

ROINFO 2018-2020 Project "Romanian Informatics" 60 years of Romanian Informatics

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Abstract

The article describes the results obtained by developing the national project ROINFO 2018-2020 "Romanian Informatics". Through studies and research activities, numerous arguments have been brought in "deciphering" the phenomenon of Romanian informatics. Some aspects were known, others not, and those that were known were known by very few people, students and pupils. Results that Romania should be proud of: 1. In 1953-1954, Romania ranked third in the world, after the USA and the USSR, in the research activity on "Theory of switching circuits" - according to the number of articles, applications of mathematical logic in technical (Grigore C. Moisil, CCUB Activity, AMC magazine, Technical Publishing House, no. 13-14, 1970); 2. In the period 1955-1957, Romania designed and built its first electronic digital computer (1957, CIFA 1 computer), by a team led by Eng. Victor Toma, at the Institute of Atomic Physics (IFA) - Măgurele Bucharest; 3. Romania was the 8th country in the world to design and build an electronic computer (1957) and the 11th country in the world to build an electronic computer with transistors (1963).

Keywords: Computer Science, Computer System, Computing, Informatics, Concepts, Theories

MOTTO: "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 a 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" Solomon Marcus (1925-2016)

2 Introduction

"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. Prefaced the 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).

Contemporary society has as primary objectives to reach a knowledge society (knowledge society), because human society organizes its technical reality, economic, social, etc., based on the level of development of knowledge. The volume of knowledge we have at our disposal is currently doubling every 5 years, through research and the results of all sciences. The need to know nature and the world has led to the emergence and development of science, which are representations and

virtual models of knowledge. The evolution and development of science are continuous processes, because "*the limits of knowledge and scientific predictions cannot be predicted*" as *Dimitri Mendeleev* (1834-1907) states, and theories and methods are invented because "*Imagination is more important than knowledge. Knowledge is limited, imagination goes around the world*" according to *Albert Einstein* (1879-1955). He also says that "*the only source of knowledge is experience, and information is not knowledge.*" Also, "*Our science is the sum of the thoughts and experiences of countless minds*" says *Ralph Waldo Emerson* (1803-1882). On the other hand, according to *Francis Bacon* (1561-1626) "Knowledge is in itself power", but with the advent of electronic computers and the development of Computing (hardware + software), the information held by man makes it powerful. The national project ROINFO "*Romanian achievements in the field of Informatics*" aims to develop studies and research to describe and explain the "phenomenon" of the emergence, evolution and development of informatics in Romania. This approach cannot be complete and comprehensive, being a beginning, unless we take into account the diversity of variables in time and space. We are aware that studies will be characterized by subjectivism, being people, events, institutions, processes, theories and applications, methods and technologies, evolutions and changes, etc. Also, our approach is all the more opportune and major, given the fact that there are still living scientists, professors, researchers, engineers, economists, etc., who lived in the '50s and' 60s, when it was consolidating. Computing worldwide and, when the first electronic computers of generation's I-III were built.

Definition [2].

The pioneer of Romanian informatics is the institution or scientist, professor, researcher, engineer, etc., which has contributions in (when Informatics / Computer Science acquired its status as an independent science, during 1955-1990):

- studies and research in the field of Computing (hardware and software, The 2012 ACM Computing Classification System - DL: DIGITAL LIBRARY), https://dl.acm.org/ccs/ccs_flat.cfm);
- development of Computer Science and Information and Communication Technology (IT&C) theories, methods and techniques, including the development of software and hardware products;
- the use of software installed on the computer to solve problems in the scientific, engineering, economic, health, education, military etc.;
- promoting and spreading the use of computers by all categories of people, including pupils and students;
- Promoting and participating in scientific events in the field of Computing (hardware and software), including through connections and exchange of ideas among the international community in the field.

The first results of the national project ROINFO 2018-2010 appeared by publishing the first 2 volumes of "History of Romanian Informatics. Emergence, development and impact": Volume I "Computing - The international context", Volume II "Computing - The national context". The volumes were elaborated out of the desire to describe relevantly and with evidence of the events unfolding in the reality of the time, the correct understanding of the evolution of Romanian informatics, both for contemporaries - for those who lived some of these stages in Romanian informatics, and for future generations. Specialists. In this way, in the future, it will be much easier to understand the evolution of theories, methods and technologies in the field of Informatics and Information Technology (IT).



