

# A HISTORY THAT MUST BE KNOWN: THE PHENOMENON OF ROMANIAN INFORMATICS. THE CONCLUSIONS OF THE ROINFO PROJECT COMPUTING “ROMANIAN INFORMATICS”

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*Abstract:* The article describes the partial conclusions of the national ROINFO project 2018–2022: the phenomenon of Romanian informatics is contemporary with the beginning of global computer science and the Cybernetics was born in Romania (1938–1939). The article shows the stages in the emergence and development of Romanian informatics: 1. Research on recursive functions, logic and theory of demonstration (1927–1935) – prehistory of Romanian informatics, 2. Cybernetics was born in Romania (1938–1939), 3. Fundamentals of models for computing and development of computing, 4. Realization of Romanian computers, 5. Development of computers in the world. In Conclusions, we underline that Cybernetics was born in Romania (1938–1939), following the international recognition of the work of the scientist Ștefan Odobleja, the creator of Cybernetics: 1. “Demonstration de phonoscopie”, the year 1937, 2. “Psychologie consonantiste“, period 1938–1939, 3. Year 1972 – the autobiography of the mathematician Norbert Wiener, 4. “Cybernetics and Consonantist Psychology”, the year 1975, 5. “Diversity and Unity in Cybernetics”, the year 1978.

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**Tell future generations that Cybernetics was created in Romania (1938-1939), that Romania developed a Romanian informatics (after 1953) and built its own electronic computer (CIFA-1, 1957)!**

**Motto:** *“The Informatics/Computer Science restores not only the unity between the pure and the applied mathematical sciences, the concrete technique and the abstract mathematics, but also that between the natural sciences, the human being and the society. It restores the concepts of the abstract and the formal and makes peace between arts and science not only in the scientists’ conscience but also in their philosophy as well.”* **Grigore C. Moisil**, Computer Pioneer Award and the father of Romanian Computer Science.

*“Knowledge is the bridge that connects us with all those who have ever lived before us. From civilization to civilization and from life to life, we contribute to the individual stories that become our collective history. No matter how well we keep the information about the past, the words in these stories are just “information” until we make sense of them. The way we apply what we know about our past becomes the wisdom of the present.”* **Gregg Braden**.

*“Understanding the evolution of concepts and theories in all fields and sciences, understanding the history of fields and sciences, consolidates the treasure of universal knowledge and helps us to develop them.”* **Marin Vlada (2019)**.

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## INTRODUCTION: PRIORITIES IN CYBERNETICS, COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

Science develops through the set of research, concepts, theories, methods and techniques that become valid and contribute to science complex problems studying and solving. Sometimes, over time, some of the theories, methods or techniques become obsolete and, through the appearance of more efficient and effective ones, disappear or are updated. Such examples are in mathematics, computer science, biology, medicine etc. The role of scientists is to contribute to these efforts to develop science. Globally, every nation has some fundamental contributions in the development of science, at various times when scientists, researchers, engineers, etc. are inventors or have priorities in developing theories, methods, or techniques. In this sense, Romania can also be proud of such people, even if in some situations the international recognition came later or maybe with great difficulties. Thus, a conclusive example is the case of Dr. *Ștefan Odobleja* (1902–1978), a forerunner of Generalized Cybernetics, who, only in 1978, at the Fourth Congress of the World Organization for General Systems and Cybernetics in Amsterdam, was recognized for his primacy (1938–1939) over the mathematician Norbert Wiener (1894–1964), who founded cybernetics (1948). The president of the congress, *J. Rose*, decided to award the gold medal “*Norbert Wiener*” – 30 years of cybernetics to the President of Romania (Vlada\_2020).

*About the beginnings and development of the world and Romanian informatics*

- **The year 1938:** Inventive machine – “*Thanks to the psycho-physical reversibility, we can materialize the act of creation. Undoubtedly, the inventive machine has not yet been created, but we can see its creation soon.*” (Ștefan Odobleja, *Consonantist Psychology*, 1938–1939, Paris);

- **The year 1973:** Informatics – “*The Informatics/Computer Science restores not only the unity between the pure and the applied mathematical sciences, between the concrete technique and the abstract mathematics, but also that between the natural sciences, the human being and the society. It restores the concepts of the abstract and the formal and makes peace between arts and science not only in the scientists' conscience but in their philosophy as well.*” (Grigore C. Moisil);

- **The year 2015:** Computational models – “*All important computational models came from simulating the activity of the nervous system. The automata models of the 1940s, the Turing machine of the 1930s, and the electronic computer produced by John von Neumann and his team in 1948 focused on the upper nervous system. In my 1964 book, Finite grammars and automata there is a large chapter on the neural system, as modelled by finite automata and regular grammars by S.C. Kleene.*” (Marcus, 2015);

- **The year 2017:** Molecular computer – “*Define a molecular computer as one molecule which transforms, by random chemical reactions mediated by a collection of enzymes, into a predictable other molecule, such that the output molecule can be conceived as the result of a computation encoded in the initial molecule.*” (Buliga, 2015).

