ROMANIAN FORERUNNERS OF CYBERNETICS

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Abstract. The paper introduces the reader to the emergence of cybernetics as a science and tells the stories of the four Romanian forerunners of cybernetics: Spiru Haret, D. Danielopolu, Paul Postelnicu and Stefan Odobleja. The life and selected works of Ştefan Odobleja are presented, and Odobleja's and Wiener's cybernetic conceptions are compared. The author points out that Ștefan Odobleja's biggest merit is the one of having discovered the general character of the feedback and of having tried to emphasize it in the most diverse range of processes and phenomena. N. Wiener regained what, in other conditions, Ştefan Odobleja had discovered and managed to build cybernetics as a science through a complete mathematical analysis of the feedback theory and automated processes. The paper concludes with the author's self-question: Would not be better that instead of the Odobleja–Wiener case people would talk about the Odobleja-Wiener cybernetic theory?

Keywords: feedback, cybernetic theory, Romanian forerunners of cybernetics.

1. INTRODUCTION

The rise of a new scientific theory, a significant discovery or a pioneer invention is a process which results from a single person or from more persons that have created, each person working independent or all together in a team work. The process of generating the new is given by a sequence of stages which may sometimes last for many decades. Often, the filiations of the creative process can be followed, and the chain of the successive influences which led to the rise of a new scientific or technical concept can be established. Within the assessment of the phenomenon represented by the generation of a new science, a series of conjectural elements should be considered, noting, at the same time, the individual contributions of those who played a significant role in the process. A theoretical conceptualisation or pioneer invention is not any different from the technical scientific concerns of the moment. Usually, it is something that "floats in the air", that seemingly announces the new, which is never entirely, 100%, new. (Iancu Șt., 1996).

At present, it is generally known that Heron of Alexandria (born in the first century A.C.) designed the steam engine in antiquity and that it became an acute necessity only during the first industrial revolution. Therefore, Giovanni Branca is mentioned in history as the one who suggested, in 1629, that steam should be used

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as an engine agent of the turbine and T. Savery (1650–1715) as the one who built a usable steam engine, known in the literature as "miner's friend".

The theory of relativity started with Galileo Galilei ideas about inertia and Newton's ideas on the universal gravity, it continued with Jules-Henry Poincaré's works, the first to talk about the theory of relativity, with Hendrick Lorentz's theoretical development of J. C. Maxwell's theory and it seemed to end with Einstein's brilliant contribution. Today, the theory of relativity is questioned and new developments are expected to come.

2. THE EMERGENCE OF CYBERNETICS AS A SCIENCE

Born approximately two and a half millennia ago, forgotten until the XIX century and considered, as the result of a group of specialists that lived between 1921 and 1948, rediscovered in 1948, the word cybernetics received a great deal of attention in the 70s of the XXth century. The Greek word *kybernetike* was used by Plato (427–347 BC) meaning the art of steering a ship, of riding a pair of horses, but also the art of leading people–generally, the art of leading.

In 1834, the French physician and mathematician André Marie Ampère introduced in the paper "The Study of the Philosophy of Science" a chart of all the branches of science known until then. In this chart, in the chapter called "Politics", under the column number 83, Ampère placed a new science – *kybernetike* – meant to deal with "the study of the methods of command and leadership of the society". For each science, Ampère chose a motto made up of Latin verses, cybernetics having as a motto "*Et secura cives ut pace fruantur*" (And the careless citizens will enjoy themselves in peace). Indeed, Ampère's amazing vision was confirmed by the subsequent evolution of cybernetics which placed itself on the XXth century science orbit through its high gnosiological and praxiologic power, to the benefit of the technical and scientific progress.

The Greek word *kybernetike* is also used in the religious language, meaning "the science of church organization".

It is difficult to establish in time when exactly cybernetics emerged as a science, since its roots come from a series of old works. Although, rigorously speaking, the philosophical works of the XVIIth and XVIIIth centuries in which the living being is compared and sometimes assimilated to the machine (Gassendi, La Mettrie and others) can never be considered as belonging to cybernetics; their authors, knowing only automatic machines with a stiff control and not the ones adjusted through reverse connection, presented in their works a material-mechanical conception, totally insufficient in order to explain the cybernetic phenomena.

Until the XIXth century the mechanical devices designed to make the adjustment, by maintaining and correcting the movement in order to set and standardize some processes, were made to meet some particular practical requirements and therefore,

their operation principle escaped their attention. This explains why until the XIXth century no theoretical analysis was made that would highlight the multiplication and improvement possibilities of the mechanisms. The way in which the design of the mechanisms alone evolved until the XIXth century is an example in which technique preceded science (Iancu Şt., 1996).