Fig. 1 The Romanian Pioneers in Computing (Computer Science /Informatics)

Recently, volumes III (chapters 3-6) and IV (chapters 7-10) have been completed and prepared for publication, which complete the completion of studies on the “phenomenon” of Romanian informatics, and thus it can be stated that it was “deciphered” The way of appearance and development of Romanian informatics. The idea of writing a history of Romanian informatics did not appear suddenly. Just as in nature the phenomena and processes that take place need conditions and time to appear and be exercised through their functions, just as the conception and elaboration of a history of Romanian informatics needed time and some conditions for:

- understanding the multiple and various stages in the emergence and development of the concept of Computing (= computing technique; methods and techniques, equipment etc. - hardware and software);
- testing and using problem-solving methods using the computer, understanding the role and impact of theoretical informatics in the development of information science and technology (IT);

- the need to use the facilities offered by the computer in the development of human society, the need to use the computer in all areas of activity for efficiency and optimization of activities;
- the need to use the new technologies offered by the computer in the educational system, the use of the computer in the field of discoveries and researches in science and technology etc.

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.



Fig. 2 The 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.



Fig. 3 The volumes III and IV "History of Romanian informatics. Appearance, development and impact"

2 Why "History of Romanian Informatics"?

Today, it can be strongly and convincingly stated that Romania must be proud of the efforts and important contributions of scientists, professors, researchers, engineers, etc., in the emergence and development of informatics in Romania. Young people have the right and duty to find out these aspects regarding the appearance and development of informatics in Romania - in school through textbooks, in universities through courses in Romanian computer science history - and to be proud of these remarkable achievements of the forerunners, who have influence in education, research, industry, economy, etc., now, but also in the future. In the study on the emergence and development of Romanian informatics it can be seen that Romanian scientists (*mathematicians, engineers, physicists, economists, sociologists, linguists, logicians* etc.) led by *Grigore C. Moisil, Tudor Tănăsescu, Tiberiu Popoviciu, Mihai Drăgănescu, Mircea Malița* etc., have influenced and determined the Romanian leadership since then, to quickly find that there is a need to use electronic computers in the economy and in all activities of Romanian society. It is noteworthy that in those years, in the field of construction and use of electronic computers, decisions were made from the bottom up - in the political regime of the time, it was usually the other way around - and sometimes not all of these decisions were good.

Arguments through which we are proud to have a Romanian informatics (Computer Science, IT, Computing = hardware + software)

Today, it is known that the mathematician acad. *Grigore C. Moisil* is considered the founder of Romanian informatics for his efforts in the emergence and development of informatics in Romania, and many of his collaborators are pioneers of Romanian informatics, being specialists with significant in the field of Computing / IT (hardware and software), with many results, pioneering in these fields. In 1996 his activity was recognized results internationally by awarding the *Computer Pioneer Award* (<https://www.computer.org/profiles/grigore-moisil>) "For the development of versatile logical switching circuits, the Romanian School of Computing, and support of the first Romanian computers". After 1950, Moisil was the key figure in the promotion of informatics and cybernetics in the Romanian academic, university and high school environments. This state was at a time when Romania was strongly influenced by Soviet political

domination. At that time, the official Philosophical Dictionary, translated from Russian and published in 1953, still described *Cybernetics* as a "*reactionary bourgeois science directed against the working class*". Following the installation of communism in Romania, after the Second World War, Cybernetics was considered a reactionary science: "*Cybernetics - the reactionary pseudoscience invented by the international bourgeoisie to divert the attention of the proletariat from the class struggle*".

In Romania, the first electronic computer of parallel type with electronic tubes was built in 1957 (for measuring the degree of radioactivity at the Magurele nuclear reactor), at the Institute of Atomic Physics (IFA) - director acad. *Horia Hulubei*, under the leadership of Eng. *Victor Toma* and is named CIFA-1. In 1961, the MECIPT-1 computer with electronic tubes was built at the Polytechnic Institute of Timișoara (IPT). Between 1959-1963, at the Cluj Computing Institute, the construction of the DACICC-1 computer (*Automatic Computing Device of the Cluj Computing Institute*) followed, having as constructive elements electronic tubes and transistors. Then other computers that were built in the country: FELIX series C-256/1024, INDEPENDENT, CORAL and some types of personal computers. The construction of these computers was carried out starting with 1970 at the Electronic Computer Factory in Bucharest (Felix) and at ITC.

