

**Motto:**

***"Always you looking for the new, work to know it and persevere!" (Aurel NANU)***

## **PROSPECTS OF NONCONVENTIONAL TECHNOLOGIES**

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### **1. Introduction**

14 years after the publication of the first "*Nonconventional Technology Treaty*", it is necessary to reconsider the issue, which is so complex and important for the future of developing performing technologies. It is noted that there are no radical changes at the level of their approach. The paper is the result of an analysis of news and perspective aspects of the technologies, in general, on the role and importance of unconventional technologies in the future. In the industrial environment, the machines are still stronger, with higher reliability, capable of working under forced conditions, with active elements actuated by shocks, high pressures or extreme temperature conditions.

In order to be so resistant, suitable materials are created with increasing mechanical properties or with other structures, characteristic elements that place these in the category of unconventional materials. In order to increase processing performance, a group of nonconventional technologies is developed, in which forcing is not transmitted to the workpiece through the classical tool (e.g. cutting tool), but by the action of the concentrated energies, which multiplies the ability to act, the nonconventional "tool" that having some mechanical properties inferior to the material to be processed. The most used nonconventional technologies are based on the principles of electrical erosion, laser beam, electron beams, ultrasonic waves, and so on.

The nonconventional (or alternative technologies, as they are said to be), are the technologies of the future. We can safely say that these technologies are already today's technologies in economically developed and know-how countries such as Japan, China, USA, Switzerland, Germany.

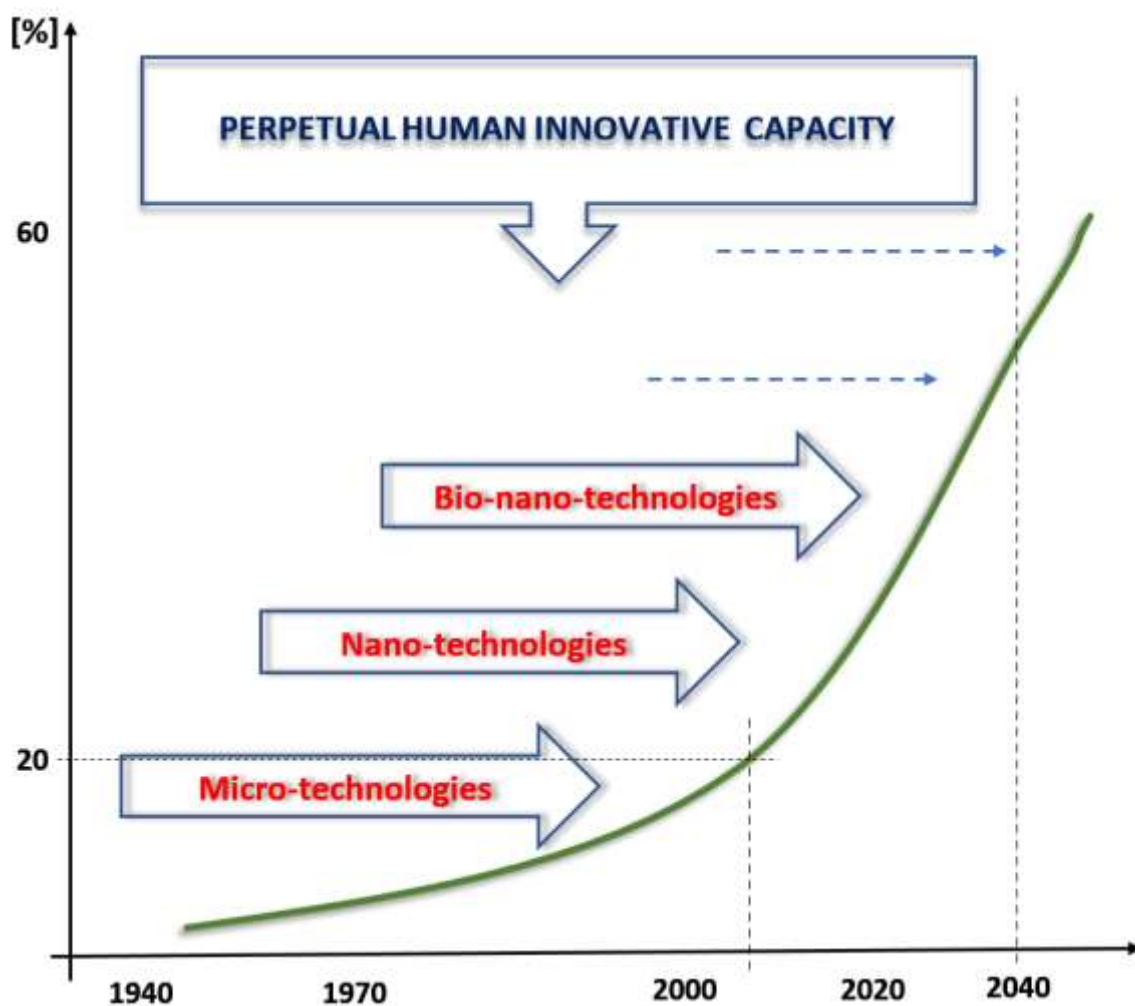
### **2. Evolution of the nonconventional technologies**

Worldwide, the greater interest in nonconventional technologies emerged almost 80 years ago during the Second World War. Since then, there have always been concerns about the diversification and development of nonconventional technologies in all areas of activity.