In 1978, as a student of the Faculty of Mathematics in Bucharest, Department of Informatics, I participated in the conference held by professors Solomon Marcus, Cristian Calude (newly assistant), and Ionel Țevi – researcher at the Institute of Mathematics with the topic “Gabriel Sudan – The first example of position recursive which is not primitive recursive”. The results of the research were published in C. Calude, S. Marcus, I. Țevi, *The First Example of A Recursive Function Which Is Not Primitive Recursive*, *Historia Mathematica*, 6 (1979), pp. 380–384. Many years later, in 2017, I remembered this event-episode when writing an article in the ICVL 2017 volume: “*History of Informatics. From recursivity to the Turing universal machine and Horn clauses*”, then in 2018 on the occasion of the elaboration of vol. I and II of “*History of Romanian Informatics*” (ROINFO project 2018–2022). Prof. Cristian Calude – came from New Zealand, was present at the launch of vol. I and II, which took place in the Spiru Haret amphitheater at the Faculty of Mathematics and Informatics, 26 Sept. 2019. In the presentation made on this occasion, C. Calude referred to this episode and confirmed the aspects related to those researches from 1974–1978. Sergiu Rudeanu<sup>1</sup> (1935–2019) was also paid homage, for his contribution to the development of pseudo Boolean programming, which today underlies quantum computers. Solomon Marcus, in the book “*From Romanian mathematical thinking*”, Scientific and Encyclopaedic Publishing House, 1975, writes about these researches related to the recursive function G. Sudan (Marcus 1975).

**The Pioneers in Computer Science/Informatics:** *David Hilbert, Wilhelm Acherman, Alonzo Church, Kurt Gödel, Alan Turing, John von Neumann, Norbert Wiener, Noam Chomsky.*



Fig. 1 *The Pioneers in Computing (Computer Science /Informatics)*<sup>2</sup>

<sup>1</sup> <http://mvlada.blogspot.com/2019/07/in-memoriam-prof-dr-sergiu-rudeanu.html>

<sup>2</sup> [https://museums.fandom.com/wiki/Pioneers\\_of\\_Computing](https://museums.fandom.com/wiki/Pioneers_of_Computing)

Worldwide, the American mathematician – of Hungarian origin, *John von Neumann* (1903–1957) is the author of the structure of the modern computer through *Von Neumann architecture*, through the technical report *First Draft of a Report on the EDVAC* from 1945, architecture that was based on the work of the British mathematician Alan Mathison Turing (1912–1954), ([https://en.wikipedia.org/wiki/Alan\\_Turing](https://en.wikipedia.org/wiki/Alan_Turing)) – this was acknowledged by Neumann, who described the so-called abstract Turing machine) – “*On Computable Numbers, with an Application to the Entscheidungsproblem (decision problem)*”, Proceedings of the London Mathematical Society, 2 42: 230–65, 1936. In 1943, Turing built, for the benefit of the British army, Colossus – the first digital electronic computer for decryption of German codes, and in the period 1945–1946 contributed to the prototype of the computer machine “*Automatic Computing Engine*”, made physically later, in 1950. In 1946 Turing presented a work that represents the first detailed design of a computer with a stored program. Today, this architecture is recognized and valid.

The construction of the modern computer was preceded by research and scientific papers on the construction of a computing machine to perform calculations, but also operations with symbols. This is how the “decision<sup>3</sup> procedure” arose from the computability theory and computational complexity theory. Decision problems usually arise in mathematical questions of decision-making, i.e. the problem of the existence of an effective method for determining the existence of an object or its membership in a set; some of the most important problems in mathematics are undecidable. The field of computational complexity classifies decision problems determined by how difficult they are to solve. “Difficult” in this sense is described in terms of the computational resources required for the most efficient algorithm for a given problem. Meanwhile, the field of recursive theory classifies undecidable decision problems according to the degree of Turing, which is a measure of the non-computability inherent in any solution. The origin of the decision problem dates back to the mathematician *Gottfried Leibniz*, who in the seventeenth century, after building a mechanical calculating machine, dreamed of building a machine that could manipulate symbols to determine the truth value of a mathematical statement. He realized that the first step should be a formal language, and much of his later work was directed toward that goal. In 1928, *David Hilbert* and *Wilhelm Ackermann* put the issue in the form presented above. Following his “program”, Hilbert asked three questions at an international conference in 1928, the third of which became known as “Hilbert’s Entscheidungsproblem” (Hilbert’s decision problem). In 1929, Moses Schönfinkel published an article on the particular cases of the decision problem, which were prepared by Paul Bernays. Even in 1930, Hilbert believed that there were no unsolvable problems (Păun 2016).