1958 - the first *National Symposium of Cybernetics* in Romania, organized at the Cluj Computing Institute. It is the indisputable merit of acad. Tiberiu Popoviciu to have organized the first National Symposium of Cybernetics in Cluj, at the Institute of Computing, in 1958. We appreciate that this was probably possible due to the fact that the Soviet Union had produced its first electronic computers for several years, and therefore the mentality about this "*reactionary pseudoscience Cybernetics*" had changed. In order to stimulate research in the field of computers, in the academic year 1959/1969 acad. *Grigore C. Moisil* founded the *Department of Computing Machines* (the last 2 years of 5 years of study), and in February 1962, he founded the *Computing Center of the University of Bucharest* (CCUB), at the Faculty of Mathematics and Physics, the first with this profile from the country. The establishment request, handwritten by Moisil, was approved by the then Minister of Education, Prof. *Ștefan Bălan*, a former colleague of Moisil at the Polytechnic Institute in Bucharest (in the 1940s). CCUB was established as a Laboratory under the *Department of Algebra* led by Moisil, he being also the first Director of the Center.

An example regarding the promotion of Cybernetics in Romania is the Cybernetics Course held by acad. *Grigore C. Moisil* and having as secretary Mr. *Petre Dimo*, at the Popular University of Bucharest "*Ioan I. Dalles*", in the univ. 1964-1965 (third year of activity). The program of the course "CYBERNETICS", director acad. *Grigore C. Moisil*, secretary eng. *Petre Dimo*: 1. What is cybernetics; 2-3. Elements of mathematics; 4. What is a model; 5. Analog computers; 6. Finite automata - numbering systems; 7. Digital computers; 8. CIFA computers; 9. Computer programming; 10. MECIPT computer; 11. New types of digital computers; 12. Use of computers in economics; 13. Use of computers in transport; 14. The successes of the Romanian school of numerical analysis; 15. Automatic adjustment systems; 16. Elements of automatic systems; 17. Properties of automatic systems; 18. Use of computers in automation; 19. Biological models; 20. Automatic biological systems; 21. Endocrine regulation; 22-23. What is neurocybernetics; 24. Cybernetics and psychology; 25. Artificial intelligence; 26. Mathematical linguistics; 27. Automatic translation; 28. The philosophical implications of cybernetics; 29. Achievements of the Romanian School of Cybernetics; 30. The perspectives of cybernetics.

In 1966, an important event that contributed to increasing the quality of CCUB activity, was the International Colloquium "*Computing Techniques and Computers*" organized by the University of Bucharest, ASE and Polytechnic of Bucharest, based on consistent financial support from the Romanian Government. The young researchers of CCUB, Acad. *Grigore C. Moisil* and Acad. *Nicolae Teodorescu*-dean of the Faculty of Mathematics contributed substantially to the

organization of this Colloquium. The colloquium brought new experiences in the country in the field of computers.

The *Third International Congress of Cybernetics and General Systems* (Third International Congress of Cybernetics and Systems, Romania) organized in Bucharest, between August 25-29, 1975, under the auspices of the *World Organization of General Systems and Cybernetics* (WOSGC) - <http://wosc.co/wosc-congresses/>, with the cooperation of the Romanian Organizing Committee. The Romanian Committee and the Congress Secretariat were based at the Academy of Economic Studies, at the Laboratories of the Department of Economic Cybernetics (LCCE), as well as the location of the Congress Adviser, Dr. *John Rose* - the Director General of WOSGC. The International Patronage Committee of the Congress included 2 NOBEL laureates and 15 academy presidents. The Secretariat of the Congress is located at ASE, at the Faculty of Economic Cybernetics, Informatics and Statistics, and the Operative Secretariat, made available to participants (about 1,500 from 30 countries) Also on the ground floor of the Palace Hall was organized, on the occasion of the Congress, an Exhibition International Computer and Auxiliary Equipment (August 20-30, 1975), represented by the largest computer, automation and telecommunications companies in the world (IBM, Control Data, ICL, Elliott, Siemens and Bull).