In response to the evolution of new technologies, the Timisoara Polytechnic, in the academic year 1957/58, initiated at the Department of Mechanical Technology (Faculty of Mechanical Engineering), the first Laboratory of Electro-technologies in Romania, then, in the early 60's, was created a strong team of nonconventional technologies - „TNC” researchers. In 1974 the Center for Research on Nonconventional Technologies was established within the Polytechnic Institute "*Traian Vuia*" in Timisoara, and in 1985 under the aegis of RSR Academy is organized the Research Committee on Nonconventional Technologies, Timisoara Branch, whose president is named Professor Aurel Nanu, under the initiative and leadership of which the "Romanian Association for Nonconventional Technologies" (ARTN) was established in 1993, with 11 branches in all the country.

This complex TNC structure has resulted in great effervescence throughout the country for nonconventional technology research, materialized in more than 250 PhD theses. ARTN also contributes to the introduction of the specialization called "Nonconventional Equipment and Technologies" in the national nomenclature of engineering specializations. 18 international conferences were organized, and in order to further contribute to the training of specialists in the field, were edited 13 volumes of the Treaty of Nonconventional Technologies (the first appeared in 2003), under the coordination of by prof. Aurel Nanu.

One of the important aspects of the regular discussions held by ARTN members was related to the updating of the framework of the nonconventional technologies and to their typology. Respecting dictionary specifications and technical language developments, unlike Conventional Technologies (TCs), based on well-known principles whereby "harder tools" modify "softer" material, appeared in a revolutionary mode the nonconventional technologies (TNCs) - determinants in the dimensional modifications and / or structure transformations, these based on concentrated energies generated in various forms, such as: electric discharge, fascicles (bundles, electrons, ions, neutrons or laser), plasma, phenomena caused by physicochemical reactions (e.g. electrolysis), wave movements (ultrasonic), mechanical actions at very high speeds, and so on.



**Figure 1.** - *The evolution of the share of nonconventional technologies*

The field of the coverage of the category "nonconventional" has expanded also depending on the typology of materials. The nonconventional material was distinguished by the fact that it does not identify by structure and properties with any classical material. The advance brought about by nonconventional technologies has also been achieved by the need to develop new materials with special characteristics and properties, which are predestined for well-specified uses. Thus, particle (dust) aggregation technologies have gained momentum. Also, rapid prototyping through multiple implementation processes is based also on nonconventional principles and technologies

Scientific research everywhere focused more at the beginning of the Third Millennium on the approach of the technologies applicable to extreme sizes: *nano-* and *macro-*. Thus, nonconventional technologies have opened new areas of presence, but in a multidisciplinary engagement, with the connection of scientific knowledge from several fundamental areas. Thus, nonconventional technologies have descended from industrial enterprises in the medical laboratories and clinics or those related to the modern agriculture. For example, drying agri-food products through initial freezing and not heating is a nonconventional technology. Or in current surgery, replacing the bistoury with the laser beam, it falls into the nonconventional surgery group.

It can be said without a doubt that these technologies are technologies that can be identified anywhere in any field of activity, where we discuss the quality, precision, traceability and especially reliability. This is why we want to expand the scope of this Review so that researchers in the country and abroad can be attracted to publish their studies. An important role can be played by young people who can publish in the Review while studying at college or under the guidance of a teacher. The doctoral students are another category of young people or younger people who can add value to the Nonconventional Technologies Review by publishing studies and research at various times during the PhD program.

### 3. Future of nonconventional technologies

Considering the way, the nonconventional technologies have evolved so far, their future will always be on the axis of the optimal technical solutions resulting from the approach of the system consisting of: the requirements and conditions of the market, the level of quality requested, the possible budget to be allocated, the level of knowledge in the field, the technical equipment available. In order to obtain the highest profits, the technical and technological solutions will be sought to ensure a superior quality with minimal efforts, in the conditions of high productivity. Practically, nonconventional technologies can be viable solutions and their share will be more and more of the total of applied technologies, exceeding 50%, in 2040 (after about 100 years since the emergence).

The acceleration of the development of unconventional technologies is also justified by the current tendencies of increasing the processing capacity of the new materials, in the conditions of high productivity.

It is expected an essential change, at once with the passing the traditional conventional technologies to the nonconventional area. For example, when casting in temporary shapes the dimensional limitation will be determined by force fields generated by concentrated energies, oriented by specialized equipment and an appropriate software.