In the XIXth century the victory of electricity over steam was proclaimed and adaptive command mechanisms acquired a greater and more diverse use. Consequently, scientists became interested in these devices, using a more refined mathematic machine. The notion of entropy introduced by J.E. Clausius in thermodynamics did not allow its later fertility in the development of information theory to be foreseen. Around 1868, J.C. Maxwell established a mathematic pattern for Watt's regulator which consisted of differential equations that underlined the effect that different system parameters had on its performance, substantiating thus the reverse connection adjustment theory. While some people claim that 1868 is the birth year of cybernetics, others think that Maxwell's paper is nothing else but automation, which has become nowadays, a section of cybernetics, exclusively destined to the artificial automated mechanisms. During the next age, the studies in this direction would intensify and the bases of a mathematical adjustment theory would be constituted in the last decade of the XIXth century by using the theory of differential equations.

In the XXth century, the mechanic adjustment was replaced with the electromechanical one and subsequently, with the electronic one, noting a significant progress, especially in communications (telephony, radio-technique) but also in fields such as temperature, rotation speed adjustment, etc. Valuable works were designed in Bell laboratories from USA by H.S. Black in 1931 and by H. Nyquist in 1932 in order to develop the telephony and especially the amplifiers. The theoretical studies which addressed automatic regulation issues underlined a fundamental concept that technicians intuited and theorists defined as "feedback". The feedback devices were classified in two categories according to the way in which they led to: the intensification of the effects due to the input signals, regenerating and intensifying the oscillatory processes (positive feedback – for instance the electronic auto-oscillator) or to the reduction of the effect caused by the input signal in order to reduce the deviations, damping them down and achieving process stability (negative feedback – for instance the electronic amplifier that ensures the stability of the application coefficient by reducing the background noise and interior parasites).

The developments in biology allowed the exploration of the adjustment processes in living things: Karl von Voit 1878 – thermal adjustment, J.F. Miescher 1885 – breathing, W.R. Hess 1930–circulation, I.P. Pavlov (1880–1926) – reflex arch and others (Iancu Şt., 1996).

In 1932, Jacques Laffitte published the work entitled "Reflections on the science of machines" considered by some people a prediction of N. Wiener's famous work "Cybernetics or command and communication science in beings and

machines" and in 1934 Rudolf Carnap treated the language problems. In 1935 M. Kalecki drew the attention on the reverse connection phenomena in economic sciences and Stefan Odobleja published, in 1938/1939, the book "The Consonants Psychology", (*Psychologie consonantiste,* Librairie Maloine, Paris, vol. I 1938, vol. II 1939)[1]. In this book, Odobleja thought and enounced the first generalized cybernetic vision. In 1940, W. Schmidt thought of an absolutely general science for the mechanisms with automatic regulation that, according to some researchers, is nothing else but cybernetics, since this would be its birth year.

In 1943, A. Rosenblueth, Norbert Wiener and J. Bigelow published the book "Behaviour, Purpose, and Teleology, Philosophy of Science" in which they presented general cybernetic concepts paying no attention to the mathematical approach and in which the relation between the technical cybernetic processes and those of the living organisms was established.

1948 is considered the birth year of cybernetics, since it is the year in which the following papers were published: "Cybernetics or command and communication science in beings and machines" by Norbert Wiener and "The Mathematic Theory of Communication" (which founded the modern theory of information) by Claude Shannon and Warren Weawer. E. Ross Ashby also published "The brain project" in which the homeostatic theory appears.

Wiener did not know the word *kybernetike* – the Greek equivalent of the art of leading – that had been used by Plato and Ampère for notion cybernetics. Instead, he has used another Greek word–*kibernetos*, the equivalent of the term pilot, steersman (Iancu Şt., 1996).

It is well known that after the publishing of Norbert Wiener's paper in 1948, cybernetics was applied in technique, economy and sociology. Bio cybernetics, neurocybernetics, economic cybernetics appeared in the 50s and 60s of the XXth century. This century came with a cybernetic vision of society and a continuous growth of technical cybernetics. Cybernetic psychology developed in the 70s of the XXth century. But, still now, it still encounters obstacles in explaining the psychological level.

The movement of ideas which led to the conversion of cybernetics into a scientific subject was significantly influenced by the accumulation of the results of some researched biological, technical, economic and social processes. One of the biggest achievements of scientists in this respect was the system conception, a global conception, often encountered nowadays, and which led to the establishment of another scientific subject – the general theory of the systems.