The theme of the Round Table of the Congress was: "*Development of informatics in the next 25 years*", organized by ICI. The open forum, chaired by Signor *A. Peccei*, President of the Club of Rome, included three conferences entitled "*The Perspectives of Science and Technology in the Next 30 Years*", given by: Dr. *S.L. Fawcett* - President of the Battelle Institute; by Dr. *H. Chilver* - Vice Chancellor of the Cranfield Institute of Technology in the United Kingdom; and by Prof. univ. dr. *Mircea Malița* - University of Bucharest. Dr. *Ștefan Odobleja* (1902-1978) also participated in this Congress - then, unknown, and today, a post-mortem member of the Romanian Academy, considered the father of generalized cybernetics, because he published the monumental work, in 2 volumes "*Consonantist Psychology*", Librairie Maloine, vol.I, 1938; vol. II, 1939, 10 years before the work of the mathematician *Norbert Wiener* (1894-1964) "*Cybernetics: Or Control and Communication in the Animal and the Machine*", Paris, 1948. The paper presented at the Third Congress, Bucharest, 1975 was published in The Proceedings are published as: *Modern Trends in Cybernetics and Systems*, ed. J. Rose & C. Bilciu, Editura Technică, Bucharest and Springer, New York, 1977 ("*Cybernetics and Consonantal Psychology*", vol. III, section 7 Neuro- and Bio-Cybernetics, pag. 1211). The international recognition of Dr. *Ștefan Odobleja* as a forerunner of Cybernetics, was made in August 1978, at the Fourth Congress, Amsterdam, when his work was presented to the participants by Dr. Eng. *Stelian Bajureanu* (with a doctorate in Cybernetics, 1975). Initially, the Congress was organized in honor of the mathematician *Norbert Wiener*, on the anniversary of "*30 Years of Cybernetics*", but after the presentation of Dr. *Ștefan Odobleja's* scientific paper, the participants applauded for several minutes and chanted "*40 Years of Cybernetics*". The paper was published in The Proceedings are published as *Current Topics in Cybernetics and Systems*, ed. J. Rose, WOGSC, Springer-Verlag, Berlin, 1978 (*Ștefan Odobleja - Romania, "Diversity and Unity in Cybernetics"*). After this event, Dr. *Ștefan Odobleja* was also recognized in Romania, by publishing the collective work "*Romanian Precursors of Cybernetics*", Romanian Academy Publishing House, 1979, and "*Odobleja between Ampere and Wiener*", 1981, and in 1990 he was elected member post-mortem of the Romanian Academy.

3 Research aspects for "deciphering" the Romanian Informatics phenomenon

Some aspects were known, others not, and those that were known were known by very few people, students and pupils. In order to understand each other better, I would like to tell an episode from my student time at the *Faculty of Mathematics of the University of Bucharest*, being

a student at the *Computer Science Department*, with a computer science program in year I. From the third year of college I used to participate in various scientific events: scientific sessions, scientific symposia, conferences, doctoral theses, etc. I think it was 1978 (or 1979), when I attended the conference "*Research on the contribution of the mathematician Gabriel Sudan on the first example of a recursive function that is not primitive recursive*" (title in memory) given by professors *Cristian Calude*, *Solomon Marcus* and *Ionel Țevy*, in amph. Spiru Haret from the Faculty of Mathematics. It was a matter of calculability theory. Then, it never crossed my mind that after years and years this episode will have an important role in the history of Romanian informatics. In 2017, when I wrote the article "*Ștefan Odobleja: A Scientific Visionary, forerunner of Cybernetics and Artificial Intelligence*", In Proceedings of the *12th International Conference on Virtual Learning (ICVL)*, I remembered that research he presented *Cristian Calude*. Then, in 2018, when I started working for the ROINFO Project, I consulted by e-mail with acad. *Gheorghe Păun* on this subject. In the coord. of acad. *Florin Gheorghe Filip*, *Romanian Civilization* (coord. Victor Spinei) - *Science and information technology in Romania*, Romanian Academy Publishing House Bucharest, 2018, acad. *Gheorghe Păun* makes the following approach regarding pages in the history of Romanian theoretical informatics: "*We will still recall a series of significant moments in the evolution of the field in our country. We will go back to the "prehistory" of (theoretical) computer science, even before the establishment of "computer science" in the world (I take the current phrase, computer science, used in English), invoking Gabriel Sudan, who, in 1927, produced - without having this intention, because the terminology did not exist at that time - the first example of a recursive function that is not primitive recursive, then insisting on the two founders of Romanian (theoretical) informatics, Grigore C. Moisil and Solomon Marcus, reaching nowadays, the multitude of contributions of Romanian computer scientists to the most diverse internationally active research directions*". This was one of the topics that needed to be researched to correctly describe the phenomenon of Romanian informatics.

