest thanks to Professor Alberto Pasquinelli, then Director of the Centre of Epistemology and History of Science “Federigo Enriques”, to Dr. Franco Pollini, then Head of the Culture and University Department of the City of Cesena, to Dr. Clelia Sedda, then secretary of the Centre for the Philosophy and Foundations of Physics (ICEPHY), and to Professors Dario Antiseri, Vincenzo Fano, Giorgio Sandri and Italo Scardovi, members of the organizing committee of the conference. Marco Mondadori and Antimo Negri, two of the most distinguished contributors to this volume, who died in the meanwhile - we remember with esteem, warmth and affection.

Below is a translation of the decree with which the Faculty of Literature and Philosophy of the University of Urbino conferred the *Laurea in Filosofia honoris causa* on Sir Karl Popper in 1994.

In 1934 Karl Popper published a short article in Die Naturwissenschaften *which gave rise to a research programme of fundamental importance both for the conceptual bases of quantum mechanics and for its philosophical impact on contemporary physics. Such physicists as Albert Einstein, David Bohm and John Bell, and the philosophers Hans Reichenbach, Mario Bunge and Paul Feyerabend, to mention a few, are among those who developed and enhanced Popper* 's *original insights.*

Seven years earlier, in 1927, *Niels Bohr and Werner Heisenberg had provided a stable and mature formulation of a new theory which, rigorously axiomatized by Paul Dirac and John von Neumann, was to become one of the most dramatic turning points in contemporary knowledge, namely the new atomic mechanics. Karl Popper, at that lime an unknown Austrian elementary school teacher, proposed in the aforementioned article a thought experiment which, appropriately reformulated by Einstein, would become a real difficulty for the new theory.*

We believe that this aspect of Popper's theoretical thinking, which is clearly more than a mere contribution to the philosophy of physics, represented beyond any doubt one of the most significant sources of inspiration contained in his work, since it acutely demonstrates how philosophical investigation can be combined with the technical analysis of a problem. On the other hand, theories of contemporary physics can be considered the best testing ground for Popper 's *falsifiability principle, since they allow an unambiguous application of his demarcation criterion between science and pseudo-science. Indeed not only was Popper one of the first to advance epistemological objections to Heisenberg 's indeterminacy principle, he even incorporated his own approach within a realistic and causal interpretation of the new physics. He showed that one can and must avoid subjectivism in the quantum theory of measurement, and that quantum mechanics should not be considered “the end of the road in physics”, to use his own vivid metaphor.*

Popper brings together his cosmology, epistemology, and analysis of the foundations of physics in the original and arduous universal viewpoint according to which something can originate from nothing: in other words, the universe is a continuous violation of the principle ex nihilo nihil. *As a result, quantum mechanics. notwithstanding its formal perfection and its extraordinary predictive power, cannot be considered the definitive theory of the physical world. Nor is it advisable, as has been*

done by a large part of the scientific community, to introduce subjectivist elements to ensure its consistency, for doing so would undermine the very scientific basis of physics. According to Popper, quantum mechanics is to be interpreted as a statistical, and therefore incomplete, theory; subjective probability must be substituted by objective propensities, and moreover it is physics which is based on realism and not vice-versa.

It is in view of Popper 's fundamental contributions to the philosophy of physics - which have kept open a difficult and unusual path whose exploration necessitates the thinker's depths and the scientist's rigour - and of his outstanding and now classic contribution to the philosophy of this century, that the Faculty Board of the University of Urbino unanimously proposes to the Chancellor that an Honorary Degree in Philosophy be granted to Professor Sir Karl Raymond Popper, following art. 169 of the Testo Unico 31 *Aug* 1933 *no.* 1952.

Gino Tarozzi
Head of the Faculty of Literature and Philosophy
Mario Alai
Researcher in Logic and Philosophy ofScience

Urbino, March 21th 2006

The volume contains the proceedings of a conference on the philosophy of Karl Popper held in Cesena (Italy), in October 1994. The great epistemologist himself was to participate, and receive an honorary degree in Philosophy from the University of Urbino, but he died the previous month. The book therefore represents a survey of studies on Popper's philosophy at the time of his death.
Contributors include prominent ltalian and foreign philosophers of science, such as Evandro Agazzi, Jenner Barretto Bastos, Giovanni Boniolo, Marcello D'Agostino, Maria Luisa Dalla Chiara, Vincenzo Fano, Michel Ghins, Giulio Giorello, Daniele Mundici, Franco Selleri, Gino Tarozzi, and two of the most distinguished Popper scholars, Dario Antiseri e David Miller. The important contributions of Marco Mondadori and Antimo Negri are posthumous.
The first of the four parts of the book, devoted to the discussion of critical rationalism and its relations with realism, dialectics and hermeneutics, begins with a remarkable essay by David Miller, which represents both a tribute by his former pupil and collaborator, and an original attempt to reformulate Popper's epistemology as a strongly objectivistic theory of knowledge. The second concerns Popper's contributions to the analysis of scientific laws, induction, probability, conjectures, verisimilitude, conventionality, and falsification. The third focuses on the logical and epistemological problems associated with the structure and dynamics of theories. The last part contains an evaluation of the consequences of Popper's philosophy of physics, in particular of his criticism of the main tenets of the Copenhagen interpretation of quantum mechanics, such as the indeterminacy principle, the standard theory of measurement, non classical logic, and the subjectivist conception of probability.

Mario Alai is *ricercatore* in Logic and Philosophy of Science at the University of Urbino. His work concerns prominent figures and themes in contemporary epistemology, with particular regard to the discussions on realismo On these topics he has published various articles, the books A *Critique ofPutnam's Anti-realism* (U.M.I., 1989) and *Modi di conoscere il mondo* (Angeli, 1994), and edited the anthology *Filosofia della Scienza del Novecento* (Armando, 1998).

Gino Tarozzi is *professore ordinario* of Logic and Philosophy of Science, Dean of the Faculty of Arts at the University of Urbino, and Director of the Interuniversity Centre far Research in Philosophy and Foundations of Physics of Bologna, Lecce and Urbino. His research interests focus on the foundations of quantum mechanics and the relations between science and philosophy. On these questions he has organized a number of scientific conferences and in many cases edited their proceedings, expressing his own ideas in articles published in international physics and philosophy journals, contributions to collective volumes, and in the book *Filosofia dello microfisica* (Accademia Nazionale di Scienze, Lettere e Arti, 1992).

M. Alai, G. Tarozzi (editors)
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