It is still under discussion whether cybernetics is an idea, a point of view, a way of thinking or a true science, since it is very difficult to make a distinction between the general theory of the systems and cybernetics because, generally they

[1] The book *The Consonants Psychology* was reviewed in 1939 in Romania, in the *Modern military spirit* publication and in 1941 in USA in the *Psychological Abstracts*, summary magazine.

represent the same field and specifically, cybernetics refers to the structures of the loops with reaction or of the reverse connection (feedback) in a system and to the properties determined by connections. The discussions over the definition of cybernetics will continue but what is clear and amazing about the human way of thinking is the cybernetic concept, the role of the reverse connections in all aspects of reality, their use in technique.

Cybernetics on the whole is considered a science of leadership, the science which is interested in the mathematical study of connections, commands and control within the technical systems and living organisms from the point of view of their formal analogies with a view to design and build automated electronic machines and devices able to perform different operations or operation sequences. Cybernetics could be defined as a synthetic science interested in the mathematical study of the operation of systems characterized by commands and adjustments no matter if they are natural, social or technical systems or as a science of the general evolution and balance laws or as the art of making the action efficient.

The studies made by cybernetics on different systems are abstract studies of their formal analogies and not of their constitutive elements or specific functions. Norbert Wiener defines cybernetics' scope stating that it refers to "the entire field of the command and communication theory in machines or animals". Raymond Ruyer insisted, in 1954, on the informative aspect of cybernetics, defining it as "the science of the information machines either natural – the organic ones – or artificial machines" (Ruyer, Raymond, 1962).

Norbert Wiener said that "when I lead another person's actions I communicate to him/her a message and even though this message is imperative in nature, the communication technique is not different from the one of transmitting a fact. Moreover, for a command to be efficient I have to know all the messages that came from that person, messages that can announce me that the order is understood and that it had been executed (Wiener Norbert, 1952)". Cybernetics became, thus, the science of information; it is also interested in the general study of the signals or signal systems, always aiming at providing some elements for the study of their transmission and always taking into account the structures of the communication means of these messages (the study of the networks). The two notions – command and communication – mix closely, the information becoming valuable only if it allows acting.

3. ROMANIAN FORERUNNERS OF CYBERNETICS

It is a great satisfaction to acknowledge that highly valuable cybernetic ideas for the Romanian way of thinking, culture and science arose in the mind of four important representatives: Spiru Haret, D. Danielopolu, Ștefan Odobleja and P. Postelnicu.

3.1. ***Spiru Haret*** (1851–1912), Romanian mathematician, astronomer and sociologist published in 1910 in Paris his masterpiece *Sociale Mécanique* (Spiru Haret, 1969)", the first big Romanian work which addressed social-economic issues with the help of the mathematical and mechanical patterns and which analysed these processes according to the system.

The book *Sociale Mécanique* is not an attempt to apply the entire body of axioms and laws belonging to the rational mechanics to the social movement, Spiru Haret trying to adapt only the device of the rational mechanics to the analysis of the social and economic phenomena evolution, continuously revealing the specific nature of these phenomena and the fact that they must not be confused with the mechanical phenomena.

Spiru Haret used in his paper several mathematical patterns that refer to some demographic problems, to the role of science and technique in the development of the society, etc. and defined society using a dynamic system model which includes both the recreation idea and that of data collection and processing in order to carry out command and control processes. Obvious cybernetic interpretations are given by Spiru Haret in the examination process of the social balance, in the treatment of the natural population growth effect on the social life, interpretations which led to the conclusion that an unwanted state of social rest could not be achieved in civilized societies and that if this was possible it would be unstable.

Spiru Haret's believes about the periodicity of social phenomena are very interesting from the point of view of the current general theory of the cybernetic systems. Making reference to a society which has a certain evolution and which finds itself under the influence of a trend or group of new necessities that will impose a new direction, Spiru Haret shows that a swinging movement will take place in that society and that moment reveals itself through what is known as "action and reaction" and it will push the societies in one direction or another when the relevant ideas intervene or the pressure of the new necessities exercise until the movement melts down and disappears in the general movement of the system" (Spiru Haret, 1969).

Spiru Haret's work underlines through its numerous examples the conception of this great forerunner of our national system science and culture.

3.2. ***Daniel Danielopolu*** (1884–1955), Romanian physiologist who reached cybernetic conceptions following the path of biology and medicine and dedicated his work to the experimental analysis and logic schematization of the nervous, endocrine and immunity system.

Elements of his cybernetic thinking began to appear in 1923, determining a bio-systemic, cybernetic vision of the human system. Without making a clear distinction between the informational and the non-informational systems, Danielopolu, intuitively, felt it and showed a predilection for the former. Studying for over 50 years bio systems that receive, send process and generate information, he

highlighted and deduced the existence of some mechanisms, some operation principles or some operational laws that coherently integrate in bio cybernetics. In the absence of the formal apparatus that we have nowadays and without using the modelling technique, Danielopolu made in his works synthetic interpretations and graphic and logic schematizations which constitute an exceptional scientific prevision of bio cybernetics.

