INTRODUCTION

This volume is dedicated to Professor Andrzej Grzegorczyk on the occasion of his 90th birthday. It is rare to be able to pay respects to someone who has reached this impressive age and is still actively involved in creative research. To wish "one hundred years," as Polish tradition has it, seems much too modest. We are happy that we can present to him this volume, and we hope that Professor Grzegorczyk and ourselves will be able to participate in a future project in which scholars who have been influenced by him can present their research and reflections related to his fields of activities.

Only a very brief outline of Grzegorczyk's life and achievements is given below. More detailed accounts can be found in the following two papers: S. Krajewski and J. Woleński, "Andrzej Grzegorczyk: Logic and Philosophy", *Fundamenta Informaticae* 81, 1–3 (2007), pp. 1–10; S. Krajewski, "Andrzej Grzegorczyk" (in Polish), *Edukacja Filozoficzna* 37 (2004), pp. 185–204 (also published in *Polska filozofia powojenna III* [*Polish Postwar Philosophy III*], ed. by W. Mackiewicz, Agencja Wydawnicza Witmark, Warszawa 2005, pp. 99–118).

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Andrzej Grzegorczyk was born in Warsaw on August 22, 1922. World War II interrupted his high school education, but he continued his studies in a clandestine school system organized in occupied Poland. Then he studied in a chemical college and attended clandestine classes in philosophy (given by Władysław Tatarkiewicz) and logic (by Fr Jan Salamucha and Henryk Hiż).

Grzegorczyk took part in the 1944 Warsaw uprising, and after the war went to study at the Jagiellonian University in Cracow. He graduated in philosophy, having written his master's thesis, *The Ontology of Properties*, and he then returned to Warsaw in 1946 where he became Tatarkiewicz's

assistant and the secretary of *Przegląd Filozoficzny* (Philosophical Review). He began research in the field of logic and foundations of mathematics, and obtained his PhD at the University of Warsaw in 1950. His dissertation, *On Topological Spaces in Topologies without Points*, was written under the supervision of Andrzej Mostowski. Then he worked at the Institute of Mathematics of the Polish Academy of Sciences, where he became a docent in 1953 (the paper *Some Classes of Recursive Functions* served as a *de facto* Habilitation dissertation), an associate professor in 1961 and a full professor in 1972. He also lectured at the University of Warsaw, and in 1974 moved to the Institute of Philosophy of the Polish Academy of Sciences where he became the head of the Ethics Group in 1982; he retired in 1990. Married to Renata Majewska, a professor at the University of Warsaw, Grzegorczyk has two children and six grandchildren.

Active in organizing scholarly activities, Grzegorczyk headed the Logical Semester at the International Mathematical Center (the Banach Center) of the Polish Academy of Sciences in 1973; he led a special project, "One Hundred Years of the Lvov-Warsaw School", in 1995–1997; he worked as an assessor on the Executive Committee of the International Union of History and Philosophy of Science, the Division of Logic, Methodology and Philosophy of Science; and from 1999 to 2003 he served as the President of the Committee of Philosophy of the Polish Academy of Sciences.

Grzegorczyk published popular books on logic and computability as well as a widely used textbook: *An Outline of Mathematical Logic, Fundamental Results and Notions Explained in All Details*. These all played an important role in logical education in Poland – and also outside its borders, as his popular books, the first presentations of the theory of computability for a general public, were translated into Czech and Russian.

Grzegorczyk's best known achievement, the so-called Grzegorczyk's hierarchy, was introduced in 1953. He described and investigated classes of recursive functions obtainable by superposition, restricted recursion and the operation of restricted minimum from some initial functions containing addition, multiplication and, in addition, for each class the appropriate, more complicated, primitive recursive function. The resulting subrecursive hierarchy fills the class of primitive recursive functions. Grzegorczyk also co-authored (with Mostowski and Ryll-Nardzewski) a fundamental paper about second-order arithmetic and the infinitary omega-rule.

During his career, Grzegorczyk studied computable real numbers, axiomatic geometry based on the concept of solid, and the theory of Boolean algebras. He showed how to interpret Lesniewski's ontology as Boolean algebra without zero and demonstrated the undecidability of the theory of

Boolean algebras with the operation of closure. He investigated intuitionistic logic, and a modal interpretation of Grzegorczyk's semantics for intuitionism leads to the system known in the literature as $S4.Grz$, defined as $S4$ plus the formula $\Box(\Box(A \Rightarrow \Box A) \Rightarrow A) \Rightarrow A$, called Grzegorczyk's axiom.

Grzegorczyk's recent contribution, the undecidability of the theory of concatenation, has a philosophical motivation: studying formal systems should be performed by operating on objects which are visually comprehensible. The most natural is the notion of text.

Grzegorczyk has always believed that logic is the morality of speech and thought, something that is also applicable to moral discussions. Logic conceived broadly, including the methodology of science, forms a basic component of the intellectual attitude identified by Grzegorczyk as European rationalism. It is rationalism open to the realm of values that makes it possible to acquire reliable knowledge and advocate ethics in social relations. Logic appears from this point of view as a human affair. Interestingly, Grzegorczyk opts for psychologism in logic: semantic relations are always relations for someone and are mediated by language. As a result, for example, paradoxes should not be interpreted as showing that our language is inconsistent, but rather that our concepts and theoretical systems are limited.

Grzegorczyk is a devout Roman Catholic who feels an affinity to Russian Orthodox Christianity. He has always been highly independent in his views and has expressed critical opinions about various policies of the Church. His religious reflection is focused on the moral dimension of Christianity as well as on its links with the European cultural tradition. According to him, Christianity is deeply involved in the same values as European rationalism. The history of Christianity (including its Biblical roots) can be considered the history of how a sense and understanding of the world can be deepened by contemplating the sacred and transcendent. In particular, Jesus provides a moral pattern because he demanded and demonstrated coherent individual testimony.

Grzegorczyk has applied his ethical views to the field of conflict resolution, attaching special importance to the methods of non-violence, such as those advocated by Mahatma Gandhi or Martin Luther King. He cooperated with leaders of non-violent movements. He was also one of the first figures visible in Polish public life who took seriously ecological issues. Before it was widely understood in Poland, he popularized warnings made by the Club of Rome that the resources of our planet are scarce and, therefore, the idea of permanent growth is dangerous.

Introduction

Andrzej Grzegorczyk's philosophical and axiological views have not become as influential or even as known as their author expected. Still, his achievements in logic, such as the Grzegorczyk hierarchy, the geometry of solids, results about undecidability, results about second-order arithmetic, the S4Grz system and semantics for intuitionistic logic, have secured his place in the history of this field. Moreover, his results in concatenation theory and, most recently, regarding propositional calculus with the descriptive equivalence connective, provide an important addition to his signal achievements.

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