Next, we will give more details about this studied topic. In April 1973, before leaving for Canada, *Moisil* told *Solomon Marcus* that *G. Sudan*, a student of the German mathematician *David Hilbert* with *Ackermann* in the 1920s in Göttingen - he had defended his doctoral dissertation in 1925 - had produced a such an example. Gr. C. Moisil did not have time to give details, it is not clear what details he had, and in Canada he died, as a result of which, later reported in various places Professor *Solomon Marcus*. A real detective operation was launched, in search, first of all, of the work in which Gabriel Sudan had the respective example - of course, in a completely different context and with a different terminology than that of recursive functions, a field developed only in the 1930s. the search for *Cristian Calude*, then a student at the Faculty of Mathematics of the University of Bucharest, and *Ionel Țevy*, a researcher at the Institute of Mathematics of the Romanian Academy. "*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 ω^ω [omega-la-omega], published in the Bulletin Mathématique de la Société Roumaine Gabriel Sudan des Sciences, vol .30, 1927, fasc. 1, pp. 11–30.*" (Source: *S. Marcus*, From Romanian mathematical thinking, Scientific and Encyclopedic Publishing House, Bucharest, 1975).

Following the work of *C. Calude*, *S. Marcus*, *I. Țevy* „The First Example of a Recursive Function which Is Not Primitive Recursive”, *Historia Mathematica*, 6 (1979), pp. 380–384, both mathematicians, *W. Ackermann* and *Gabriel Sudan* are now considered to be simultaneously and independently the authors of the first example of such a function. Testimony of Prof. Dr. *Cristian Calude* held on September 26, 2019 on the occasion of the launch of vol. I & II of "*History of Romanian Informatics*", amf. S. Haret, Faculty of Mathematics and Informatics: "*At the beginning of my research career I worked (together with Acad. S. Marcus and Prof. I. Țevy) to document the paternity of the Romanian mathematician Gabriel Sudan in a problem of calculability theory. Our results, published in the journal Historia Mathematica in 1979, could only prove the simultaneity*

of the construction of Sudan with that of the German mathematician W. Ackermann (the only quote in literature up to that time). The mere publication of this article would not have changed the attitude of the international community towards this paternity; it took concerted efforts, personal relationships, repeated citations in articles and books, returns, spread over more than 15 years for the name Ackermann to be replaced by Ackermann-Sudan in the main monographs of the field. The priority is obtained first of all through scientific evidence, but also through social efforts”.



Fig. 4 September 26, 2019, Meeting of Romanian computer scientists, launching volumes I and II, Amf. S. Haret, Faculty of Mathematics and Computer Science

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 (<http://c3.cniv.ro/?q=2018/restituiri>). The second ademers is made by the Vietnamese *Pham GiaDuc*, “*The History of the Establishment and Development of Computer Science in the R.S.R.*”, 1972 (The doctoral thesis has 185 pages and has the number IV 40230 in the catalog of the National Library of Romania). In 1972 through the doctoral thesis (<http://c3.cniv.ro/?q=2018/duc>). 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, in the two papers were 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:

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 Russell and Whitehead. Professor Moisil learned about Lukasiewicz's multi-valued logics in the 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 "Consonantal Psychology", 1938-1939, at the Publishing House "Maloine", Paris, in French (totaling 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 no. 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 1955-1957, 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) - Magurele Bucharest.
5. DEVELOPMENT OF COMPUTERS IN THE WORLD - ROMANIA was the 8th country in the world to design and build an electronic computer (1957) and the 11th country in the world to build an electronic computer with transistors (1963).

Some examples for arguing the phenomenon of Romanian informatics, through various development strategies, initiatives and concrete results.

Of course, I can achieve this after I have covered almost all the objectives of the ROINFO project "Romanian Informatics" 2018-2020 (<http://c3.cniv.ro/?q=2018/iir>), materialized by publishing 4 volumes, volume V being in progress, after which we will continue with 1-2 volumes on the presentation of prestigious computer scientists in Romania. This objective has been announced since the launch of the project, in May 2018, in the Centenary year of the Great Union. It is an objective that requires a lot of effort, but through a good information and promotion,

through the involvement of as many specialists in Computing (hardware + software), this important approach has been achieved. I mention the fact that 114 authors contributed to the 4 volumes: 15 authors - vol. I, 41 authors - vol. II, 34 authors - vol. III, 24 authors - vol. IV. In this way, we will conclude an overview of the emergence, development and impact of informatics in Romania, by highlighting an evolution regarding the contributions of some people, institutions, concepts, theories and technologies.