All D. Danielopolu's works regarding the neurone-endocrine and immunity systems were based on a systemic interpretation. In the 20s of the XXth century he elaborated a theoretical model applicable to the way of functioning of the neurone-endocrine and immunity systems. In 1928, Danielopolu formulates the following three laws: the law of the amphomechanism, the law of the predominance and the law of the circular mechanism which lay at the basis of the interstimulative antagonism. The analysis of these laws highlights the fact that they imply the existence of some negative reverse connections in the neurovegetative system. Without calling it negative reverse connection, Danielopolu identified this type of reaction in order to explain the operation mode of other bio systems as well. In some works, published between 1923 and 1932, he intuited the concept of positive reverse connection and its importance in physiopathology.

D. Danielopolu was an international forerunner of bio cybernetics, a forerunner of the biological systems theory and of cybernetic medicine.

3.3. *Paul Postelnicu* (1917–1983), an electro mechanic engineer (graduate of the Polytechnic School from Bucharest in 1941) with philosophical inclinations, employee of the Romanian Telephone Society, managed in 1945 to independently present a cybernetic vision on life. The cybernetic loop – according to P. Postelnicu – was a characteristic of the matter in general. In 1944, P. Postelnicu drew up an article "The Theory of the Vicious Complex" that he sent to *The Scientific Magazine – V. Adamachi* from Iași (3 pages) to be published. In the absence of a response in real time he rewrote and developed a version of 6 pages entitled "The Hypothesis of the Vicious Complex" that he sent for publication in 1945 to the *Nature* magazine from Bucharest. The article, with its two versions, circulated in the typed form among its colleagues and it represented the foundation of a paper presented by P. Postelnicu within the meeting of the "Friends of natural sciences" society of 24 February 1945. The article appeared only later, in 1968, in *The Telecommunications magazine*. (P. Postelnicu, 1968).

P. Postelnicu's basic idea relies on the concept of a vicious circle that he called "*vicious cycle*", maybe in order to avoid the confusion with the vicious circle from the elementary logics. He defines the vicious cycle as a causal chain made up of a, b, c….m, n,…. phenomena which have the property that a determines b, b determines c and so forth. These causal chains can be exemplified with systems from physics such as: engines, reaction electronic tubes, etc. Any system that includes a vicious cycle is called by P. Postelnicu "a vicious complex".

P. Postelnicu determined the properties of the vicious cycles after he had made a detailed analysis of the amplifying triode with feedback loop underlying the relation between the circuits of the grid and of the plate, where one's oscillations determined the others and the other way around and finally, he concluded that "the viciousness" of the triode characterized the biological phenomena as well.

On the basis of an identified property of the vicious cycle, that is that "any progressive vicious cycle includes the resonance condition", P. Postelnicu stated that hazard made so that a little material part would acquire an organization that would essentially differentiate it from the inert matter. Due to the resonance condition the vicious cycle became progressive and evolved through impulses that came both from the hazard and the environment. Thus, he admitted that the appearance of the molecule with vicious cycle properties could be explained.

P. Postelnicu asserted that matter became alive when in its organisation a system of reverse connections is established (bio cybernetic conception). "Viciousness is an essential property of the matter and even the evolution of the universe itself could be explained by the hypothesis of the vicious complex. In this case, matter and life would not be but two levels of vicious organisation: the matter as a vicious organisation of energy, life as a vicious organisation of matter and implicitly of energy" (Postelnicu Paul, 1968). Starting from the existence of the "viciousness" in physical devices created by man, Paul Postelnicu extended it to the biological, social and economic phenomena and then he generalized it to the phenomena that go beyond the usual human experience. Under this form, the viciousness was admitted as a constitutive element of a general theory that would allow the construction of a cybernetic model of the universe, eventually in the sense of the distinctions operated by the general theory of the systems.

3.4. *Ştefan Odobleja* (1902–1978) is one of the great thinkers and creators of the XXth century whose originality and clear-sightedness overcame the traditional scientific knowledge patterns and models.

3.4.1. *The life and his selected works*

Born on 13 October 1902 in *Izvorul Anestilor –Mehedinţi*, Odobleja wins in 1922 a scholarship at the Faculty of medicine and becomes scholar of the Military Medical Institute. During his studies he makes researches in neurology, psychology and methodology of knowledge and logics. In 1928 he becomes PhD in medicine and surgery maintaining a thesis on car accidents and on 1 May 1929 he publishes the study entitled "Method of thoracic transonance" in the "Medical Therapeutic Bulletin" in which he formulates the so-called reversibility law.

