

Lionello Pogliani

*Numbers Zero, One, Two, and Three
in Science and Humanities*

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This is the second monograph in the series *Mathematical Chemistry Monographs*, which is edited by Professor Ivan Gutman (Faculty of Science, University of Kragujevac, Kragujevac, Serbia) and published by the University of Kragujevac. The author of the monograph is the well-known mathematical chemist and member of the International Academy of Mathematical Chemistry Professor Lionello Pogliani (Dipartimento di Chimica, Università della Calabria, Rende, Italy). It is interesting to point out that Professor Pogliani's attention was drawn to the role of numbers in science, humanities and everyday life by the following article published in this journal: N. Trinajstić, The Magic of the Number Five, *Croat. Chem. Acta* 66 (1993) 227–254. The outcomes of Professor Pogliani's research related to numbers in all aspects of human life are several publications and this book.

The monograph consists of *Preface*, *Acknowledgements*, *Bibliography* and four chapters, labeled appropriately from zero to three. In the *Preface* (p. 1), the author describes very briefly why he decided to write this book – his aim was to show that even such simple mathematical objects as zero, one, two and three have a rich and complex history and that there are still some open questions regarding them. In *Acknowledgements* (p. 1), the author mentions people who in different ways influenced him to complete the book as well as references that were useful sources of data he used in the book. In *Bibliography* (pp. 2–8), the author gives the titles of 88 books from all areas of human interest, 38 papers and 14 Internet sources that he consulted while preparing the book.

Chapter 0 (pp. 9–61) is entitled *Is Zero Something rather than Nothing?* In this chapter, the author discusses the fundamental question What is zero?, presents the history of this rather unusual number in the sense of what is the meaning of possessing, for example, zero cows, relates zero and the problem of vacuum, and then points out the role of zero in mathematics (giving,

among other things, an amusing discussion about the Fibonacci numbers), zero in physics (for example, discussion about the Heisenberg uncertainty principle), zero in chemistry (for example, discussion about the Bing Bang and the synthesis of elements and molecules), zero in biology (for example, discussion about the origin of life), and the appearance of zero, for example, in music (the 'nullte' symphony in *d* minor, *i.e.*, the zeroth symphony of the Austrian composer Anton Bruckner (1824–1896)). Finally, in the last section entitled *Finalino* (the title of all end-sections), he presents the symbol of Ouroboros, a snake biting its tail, and questions the meaning of the null complete graph.

Chapter 1 (pp. 62–103) is entitled *An Inquiry about One*. In this chapter, the author discusses the question whether one is a number, presents the philosophical side of this question and gives a brief history of one and the ways the number one is written in different cultures. Then, the author describes the role of one in mathematics (for example, he again discusses the Fibonacci numbers and their relation with binomial numbers and Fibonomial numbers), one in physics (for example, he again discusses the Bing Bang, and the fundamentality of the number one in many physical constants), one in chemistry (for example, the meaning of the number one in character tables for point groups) and one in biology (for example, he discusses the evolution of human brain). This chapter ends with two sections. In the first section, the author describes efforts regarding the quest for a single theory that would embrace the fundamental aspects of nature. Here he presents, among other things, the ideas about the unified mathematical theory of all forces existing in nature put forward by (correctly spelled name) Rugjer Bošković (1711–1787) in his book entitled *Theoria philosophiae naturalis redacta ad unicam legem virium in natura existentium* (Vienna, 1758; improved and revised Venice, 1763). In the second section, entitled *Finalino*, the author discusses, among other things, the random sequences.

Chapter 2 (pp. 104–176) is entitled *Two and the Intriguing Dualism of Nature*. In this chapter, the author, after asking and answering if the number two is important, discusses the dualistic systems and the meaning of the number two in different cultures. Then, the author presents the role of the number two in mathematics (for example, the number 2 in the Euler polyhedron formula, in Fermat's last theorem and in Boolean algebra), two in physics (for example, the discussion of the Heisenberg

uncertainty principles, the wave-particle dualism, binary collisions), two in chemistry (for example, the dual concepts, such as the acid-base concept and the oxidation-reduction concept), two in biochemistry (for example, the double helix) and, in a separate section, the symmetry-asymmetry dualism and two in biology (for example, the origin of natural selection). The chapter ends with a section on some very special dualisms, such as god and devil, fat and thin, good and bad and with *Finalino* on the dualism science-religion.

The final chapter, *Chapter 3* (pp. 177–250), is entitled *The Strange Human Preference for a Ternary Patterned Reality*. In this chapter, after asking and answering the question why the number three is a special number, the author presents a brief history of this number. Then, the author describes the role of three in mathematics (for example, he discusses the lucky numbers; however, he did not speculate on their possible use in predicting lottery outcomes), three in physics (for example, he discusses the three possible forms of the Universe), three in chemistry (for example, he discusses the knotted molecules), three in biology (for example, he discusses the unfortunate genetic defect when the embryo develops with a triplet in-

stead of a pair of chromosomes), three in literature (for example, he discusses the novel *The Third Man* by Graham Greene (1904–1991)), music (for example, he discusses the operetta *Dreimäderlhaus* (The House of the Three Girls) by Franz Peter Schubert (1797–1828)), philosophy (for example, he discusses the formal structure of the Aristotelian logic) and religion (for example, he discusses the Holy Trinity concept). The end-section, *Finalino*, presents three in various contexts, such as in baseball, slogans and verbal rituals, ads, etc.

I have found only a few misprints in this carefully prepared book, e.g., *Louis XVI* should stand instead of *Louis XIV* (p. 105) and *A father* instead of *e father* (p. 110).

I enjoyed reading this book and found it a rich source of all kinds of interesting data about the first four numbers 0, 1, 2 and 3. Since the first two books in the series *Mathematical Chemistry Monographs* represent a very stimulating reading and useful reference sources, I am looking forward to books that, hopefully, will follow. Information about forthcoming books as well as the ones published can be found at the address <http://www.pmf.kg.ac.yu/match/>.

Nenad Trinajstić