It should be noted that all this evolution would not have taken place if in the period 1955-1965 the field of Automation was not supported by research, design and production. In 1955, the Institute of Electrotechnical Research (ICET, the future ICPE) was established, after which the company "Automatica" was established, which included "Termotehnica", in 1960. In 1962, by concentrating the profile companies in industrial groups, the Factories for Electrotechnical Equipment and Automation Installations (GUAEIA), which includes several enterprises: Electrical Engineering, Electromagnetics, Electrical Appliance, Automation, including the Research and Design Institute for Automation (IPA). "*Association of the fields Logic - Automation - Informatics: Professor Gr. C. Moisil told me that this association expresses his vision on informatics.*" says prof. univ. Dr. Dragoş Vaida.

For argumentation, I present only a few significant examples that we studied during our research on the phenomenon of Romanian informatics, within the ROINFO project.

The Government of Romania adopts strategic development programs - The program for equipping the economy with electronic computers and the Computerization Plan of the country in the period 1971-1980:

1. On June 21, 1967, the "*Program for equipping the national economy with modern computing equipment and data processing*" was launched, the first computerization program in Romania (National Archives 33/1967). This program was developed by the team of specialists: Professor Mihai Drăgănescu, Professor Mircea Petrescu, Nicolae Costake, Vlad Iancovici, Ştefan Bârlea, Emil Miteşcu, Cornel Mihulecea, Edmond Nicolau, Radu Sipoş, Simion Florea and Nicolae Sucitulescu. This program provided for the creation of a specialized institute (ITC), specialized factories, a service enterprise, a computer institute (ICI), a network of Territorial Centers of Electronic Computing (CTCE), of some departmental Computing Centers etc.
2. Elaboration of the strategic program, Period 1970-1971 - Debates and clarifications - Decision of the CC of the PCR (April 1972) „Improvement of the economic-social information system, introduction of management systems with means of automatic data processing and endowment of the national economy with calculation in the period 1971–1980”.
3. It is approved (Decision of the CC of the PCR, April 1972) "The program on the improvement of the economic-social information system, the introduction of management systems with means of automatic data processing and the endowment of the national economy with computer technology in the period 1971 - 1980" by which dissolves the Governmental Commission for the endowment with computing equipment and the automation of data processing, and the transfer of its attributions to the National Council for Science and Technology (CNST), created in 1967.
4. A number of 18 Territorial Centers for Electronic Computing were established (CTCE, Object of activity: research, development of programs and implementation of computer systems; data processing on computer equipment; training and improvement of staff for computer science) - economic units and 5 High schools for informatics (training of staff with secondary education for informatics) - budgetary units; COUNCIL OF MINISTERS, DECISION No. 1312 of October 6, 1973 on the application of Decree no.

499/1973 regarding the unitary organization of the informatics activity and some measures for the improvement of the elaboration of the economic management systems.

Even if Romanian computers appeared (CIFA, MECIPT, DACICC etc.), until 1969 we did not have an electronic computer factory. Therefore, they were purchased from abroad - e.g. IBM 360 computer, third generation electronic computers:

- At the University of Bucharest, Faculty of Mathematics, an IBM 360 model 30 with which the Computing Center of the University of Bucharest (CCUB) was equipped. In 1963, the Ministry of Education purchased an analog MEDA computer with which CCUB was equipped.
- The Siemens computer from the Computer Center of the Ministry of Transport, whose director was Dr. Eng. Mihai Mihăiță, the current president of AGIR and ASTR.
- The Siemens computer from the National Statistics Directorate.
- The Elliott computer from the Hunedoara Plant, where specific applications were operated, although other types of applications from other fields of activity were sometimes accepted there.
- The Elliott computer from the National Electricity Dispatcher.
- An IBM 360 system from the “Tractorul” Plant in Braşov.

Courses on the use of electronic computers held at the headquarters of the following institutions, during 1963-1969, when Gr. C. Moisil was director of CCUB: Computing Center of the University of Bucharest (CCUB), Institute of Mathematics of the Academy, Energy Institute of the Academy, Astronomical Observatory of the Academy, Institute of Fluid Mechanics of the Academy, Aerodynamic Research Center, Ministry of Petroleum and Chemistry, Ministry of Machine Constructions, Ministry of Railways, Ministry of Armed Forces, Bucharest Military Academy, Bucharest Polytechnic Institute, Bucharest Institute of Construction, Faculty of Mathematics from Iaşi, Design Institutes, ISPE, IPROMET, ISCAS, CEPECA, IPACH, CSCAS. (Source: Gr. C. Moisil, CCUB Activity, AMC no. 13-14 1970, Technical Publishing House).