Between 1928 and 1935 he publishes in the specialized magazines of that time a series of works regarding the study of the organism using the method of listening to the noises of the human body, works that he gathers in a volume called "*La Phonoscopie, nouvelle méthode d'exploration clinique*". The volume published

by Gaston Doin Publishing House–Paris was awarded by the Romanian Academy with the "General Physician Dr. Papiu Alexandru" prize, which was granted every 2–4 years to the most praiseworthy works written by military physicians;

In 1936 Odobleja publishes the work entitled "*Phonoscopy*[2] and the clinical semiotics" and in 1937 he participates in the IXth International Congress of Military Medicine with a paper entitled "Demonstration de phonoscopie" and on this occasion he disseminates a prospectus in French announcing the appearance of the work "The Consonantist Psychology".

"The Consonantist Psychology"[3] was elaborated between 1929 and 1937, the author starting from the idea of the possibility of studying a phenomenon (such as the moods of the animal organism) through other phenomena (such as the phonic ones). The book was published in two volumes comprising 880 pages (*Psychologie consonantiste*, Librairie Maloine, Paris, vol. I 1938, vol. II 1939. In reality, this book has been printed in Romania, in Lugoj). Soon after its publishing, the book was reviewed in 1939 in Romania in the "Modern military spirit" publication and in 1941 in USA in the "Psychological Abstracts" summary magazine.

During the war, Odobleja was chief physician on a military ambulance and after the war, he expressed his intention of working in research but, completely misunderstood, he was forced in 1946 to retire from the army. After his retirement, he did not manage to find a job appropriate to his education and wishes and he continued to live on a modest military pension.

Ion Oancea-Stroe, Odobleja's friend, tells that "I met the author in 1949–1952 in his parents' house from Valea Izvorului. During our short introduction he never told me that he wrote such important works. Only later, around 1964, when he changed his residence in Turnu Severin did he carry with him the volumes of "The Consonantist Psychology", a copy of which he had given to the "I.G. Bibicescu" Municipal Library. After 1968 he participated in "Al. Vlahuţă" Literary circle, where he read some passages from his book" (Oancea – Stroe, 1972).

Odobleja meditated on the issues discussed in his book "The Consonantist Psychology" and reached the conclusion that he was the possessor of an original conception on logics, different both from the traditional Aristotle one and the modern mathematic one and started to write a logic paper that he abandoned after 1973. The totality of Ştefan Odobleja's manuscripts exceeds 50,000 files.

In 1975 – during the Third Cybernetics International Congress that took place in Bucharest – Odobleja presented the paper "Cybernetics and the consonantist

[2] ***Phonoscopy*** – the photographic recording of intrathorax noises (in the heart or lungs).

[3] ***Consonantist*** – harmonious. Ştefan Odobleja's consonantism is the theory of man's psychic activity. All psychic phenomena are consonance, that is, the psychic is also physical, exiting however a physical-psychic consonance- where the physical is understood in its ordinary meaning and the psychic is another type of physic. Since consonance means harmony, the consonantist psychology becomes, according to the author, a logic of harmony or in other words, a science of organisation and self-adjustment.

psychology" and in 1977 the text of his paper appeared in the volumes published by the Congress (Springer Verlag and The Technical Publishing House). In 1978 he sent to the IVth Cybernetics and Systems International Congress that was taking place in Amsterdam, the paper entitled "Diversity and unity in cybernetics".

3.4.2. *Ştefan Odobleja's cybernetic conception*

"The Consonantist Psychology" is not a cybernetic or purely psychological paper; it is a work of thinking, a philosophy of mental processes and of science, the author searching several general laws: laws of movement, balance and unbalance, energetic processes, reversibility and irreversibility, etc. that would apply to all domains, all inert or living natural sciences, to psychology, socio-economic life. Among the fundamental laws that, according to Odobleja, govern the physical and the psychic, the *reversibility law* or as we might call it nowadays, *the reverse connection law,* or *feedback law* is worth mentioning. The author of "The Consonantist Psychology" treats in an interdisciplinary, integrating vision, issues related to psycho-neurology, psycho-physiology, psycho-pathology, psycho-therapy and therapeutics, on the one hand, and issues related to the physical-chemical, mathematical, biological, sociological economic, philosophical, etc. sciences on the other hand and also issues related to their specific laws, that are in close interdependence and interconditioning, focusing especially on the connections from the physical-psychological-philosophical levels.