**NORBERT WIENER’S CYBERNETICS (1894–1964)  
VS. CYBERNETICS OF ȘTEFAN ODOBLEJA (1902–1978)**

The mathematician *Norbert Wiener*<sup>4</sup> is considered the founder of cybernetics, the basic principles being described in his work “*Cybernetics or Control and*

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<sup>3</sup> [https://en.wikipedia.org/wiki/Decision\\_problem](https://en.wikipedia.org/wiki/Decision_problem)

<sup>4</sup> [https://en.wikipedia.org/wiki/Norbert\\_Wiener](https://en.wikipedia.org/wiki/Norbert_Wiener)

*Communication in the Animal and the Machine*” (1948), even if 10 years previously the Romanian Dr. *Ștefan Odobleja*– military doctor, published in French the fundamental work in 2 volumes, “Consonantist Psychology” (1938–1939), in which he defined the bases of a new science, Cybernetics, which will propel the construction of the modern computer and developing a new science: Computer science. Odobleja established the fundamental ideas of Cybernetics<sup>5</sup> – the 9 universal laws, the most important referring to feedback. *Norbert Wiener* is regarded as one of the first to theorize that all intelligent behaviour was the result of feedback mechanisms, which could be simulated by machines and was an important early step toward the development of modern artificial intelligence. Wiener's name frequently appears in the context of computer development, where he made important contributions to solving differential equations (1940). His World War II preoccupation with directing artillery fire led Wiener to develop a communication and transmission system for cybernetics. Thus, the birth of cybernetics took place in 1943, and in 1947 Wiener reached an agreement with other scientists to use the term “*cybernetics*” – a Greek term (κυβερνήτης – helmsman). It is a term that includes the regulation and linking of systems in the field of static mechanics, technology, and systems in the world of living organisms.

#### STAGES IN THE EMERGENCE AND DEVELOPMENT OF ROMANIAN INFORMATICS

Following studies and research within the ROINFO 2018–2022 project (*Romanian Informatics*) conclusions have been reached that must be known by the scientific world. These conclusions refer to the emergence and development of Informatics in the world and in Romania. The role of some nations in the emergence and development of Informatics worldwide is highlighted, through the joint efforts of scientists – *pioneers of Computing* (Computer Science and Computer): mathematicians, physicists, engineers, cyberneticists, economists, psychologists, etc. From the conclusions of the ROINFO project, some facts unknown until today in the history of world informatics have been reached. For example, Romania can be proud of a “*Romanian Informatics*” because the scientists from 1953–1970 contributed to the development of researches regarding the construction of the modern computer, managing to build their own Romanian computers. Between 1953 and 1954, Romania ranks third in the world, after the USA and USSR, in the research activity on the Theory of switching circuits – according to the number of articles (*Grigore C. Moisil*). Romania was the eighth country in the world designing and building an electronic computer (1957) and the eleventh country in the world, which built an electronic computer with transistors (1963). Therefore, comparing the scientific results and the contributions of scientists in the development of Informatics and computers, the priorities of some researchers and scientists, worldwide or nationally, can be highlighted. These priorities refer to Cybernetics – the science of systems, without which Informatics and the construction of computers would not have been possible. There is also evidence and results on some concepts and aspects regarding the vision of

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<sup>5</sup> <http://mvlada.blogspot.com/2019/10/stefan-odobleja-precursor-al.html>

some scientists for the emergence and development of Artificial Intelligence – a complex field for building intelligent machines and systems that simulate intelligent human behaviour in solving complex decision-making problems.

Romania can be proud of the contribution of the Romanian scientists – mathematicians and engineers, in several fields of scientific research, on the fundamentals of calculability theory, the fundamentals of cybernetics, the algebraic theory of automatic mechanisms, mathematical logic applied to building and using the first electronic computers in Romania. A key role was played by acad. *Grigore C. Moisil* (1906–1973), considered the founder of the Romanian computer science, together with the engineers who built and developed the Romanian computer industry. Also, today, it is known that the new science Cybernetics was born in Romania, in 1938 and 1939, when Dr. *Ştefan Odobleja* – military doctor, published in French the fundamental work in 2 volumes, “*Consonantist Psychology*”. He defined the foundations of a new science, Cybernetics, which will propel the construction of the modern computer and the development of a new science: Computer Science, which will contribute to the development of Artificial Intelligence. Odobleja established the fundamental ideas of Cybernetics (the 9 universal laws), the most important referring to feedback.

Romania in those years, before and after World War II, was connected to the scientific and technical activity on the emergence of new sciences: Cybernetics and Informatics, through the scientific efforts of the world community, to the construction of computer systems. In the ‘60s, Romania was considered among the first countries in the world (after the USA, England, USSR, Germany, France, Japan, Austria, Holland, Italy, and Denmark) regarding research and efforts to build the electronic computer. The Romanian school of mathematics developed under the influence of Romanian mathematicians who defended their doctorates with prestigious mathematicians from France, Germany, and Italy. For example, the mathematician *Gabriel Sudan* (1899–1977) published in 1927 (before *W. Ackermann*, 1928), the first non-primitive recursive function (Vlada 2019).