In the field of electronic computers, an important moment in Romania was the period 1968/1969, when the establishment (founding decision in 1970) of the electronic computer company Felix (ICE Felix) - French license IRIS 50, as a result of the contract provisions, was discussed. license agreement signed with CII (France), being a reproduction of the construction of the similar factory in Toulouse of the licensing company.

Significant arguments to put Dr. Ştefan Odobleja in the right place in the memory of Romanians

For me, Dr. *Ştefan Odobleja* (1902-1978) - military doctor (post-mortem member of the Romanian Academy), was a mystery, because I did not have the opportunity to know his work or its merits in the field of Cybernetics. The first time I met his name was at some conferences and scientific sessions I attended when I was a student at the Faculty of Mathematics of the University of Bucharest. I didn't pay much attention. I remember that at some conferences I saw Eng. *Victor Toma*, a pioneer of informatics, the one who coordinated the construction of the first Romanian electronic computer CIFA 1 (1957).

The construction of the computer system (computer systems) and the advent of computer science in the world did not take place if, before, a new science of Cybernetics (science of systems) did not appear and remarkable results in the field of computability were not obtained by mathematicians: *David Hilbert* (1862 - 1943).), *Alonzo Church* (1903 - 1995), *Kurt Friedrich Gödel* (1906-1978), *John von Neumann* (1903 - 1957), *Alan Mathison Turing* (1912 - 1954) etc. After the invention of the 2 domains and through the results obtained in the period 1930-1945, we came to the appearance and development of the domain *Computing* (hardware + software). Now

we highlight the mystery we were talking about, namely that, in the years 1938-1939, Dr. *Ștefan Odobleja*, in Lugoj, "far from the scientific world" published in 2 volumes "*Consonantal Psychology*", at the Publishing House "Maloine", Paris, in the language French (totaling 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. As I have learned in recent years - since I began to study his life and work, Dr. *Ștefan Odobleja* had a destiny with ups and downs, with a hard life considering that he was a military doctor in World War I, initially against the USSR, then, being persecuted by the security and the political regime of the time. Many scientists did not understand his work because he was a visionary, and the new concepts and laws he defined required an understanding in the context of the level of knowledge from other sciences. Many challenged him for this reason, others, on the contrary, helped him in his endeavor.



Fig. 5 November 15, 2019, Meeting with students and teachers of *Ștefan Odobleja* College from Craiova: launching volumes I and II

I will give two significant examples. The first example is the (general) concept of system introduced by Odobleja in the 2 volumes from 1938-1939. I was even surprised to find that all the concepts he studied were described by clear and precise "Definitions," as mathematicians are accustomed to in their theories, as he is not a mathematician. Many years later, at the Congress of Amsterdam in 1978 (before he died), he was granted paternity for the term "feedback" on the systems. The second example refers to the field of Artificial Intelligence that began to develop after 1950, the founder being the English mathematician Alan Turing. Being a doctor, in the two volumes he studies the development of physical and mental processes in the human body, focusing on the human mind ("We do not see with the eyes, but with the mind. If the mind is empty, the eyes look without seeing" dr. *Ștefan Odobleja*, <https://odobleja.ro/>), from here Odobleja foresees the construction of a machine that can work through a "*Mechanized Thinking*", coming to predict the appearance over the years of today's robot.

The international recognition of Dr. *Ștefan Odobleja* as a forerunner of Cybernetics, was made in August 1978, at the *Fourth Congress of Cybernetics, Amsterdam*, when his work was presented to the participants by Dr. Eng. *Stelian Bajureanu* (with a doctorate in Cybernetics, 1975). In his memory, his son, eng. *Ștefan Odobleja jr.*, Founded the "*Ștefan Odobleja*" Foundation Drobeta-Turnu Severin, for the arrangement of the memorial house and for the publication of the work of the great scientist. Personally, in collaboration with Mr. *Ștefan Odobleja jr.*, And with the IT support offered by the company Advanced Technology Systems from Târgoviște, I created a website of the foundation that will be updated this year.

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