Ştefan Odobleja thought and enounced the first generalized cybernetic vision. In order to appreciate the importance of Ştefan Odobleja's cybernetic conception we must see two possibilities: either Odobleja knew the importance of different cases of reverse connections belonging to diverse fields of science and technique and made a generalization or he obtained the general vision not so much through a generalization, which maybe was not sufficiently prepared in 1938, but through a new approach of the phenomena belonging to the death or living nature. Odobleja made references to the important role played by the improvement of the observables in knowledge and by the development of stability, which nowadays in the cybernetic language means the role of increasing the information quantity in the improvement of systems' stability.

Obviously, Ştefan Odobleja's starting point in the creation of his cybernetic vision was psychology. This also justifies the name of his work. This was an original idea unlike the attempts of that time to substantiate the sciences and which were relying either upon mathematical logics or upon linguistics. To the extent in which any science relies upon the creative activity of the human mind it is at the same time a psychic activity but not a regular one, one that is elevated and logical-psychical.

The substantiation of the sciences on the basis of psychology made Odobleja, through his conception, the forerunner of cybernetics, of a technique of thinking in general and not only of the mechanisation of the mathematical calculus. Determining

the relations of consonance among sciences, multiple (spatial, physical, logical and psychological) consonances, Odobleja postulates the possibility of mechanising the thinking–conceived as a creative act–and suggests a thinking machine.

Odobleja was not only a forerunner of cybernetics but he also had an original vision in this field, regarding both the mechanization and automation of the constituted, repetitive thinking and the creative, authentic thinking. Odobleja imagines not only thinking machines but also machines that could create, invent, philosophize. Numerous manuscripts on logics refer exactly to this possibility which presumes not only a special psychology, a cybernetic one but also a special logic that he called *resonance logics*.

Odobleja, through his consonants psychology conceived a general cybernetics with a much larger sphere than Wiener's cybernetics and managed to create the basic paradigm of the cybernetic thinking which requires to focus on the study of the adjustment processes and on the analysis of the behaviour of "any" system by correlating the direct (command-execution) connection with the reverse (execution-command) connection. This circuit was called by Odobleja "vicious circle" and by Wiener feedback (reverse connection principle) (Wiener Norbert, 1966).

Ştefan Odobleja wrote that "There is reversibility and reciprocity of interests between individual and society. Vicious good or bad circles are often established between the individual and society", and **ten years later**, Norbert Wiener showed that "Communicating with the outer world means receiving messages from it and sending it messages. On the one hand, it means observing, experimenting and learning and on the other hand it means exercising our influence on it so that our actions to become subordinate to a purpose and efficiency… Life is a continuous interaction between individual and its environment and not a way of being eternal." (Wiener Norbert, 1972).

While Ştefan Odobleja's starting point in the creation of his cybernetic vision was psychology, from the cybernetic structure of organisms' biological and psychological processes towards the adjustment and control technical systems but also towards economy and society, Wiener, who had worked in a technological institute being concerned with the use of the mathematical methods in electronics, started from the cybernetic structure of the adjustment and control technical systems towards the biological systems. The difference between "vicious circle" and "reverse connection principle" is purely linguistic, since both concepts have the same semantic content and operational meaning, that is, *the influence that the effect exercises, in its turn, on the cause which caused it.*

Odobleja sustained that "Reversibility is a vicious circle between the cause and its effect. It is an oscillation between two states which alternatively induce themselves one another. Reciprocity of actions. Besides the acyclic causality there is a cyclic one, in a vicious circle. The same phenomenon is then one at a time effect and cause". Wiener stated that the cause-effect influence can be characterised in three types of phenomena: reduction/annulment of system's deviation from its

state of balance and its coming back to the initial state–homeostasis-negative feedback; the amplification of the distance between the initial state (of weak organisation) and the final state (of better organisation)–development–positive feedback and a larger distance between the initial state of the system of good organisation and the final state of disorganisation–involution–positive feedback. Odobleja made no clear distinction between the positive retroaction and the negative one, although it results from the book that he intuited their different role.

Odobleja's vision also had a series of limitations inherent to the age he lived in. Ştefan Odobleja operated with the diode "Substance-Energy", Norbert Wiener with the triode "Substance-Energy-Information", the latter concept having a special value. Firstly, the lack of the notion of information, not the information found in the statistic theory of communications but in its widest sense, represented a deficiency of Ştefan Odobleja's cybernetic vision. Secondly, Odobleja had no contact with electronics or automation and therefore he did not know the principles of the positive and negative feedback discovered in electronics before the period in which he elaborated his works.

Before any formalism, it is necessary to clarify the essential processes to which the mathematical treatment would apply and Odobleja, not having all the essential cybernetic notions did not use any mathematical formulation in his work and, therefore, "The Consonantist Psychology" did not have the scientific impact of Wiener's paper.