Fig. 2 The Pioneers in Romanian Informatics<sup>6</sup>

<sup>6</sup> [https://museums.fandom.com/wiki/Pioneers\\_of\\_Computing](https://museums.fandom.com/wiki/Pioneers_of_Computing)

• **Gabriel Sudan (1899–1977) and the study of recursive functions** – “After a careful examination of all the articles and books of Prof. *Sudan*, *Cristian Calude* turns his attention to the article *Sur le nombre transfini  $\omega^\omega$* , published in the Bulletin Mathématique de la Société Roumaine des Sciences, vol. 30, 1927, fasc. 1, pp. 11–30” (S. Marcus, From Romanian mathematical thinking, Scientific and Encyclopedic Publishing House, Bucharest, 1975) (Marcus 1975, Filip 2018).

• **Cybernetics was born in Romania – Cybernetics of Stefan Odobleja (1902–1978)** – “I coveted my whole life for the comfort of big cities, but fate, more prudent than me, protected me from this danger. I can believe that the realization of this psychology with a pronounced character of cybernetics is also due to the fact that its author lived his life in the province, closer to nature. The training in nature and the permanent contact with nature and its realities put me in the optimal conditions to reflect on my thinking and at the same time they imprinted on me an independent, personal and realistic attitude.” (Dr. *Ștefan Odobleja*.)

• **Grigore C. Moisil (1906–1978) – the founder of Romanian informatics and of the algebraic theory of automatic mechanisms** – *Grigore C. Moisil* receives – post-mortem, in 1996, Computer Pioneer Award (Computer Pioneer Award<sup>7</sup> – IEEE Computer Society) – the only Romanian who received this medal “For the development of polyvalent logical switching circuits, the Romanian School of Computing, and support of the first Romanian computers”.

• **The mathematician Tiberiu Popoviciu and the Romanian computer DACCIC** – Tiberiu Popoviciu (1906–1975), a visionary scientist, was a personality with important achievements in founding computer science in Romania in the ‘50s, both in terms of hardware and software. Notably, Tiberiu Popoviciu is the author of the first monograph in Romania on numerical analysis and approximation theory, 1937. We briefly list the following steps/arguments on the contribution of acad. *T. Popoviciu*<sup>8</sup> at the founding of Romanian informatics (“Tiberiu Popoviciu” Institute of Computing Cluj-Napoca, Romanian Academy).

• **Engineer Victor Toma (1922–2008), the pioneer of the construction of Romanian computers** – Thanks to Eng. Victor Toma and under his direct guidance, a series of electronic computers were made on tubes starting with CIFA-1 (April 1957), CIFA-2 (1959), CIFA-3 (1960), CIFA-4 (1962) and then on transistors CET-500 (1964) and CET-501 (1966). The CIFA-101 (1962) and CIFA-102 (1963) computers were also made in the section led by Victor Toma.

• **Wilhelm Löwenfeld and Iosif Kaufmann, creators of the MECIPT computer in Timisoara** – “*Willy Löwenfeld* was without a doubt the soul of MECIPT (*Electronic Computing Machine of the Timișoara Polytechnic Institute*). We cannot deny the merits of *Iosif Kaufmann* as a brain of MECIPT,

<sup>7</sup> <https://www.computer.org/profiles/grigore-moisil>

<sup>8</sup> <https://ictp.acad.ro/ro/tiberiu-popoviciu-unul-din-fondatorii-informatic>

*but without Willy the computer certainly would not have appeared. Out of extraordinary vitality, with a perseverance that I always took as a model without success, Löwenfeld managed to coordinate the few resources existing for the completion of the project in a way many nowadays project managers could envy him for. In 1961, as a fourth-year student at the Faculty of Electrical Engineering in Timisoara, I was approached by Willy Löwenfeld, one of the two creators of MECIPT – a project that was already talked about, but not out loudly. Willy brought me to the computer under construction and I started to work with Iosif Kaufmann, in the form of a student circle, fashionable at that time. It was the moment when, after the initial impulses of Grigore C. Moisil, I decided that I wanted to work in the field of computers at any cost.” (Vasile Baltac, 2008.)*

- **Solomon Marcus (1925–2016), the mathematician of frontier and interdisciplinarity** – Academician *Solomon Marcus*, a renowned scientist with a solid international career, developed over 65 years, the Romanian mathematician and computer scientist whose name is quoted in major international encyclopaedias, has published over 50 volumes and 400 scientific articles, in various fields: mathematical analysis, mathematical linguistics, theoretical informatics, mathematical poetics, semiotics, history and philosophy of science, mathematical models in the natural sciences, history and philosophy of science and in the socio-humanistic sciences.

- **The mathematician Sergiu Rudeanu (1930–2019) and the structures of discrete mathematics** – Prof. Dr. *Dragoş Vaida*: “Sergiu Rudeanu was a mathematician who fully deserves the international recognition and echo, from which you had something to learn, not how to make your life easy, but certainly how to make a solid, unitary, coherent work, to which you could look with gratitude even later”. Cristian S. Calude and Marian Gheorghe (*Fundamenta Informaticae*, vol. 131/2014): “Research activity of Sergiu Rudeanu<sup>9</sup> in lattice theory, algebra of logics, universal and Boolean algebras (see pseudo-Boolean programming, a subject he has initiated with P. L. Hammer), automata theory and graph theory is internationally well-known and appreciated. A very good lecturer, who devoted time and energy to write many textbooks, Prof. Rudeanu was also an excellent supervisor. The Mathematics Genealogy Project lists his 12 PhD students (including well-known researchers as D. Simovici, A. Iorgulescu and S. Istrail) and 13 descendants”.

The volumes “History of Romanian informatics. Appearance, development and impact”, MATRIXROM Publishing House, 2019–2020:

- Volume I (*Computing – International Context*), contains Chapter 1: 1. The International Context to the Emergence and Evolution of Computers.

- Volume II (*Computing – National Context*) contains chapter 2: 2 The national context on the foundation of Romanian informatics.

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<sup>9</sup> <http://www.genealogy.math.ndsu.nodak.edu/id.php?id=60012>



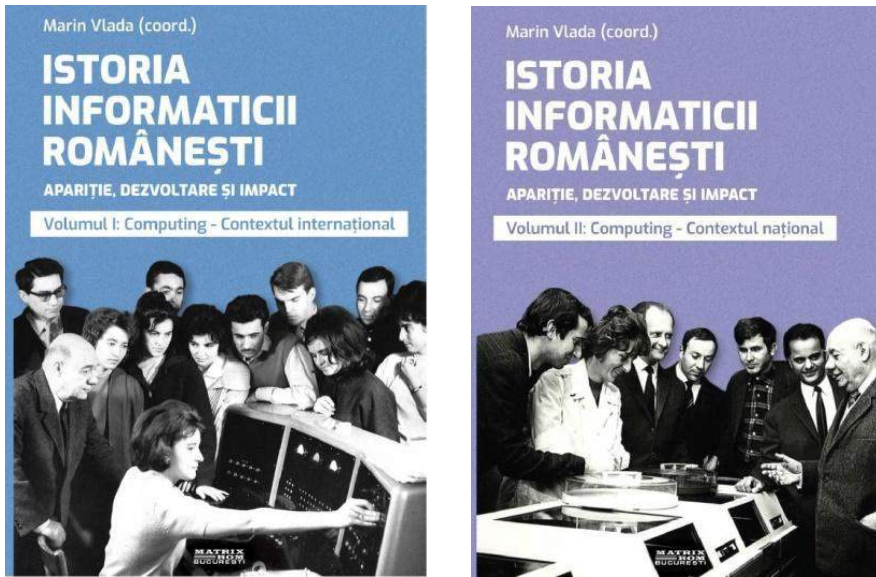


Fig. 3 Volumes I and II “History of Romanian informatics. Appearance, development and impact”

- Volume III (*Computing: Emergence and Development*) further includes 4 chapters (chapters 3–6): 3. The development of the computer industry in Romania; 4. Grigore C. Moisil – Computer Pioneer, founder of informatics in Romania; 5. Solomon Marcus, a life dedicated to mathematics and informatics; 6. The pioneers of Romanian informatics – University of Bucharest.

- Volume IV (*Computing: Development and impact*) further includes 4 chapters (chapters 7–10): 7. The pioneers of Romanian informatics – People and institutions; 8. Development and impact of informatics in Romania; 9. Computer Science and Cybernetics at the Academy of Economic Studies (ASE); 10. The history of computerization in the Romanian pre-university environment 1985–2018.

- Volume V (*Computing: Development*) further includes 2 chapters (chapters 11–12): 11. Development of the IT / IT field in Romania (Higher Education in Informatics and IT, CCUB, the first informatics unit established in Romania, Examples of software products developed by CCUB, High school and high school computer science, Emergence and evolution of IT companies / companies in Romania, Production of books and publications on informatics and IT, Contributions to the development of Romanian informatics: INFO-IAȘI and ROSYCS, Informatics methods and systems, studies and researches – evolution and impact); 12. Scientific events and IT / IT events in Romania (Pioneering scientific events in the field of informatics / IT, Pioneering scientific events in the field of informatics / IT, other programs and projects – Professional Development of Teachers).