An analysis of great perspicacity on ethics, present in Doctor Ştefan Odobleja's work "The Consonantist Psychology" reveals the fact that the author presented different points of view in order to define and implicitly understand the ethics which was defined as: "the science of good and happiness, the science of social balance, the science of morality and immorality, of rights and duties, of vices and virtues, the science of agreement and of consonance between the individuals' interests or between the individual's interests and the interests of society, the science of harmony and balance between the self and the society, the science of the "confrontations" between individuals and the ratio of avoiding them, the science of prudence and carefulness, the science of approximating its own (actual or future, near or remote) weakness. Stefan Odobleja, never famous or appreciated at his true value in his own country, presents us in a maximum synthesis the moral possibilities. The most eloquent and the deepest definition that Odobleja gives to ethics must be pointed out. "Ethics is the science of the prophylaxis and therapeutics of the evil". This definition can be considered the most appropriate one since ethics is defined through its mission.

3.4.3. *Globally acknowledging Odobleja's work*

After 1948 some Marxist philosophers showed towards cybernetics an obvious negative attitude and, that is why, cybernetics had no citizenship right in the scientific circles of the socialist world. Cybernetics was considered in this

world, for approximately 15 years, a "pseudo-science, strictly mechanicals, reactionary and useless". After 1964, a period of relaxation begins in Romania and Norbert Wiener's paper "Cybernetics" is published in 1966 at the Scientific Publishing House from Bucharest and in 1967 Jacques Guillaumaud's paper entitled "*Cybernetics and dialectic materialism*" appears with a preface signed by Paul Langevin. In this book is presented a short history of the cybernetic ideas with no reference to Odobleja.

Odobleja's work attracted again the attention of the Romanian public after many years due to I. Stroe-Oancea and to V. Pârvulescu who published in the "Future" newspaper from Mehedinți, on 12 May 1972 the article "Severinean Micro encyclopaedia".

Dr. Al Olaru presented in 1973 at Bucharest within a conference regarding the history of medicine, a paper on "The Consonantist Psychology" and on 11 May 1974, Constantin Bălăceanu Stolnici published in *Flacăra* (*Flame*) magazine the article entitled "The Romanian Ștefan Odobleja, a pioneer of cybernetics" (Constantin Bălăceanu Stolnici C. 1974).

Odobleja led a solitary life rediscovering himself, once with the appearance of the first books on cybernetics in Romania and, especially, after the publishing, in 1966, of Norbert Wiener's work. Convinced of the value of his ideas, Ştefan Odobleja addressed after 1972 to the Romanian Ministry of Foreign Affairs, asking for support in the elucidation of a Romanian priority and for the translation of his book in the Romanian language. Following his request and on the background of the discussions had in mass-media, the first debates took place and the first studies on Odobleja's work began to be published. In 1974, Professor Dr. Constantin Bălăceanu Stolnici states that Ştefan Odobleja is an important forerunner of cybernetics (Constantin Bălăceanu Stolnici, 1974). In 1975 V. Săhleanu publishes the article "D. Danielopolu and Ştefan Odobleja forerunners of cybernetics" (Săhleanu V, 1975) and Professor Eugen Niculescu Mizil in "Studies of social and economic cybernetics" notes the strong cybernetic character of the work "The Consonantist Psychology", in which Ştefan Odobleja enounced the law of the feedback circuits that he generally emphasized in all the processes and phenomena from nature and society.

After a detailed analysis of Ştefan Odobleja's work, the Section of Medical Sciences of the Romanian Academy through its Interdisciplinary Research Group reaches the conclusion that Ştefan Odobleja's capacity of forerunner of cybernetics could be taken into account at the beginning of 1975, considering the ideas of "reversibility" from "The Consonantist Psychology", similar to those that led to the appearance of cybernetics but there cannot be made a connection of filiations between the ideas from "The Consonantist Psychology" and those from Norbert Wiener's "Cybernetics" published in 1948.

On 28 September 1977, the academician Mihai Drăgănescu delivers a lecture at the County Library from Mehedinţi, Drobeta Turnu Severin, on "Ştefan Odobleja –

the relation between man and machine", and in 1978 Ştefan Odobleja publishes at Craiova, at the Romanian Writing Publishing House the work "The Consonantist Psychology and Cybernetics", in which he states his own ideas regarding his priorities in cybernetics.

All the studies and papers written during the period in which "The Consonantist Psychology" was analysed were gathered in the volume "Romanian forerunners of cybernetics" published in 1979. This volume contributes to the recognition at the Romanian academic level of Ştefan Odobleja's merits as forerunner of cybernetics and in 1981 the Romanian Academy dedicates to him the collection of studies "Odobleja between Ampère and Wiener" in which Odobleja is placed as a forerunner between the two internationally known savants.