Fig. 4 Volumes III, IV and V “History of Romanian informatics. Appearance, development and impact”

Now it can be stated that, in fact, the objectives of the ROINFO project continue some previous approaches regarding the history of informatics in Romania. The first approach is made by acad. *Grigore C. Moisil* through the article “Activity of the Computing Center of the University of Bucharest – CCUB”, AMC no. 13–14, 1970, Technical Publishing House<sup>10</sup>. The second approach is made by the Vietnamese *Pham GiaDuc*<sup>11</sup>, “The History of the Establishment and Development of Computer Science in the R. S. România”, 1972. The third approach is *Marius Guran's* book, Monograph of Informatics in Romania, Historical Landmarks, AGIR Publishing House Bucharest, 2012, 705 pages. After the conception and elaboration of the first 2 volumes of the ROINFO project, important conclusions were drawn by understanding the phenomenon of Romanian informatics. Thus, the two papers highlighted the important efforts and contributions of scientists, professors, researchers, engineers etc., on the emergence and development of informatics in Romania. Therefore, the phrase “*Romanian informatics*” is argued by examples, studies, achievements, initiatives and actions.

These aspects were described in the Preface to Volume III (Vlada 2021):

1. **Research on recursive functions, logic and theory of demonstration** – In 1927, the Romanian mathematician Gabriel Sudan (1899–1977), with his doctorate at David Hilbert, gave the first example of a non-primitive recursive function, before Wilhelm Ackermann (1928). Between 1934–1942, at the University of Iași, the mathematician Grigore C. Moisil (1906–1973) dealt with “Logic and the theory of demonstration” and aiming to “learn mathematics from the beginning”, he studied at the “wonderful library” of the Mathematical Seminar from Iași, the book by Hilbert and Ackermann, but also the 3 volumes “Principia Mathematica” by Russel and Whitehead. Professor Moisil learned about Lukasiewicz's multi-valued logics in the

<sup>10</sup> <http://c3.cniv.ro/?q=2018/restituiri>

<sup>11</sup> <http://c3.cniv.ro/?q=2018/duc>

- spring of 1935, when T. Kotarbinski, a professor at the University of Warsaw, gave 3 public lectures and a short lecture at the Mathematical Seminar on Lukasiewicz's writing without parentheses.
2. **Cybernetics was born in Romania (1938–1939)** – Today it is known that, 10 years before the book of the American mathematician Norbert Wiener (1894–1964) “Cybernetics: Or Control and Communication in the Animal and the Machine”, the Romanian Dr. Ștefan Odobleja (1902–1978) – military doctor (post-mortem member of the Romanian Academy, 1990), published in 2 volumes “Consonantist Psychology”, 1938–1939, at the Publishing House “Maloine”, Paris, in French (totalling over 800 pages), in which he establishes general laws, which he applies to both the sciences of inert nature and the sciences of the living world, psychology and economic and social phenomena. Dr. Ștefan Odobleja makes a description of the psychological functions using a general scheme of a cybernetic system, where the sense organs, which receive information from the environment, represent the inputs (INPUT), and the muscles are considered the outputs (OUTPUT). They take “*steps beyond the boundaries of psychology*” moving from man to other complex systems (communities, social organizations, etc.), inventing a new science: Cybernetics.
  3. **Fundamentals of models for computing and development in the field of computing** – In the period 1953–1954, Romania ranked third in the world, after the USA and the USSR, in the research activity on “Theory of switching circuits” – after number of articles (Gr. C. Moisil, CCUB Activity, AMC magazine, Technical Publishing House, no. 13–14, 1970). Programs for the national computer and management system, regarding the endowment with computer technology in the period 1971–1980 (1967, 1971, 1972).
  4. **Making Romanian computers** – Between 1955 and 1957, Romania designed and built its first electronic digital computer (1957, CIFA 1 computer), by a team led by Victor Toma, at the Institute of Atomic Physics (IFA) – Măgurele, Bucharest.
  5. **Development of computers in the world** – Romania was the eighth country in the world to design and build an electronic computer (1957) and the eleventh country in the world to build an electronic computer with transistors (1963).

### CYBERNETICS WAS BORN IN ROMANIA (1938–1939)

*Stages in the international recognition of the work of the scientist Ștefan Odobleja, the creator of Cybernetics (Vlada 2021):*

1. **“Demonstration de phonoscopie”, the year 1937**, Dr. Ștefan Odobleja presents a scientific paper at the ninth (IX) *International Congress of Military Medicine and Pharmacy*, Bucharest. The paper is received with great interest by Dr. W.S. Bairbridge, head of the American delegation. On this occasion, Dr. Ștefan Odobleja distributed to the participants in the Congress a leaflet in French announcing the publication of the paper: “Consonantist Psychology” (1938–1939). Coincidentally

or not, the two American military doctors (Dr. Wiliam Seman Bainbridge – chief physician of the seventh American Fleet in the Mediterranean, and Dr. Rosenblueth), later – after 1940, were included in the research team of the American mathematician Norbert Wiener – today, considered the father of cybernetics.

**2. “Consonantist Psychology”, period 1938–1939** – Dr. Ștefan Odobleja (1902–1978), publishes in 2 volumes “Consonantist Psychology”, 1938 and 1939, at the “Maloine” Publishing House, Paris, in French, totaling over 800 of pages), in which he establishes general laws, which he applies both to the sciences of inert nature and to the sciences of the living world, psychology and economics, and social phenomena. “Consonantist psychology has revealed the importance of dual, binary and dichotomous mechanisms both in psychology and beyond, in all sciences. He suggested and applied it as another essential for the mechanization of thought, along with circularity. Instead of logic based on 3, he proposed and sketched a logic based on 2”, says Dr. Ștefan Odobleja. Thus, he came to define the 9 universal laws, among them being the law of reversibility / vicious circle, feedback. The 2 volumes represent the concepts and studies for a new science: Cybernetics.

**3. The year 1972** – Since 1972, when Ștefan Odobleja read the autobiography of the mathematician Norbert Wiener, he devoted himself to demonstrating the idea that the origin of cybernetics lies in psychology and that “Cybernetics was born in Romania in 1938” through his work in 2 volumes “Consonantist Psychology” from 1938–1939. In this sense, in order to mark his partnership, he published a special work, which appeared in the very year of his death: “Consonantist and cybernetic psychology”, with a substantial preface by Mihai Golu: Ștefan Odobleja, Consonantist and cybernetic psychology, Scrisul Românesc Publishing House, Craiova, 1978.

**4. “Cybernetics and consonantist psychology”, the year 1975** – Scientific communication at The Third International Congress of Cybernetics and Systems, Bucharest, Romania, August 25–29, 1975 (ASE Bucharest). The paper appeared in Proceedings of the Congress (editors J. Rose – UJ and C. Bilciu–Romania), Vol. II, section 5 (Communications, Education, and Informatics), SPRINGER-VERLAG Berlin, Heidelberg, New York. The author presents the connection between the basic concepts of cybernetics and the ideas presented in detail in the volume “Consonantist Psychology”, Paris, 1938–1939. Consonantist psychology views the brain as a thinking machine; it proceeds to the analysis of thinking in a mechanical, modern way and separates distinctly the two primordial categories (psychological and dynamic question). Thus, Dr. Ștefan Odobleja can be considered a forerunner of Artificial Intelligence.

**5. “Diversity and unity in Cybernetics”, the year 1978** – Scientific communication at the IV International Congress of Cybernetics in Amsterdam – Netherlands (August 21–25, 1978), which was presented by Dr. Stelian Bajureanu – Dr. Ștefan Odobleja is ill in bed, and obtains international recognition as a forerunner of cybernetics. B. H. Rudall of the University of Wales, who chaired the session, said: “Dr. Odobleja's work was very well received. A great interest and

appreciation was expressed *towards Consonantist Psychology*". The convention was dedicated to the celebration of Norbert Wiener. After the presentation of Odobleja's work, "40 years of cybernetics" were chanted, although "30 years of cybernetics" and Norbert Wiener, who did not receive the Nobel Prize, were also celebrated.



Fig. 5 September 26, 2019, Meeting of Romanian computer scientists, launching volumes I and II, Amphitheater S. Haret, Faculty of Mathematics and Computer Science<sup>12</sup>

## CONCLUSIONS

*"Any science that does not dissolve in practical applications is a crippled and useless science. The great inventions were made by scientists who were at the same time scholars. With simple incursions, not much can be done. It must be attacked on a broad front. Only in such a way will it be possible to produce a more important breakthrough in the enemy front of the unknown."* Dr. Ștefan Odobleja (1902-1978), Father of general cybernetics, post-mortem member of the Romanian Academy.

*"The value of scientific work is judged by the influence it exerts on the evolution of science. There are also clogged roads in science, rivers that instead of flowing into rivers and thus into seas and oceans, fail in a small lake or simply in a puddle"* Acad. Solomon Marcus (1925–2016). *"Calculus, in all its generality, is one of the fundamental human skills; we are born with this predisposition. It took a historic effort to perform a molecular analysis of human calculus in its irreducible components, an effort that culminated in the result of the British Alan Turing 80 years ago, in what science refers to as the Turing machine. It prefaced the*

<sup>12</sup> [https://1.bp.blogspot.com/-ETUGQgfQr5c/X3gr4\\_we8mI/AAAAAAAAAUBI/\\_zfKZxKfWx8PvVu5A3RZN\\_ry4GSer3v3ACNcBGAsYHQ/s960/26%2Bspt%2B2029%2Bamf%2BS%2BHar et%2BBlansarea%2Bvol%2BI%2B-II.jpg](https://1.bp.blogspot.com/-ETUGQgfQr5c/X3gr4_we8mI/AAAAAAAAAUBI/_zfKZxKfWx8PvVu5A3RZN_ry4GSer3v3ACNcBGAsYHQ/s960/26%2Bspt%2B2029%2Bamf%2BS%2BHar et%2BBlansarea%2Bvol%2BI%2B-II.jpg)

*electronic program-based computer developed by John von Neumann and his team in 1948. Inadmissibly, this itinerary, which makes the transition from traditional, numerical to qualitative computing, with entities of an abstract, unspecified nature, is missing from the program school.” Acad. Solomon Marcus (1925–2016).*