In 1982 the Scientific and Encyclopaedic Publishing House from Bucharest published for the first time in Romanian the work "The Consonantist Psychology" with an introductory study signed by the academician Mihai Drăgănescu and professor Pantelimon Golu, and in 1984 Odobleja's paper "Introduction to resonance logics" appears in Craiova, The Romanian Writing Publishing House, edition revised by the academician Alexandru Surdu, preface signed by Constantin Noica (a selection of the first 4,000 leaves of the manuscript "Resonance Logics", which includes over 15,000 leaves).

In a series of studies meant to examine Ştefan Odobleja's role and position in the development of cybernetics the academician Mihai Drăgănescu concluded that: "Ştefan Odobleja cannot be considered the founder of cybernetics, this being Norbert Wiener's merit, but Ştefan Odobleja not only is he a forerunner of cybernetics but he also has world priority of the idea of a generalized cybernetics being the first to consider the closed loop phenomenon, therefore with reverse connection, as a universal law. According to our knowledge no one else before him had such a vision of the general role of feedback (reversibility law) in as many fields as possible, generally, in all fields. In this way, he delimits himself from all the particular instances in which reverse connections were emphasized." (Drăgănescu M, 1982).

On 13 November 1990 Ştefan Odobleja is chosen post-mortem member of the Romanian Academy.

Ştefan Odobleja's manuscripts wait to be exploited. Constantin Noica in the preface to "Introduction to resonance logics" said that the publication of Odobleja's works "could contribute to the renewal of the perspectives and points of view of today's scientific culture, a culture within which Odobleja's original ideas cannot be ignored. If he could not make the most of them until the end, we are convinced that, in the Romanian culture at least, through their novelty and boldness they will awake great creative vocations that we need to qualify in world's culture".

3.4.4. *The international recognition of Odobleja's work*

"The Consonantist Psychology" was reviewed in 1941 in USA in *"Psychological Abstracts"* summary magazine.

In August 1978 the IVth International Congress of Cybernetics and Systems took place in Amsterdam but because Ştefan Odobleja was ill he could not participate in person but he sent the paper entitled "Diversity and Unity in Cybernetics" that was presented at the congress by a Romanian representative and in the same year the text of the paper appeared in the volumes published by the Congress.

B. H. Rudall from the University of Wales, who presided the session where the paper was presented, said: "*Dr. Odobleja's work was very well received… … Dr. Odobleja's precedent paper ("The Consonantist Psychology") was considered very interesting and it was highly appreciated, but of course there were no formal discussions on any pretences, and although unofficial discussion were carried out after our meetings, I do not know yet enough about dr. Odobleja's contributions in cybernetics for me to comment on his work.*"

Thus, at the IVth International Congress of Cybernetics and Systems dr. Ştefan Odobleja's case as a forerunner of cybernetics was raised before the entire scientific community and consequently, his international life began in 1978, once with Odobleja's death.

4. SUMMARY AND CONCLUSIONS

1. Cybernetics or the theory command and communication in beings and machines is the creation of a group of experts belonging to different fields who between 1920 and 1948 observed that a series of problems related to the control of the machines and organisms have in common certain organisation mechanisms and laid the foundations of a new subject evolving around two concepts: feedback–reverse connection principle (feedback circuit) and information.

2. Through his paper "The Consonantist Psychology", Ştefan Odobleja proved that he had genius, that he deserved to appear in the universal science besides Ampère and Norbert Wiener in the establishment of the cybernetic concept and way of thinking. Ampère anticipated cybernetics as a science, Stefan Odobleja elaborated the central ideas of cybernetics and the cybernetic way of thinking, N. Wiener regained what, in other conditions, Ştefan Odobleja has discovered and managed to build cybernetics as a science through a complete mathematical analysis of the feedback theory and automated processes.

3. The second half of the XXth century is marked by cybernetic concepts because of Norbert Wiener, but behind him are many scientists as in any other field of knowledge. Among these, Stefan Odobleja is worth mentioning, as he is the one of its most valuable moments. Stefan Odobleja's biggest merit is the one of having discovered the general character of the feedback and of having tried to emphasize it in the most diverse range of processes and phenomena.

4. Odobleja made the first step in intuiting the cybernetic science but it was an important one and when it became internationally known, the Odobleja-Wiener

case was born. Maxwell remains the founder of electromagnetism but history mentions Faraday as the one who intuited the electromagnetic waves before him. But all these facts belong to the history of science and after more than a half of century of tempestuous developing of cybernetics, in our days almost nobody is speaking about Wiener's cybernetics. Why should not history mention the fact that Odobleja intuited a generalized cybernetics before Wiener? Wouldn't it be better that instead of the Odobleja–Wiener case people would talk about the Odobleja-Wiener cybernetic theory?

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