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In his vast work “*Consonantist Psychology*” (the term/concept of consonance – without consonance, did not exist in the dictionary in 1938), Dr. *Ștefan Odobleja* uses nine (9) universal laws (*equivalence, equilibrium, compensation, reaction, oscillation, reversibility-feedback, inertia, consonance, transformation*) based on the resonance phenomenon (this term existed in 1939, resonance, see resonance, source: Scriban – 1939). He is the first who applied the law of feedback (the law of reversibility) in nature and in society, to as many scientific fields as possible: *philosophy, biology, psychology, sociology, political economy, mathematics, and even medicine (psychoneurology, psychophysiology, psychopathology, interpsychology)*; this approach helps us understand more easily the interrelationships between biological, psychological and social factors, the connections between psychic and somatic, in the practice of psychosomatic medicine. The consonantist psychosomatic phrase helps us to better understand the psychosomatopsychic circuit expressed in psychophysiological and clinical terms, in the work of *Ștefan Odobleja*.

#### REFERENCES:

- BDM, SoftSolutions, *IEEE Computer Society’s Web Programming Competition* *Unsung Heroes, CHC61 Competition*: Team number 718293 (BDM SoftSolutions), <http://www.bdmssoft.com/ieecontest/life.php>
- Baltac, Vasile. <http://evocari.blogspot.com/2008/07/wili-loewenfeld-primul-pionier-al.html> Filip, Florin Gheorghe. *Civilizația Românească* (coord. Victor Spinei) – *Știința și tehnologia informației în România*: Editura Academiei Române București, 2018: 119–121
- Ghinea, Cornelia. *Ștefan Odobleja. Omul, militarul, medicul*: Buletinul arhivelor militare, Anul XVII, Nr. 3(65), 2014, <http://www.universitateaeuropeana.dragan.ro/admin/documente/1291024277.pdf>
- Păun, Gheorghe, *Moisil 110*: Editura Tiparg, Curtea de Argeș, 2016
- Marcus, Solomon. *Din gândirea matematică românească*, Ed. Științifică și Enciclopedică, 1975

- Vlada, Marin (coord.). *Istoria informaticii românești. Apariție, dezvoltare și impact. Oameni, instituții, concepte, teorii și tehnologii*, vol. I, II, III, IV: Editura MATRIXROM, 2019–2021
- Vlada, Marin and Adăscăliței, Adrian. *Ștefan Odobleja: A Scientific Visionary, precursor of Cybernetics and Artificial Intelligence*, Proceedings of the 12th International Conference On Virtual Learning (ICVL 2017): Editura Universității din București, 2017
- Vlada, Marin and Adăscăliței, Adrian. *History of Informatics. From recursivity to the Turing universal machine and Horn clauses*, Proceedings of the 12th International Conference On Virtual Learning (ICVL 2017): Editura Universității din București, 2017
- Vlada, Marin. *Priorities in Cybernetics, Computer Science and Artificial Intelligence. About the beginnings of world and Romanian Informatics*: ICVL 2020, <http://c3.icvl.eu/papers2020/1.pdf>, <http://www.c3.icvl.eu/2020/priorities>
- Vlada, Marin. *ROINFO 2018–2020 Project “Romanian Informatics”, 60 years of Romanian Informatics*: ICVL 2020, <http://c3.icvl.eu/papers2020/2.pdf>
- Vlada, Marin. *ROINFO project “Romanian Informatics” – Conclusions*, 2020, <http://c3.icvl.eu/2020/roinfo-conclusions>
- Vlada, Marin (coord.), *ROINFO project “Romanian Informatics”*, <https://sites.google.com/view/roinfo/>, 2020

#### IMAGES:

- The Pioneers in Computing (Computer Science /Informatics), in [https://museums.fandom.com/wiki/Pioneers\\_of\\_Computing](https://museums.fandom.com/wiki/Pioneers_of_Computing), last accessed 13.07.2021.
- The Pioneers in Romanian Informatics in <http://c3.icvl.eu/2020/roinfo-0>, last accessed 13.07.2021.
- Meeting of Romanian computer scientists, launching volumes I and II, Amphitheater S. Haret, Faculty of Mathematics and Computer Science, in [https://1.bp.blogspot.com/-ETUGQgfQr5c/X3gr4\\_we8mI/AAAAAAAAAUBI/\\_zfKZxKfWx8PvVu5A3RZN\\_ry4GSer3v3ACNcBGAsYHQ/s960/26%2Bspot%2B2029%2Bamf%2BS%2BHaret%2Blansarea%2Bvol%2BI%2B-II.jpg](https://1.bp.blogspot.com/-ETUGQgfQr5c/X3gr4_we8mI/AAAAAAAAAUBI/_zfKZxKfWx8PvVu5A3RZN_ry4GSer3v3ACNcBGAsYHQ/s960/26%2Bspot%2B2029%2Bamf%2BS%2BHaret%2Blansarea%2Bvol%2BI%2B-II.jpg), last accessed 13.07.2021.