Also, plastic deformation will no longer be based on physical actuators (stamping tools, matrixes, cylinders) but on the intervention of the concentrated energy strength fields.

The cutting process will be based on bundles with concentrated energy, not on classic cutting tools. Also, the aggregation of metallic powders will be based on energetic matrixes, and the sintering of the product will be done in furnaces where the required heat cycle will also be achieved on the basis of concentrated energies.

Thus, the entire range of dimensional processing will be assured by concentrated energies, becoming, in fact, energetic processing.

Where can it find so much energy? Nowadays, on the surface of the globe, there is a lot of natural energy scattered at all times, energy forms, such as solar, winds, waves, or other atmospheric phenomena. It is still expected from scientific research concrete solutions for storing energy for use for technological purposes. Also, the valorization of nuclear energies is still insufficiently controllable.

By following the most publicized sources of information related to the concept of "*unconventional*" related to the technology, more than 2 million writings can be identified. Most prove the interest of researchers for nonconventional energy resources, especially of renewable nature, as well as computational capabilities, both at hardware and software level, using artificial intelligence so close to the unconventional sphere.

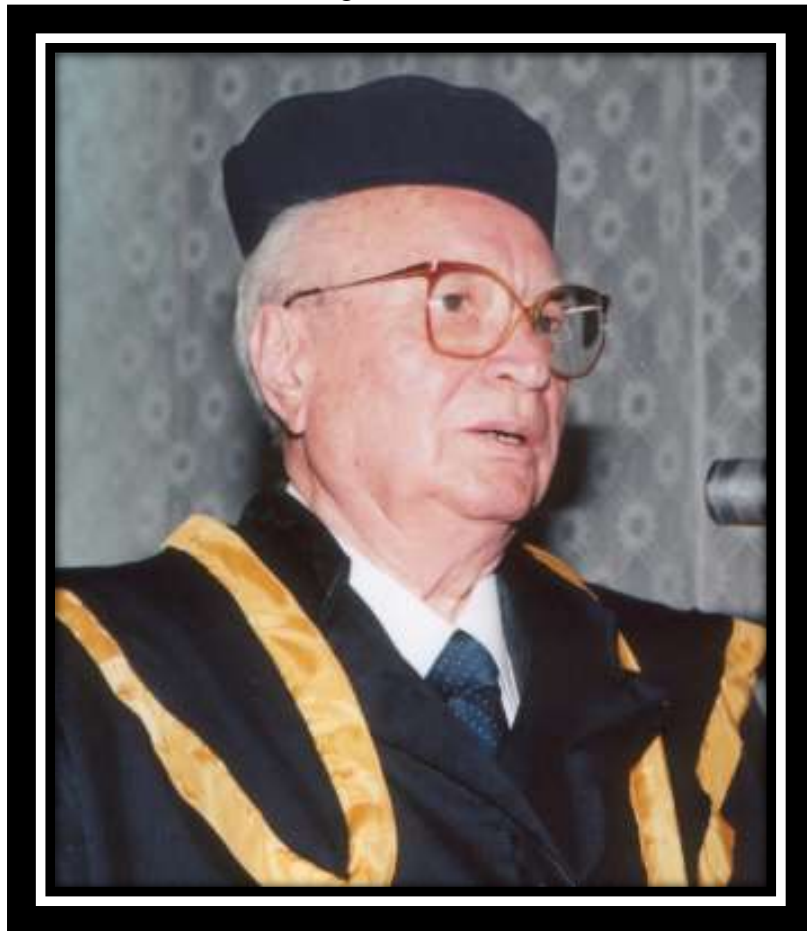
The future of these technologies is ensured by the existing know-how at this time in the market, especially in leading industries, such as aerospace, medicine, automotive, medical engineering and beyond.

#### 4. Conclusions

The prospect of nonconventional technologies is favorable, following the scientific normal progress, even if humanity is helplessly today, the generations that come will always add new knowledge and will certainly find the solutions needed to capitalize energies towards processing of any kind and in any field.

#### 5. Acknowledgement

This paper was written after the ascension of the soul of the one who was the "pioneer of nonconventional technologies", Professor emeritus dr. Doc. Del. DHC. Aurel Carol NANU. The text of the



paper is based on the co-authors' discussions in the last period of the life, the message being the belief in nonconventional technologies developed on the basis of the man's perpetual innovative capacity.

There are times in life in which, no matter how tall we are socially positioned, how important our earthly mission is, we are turned by an inner voice to remind us of our temporality of the fragility of the human being, the one second that divides the life by the Eternity. We have long hoped that this word of farewell will be delayed by God and will be spoken after a long time as possible. We believed our beloved teacher could have stayed for a longer time among us to feed our spirits with the light of wisdom with which he has accustomed many of us. Today, words that can contain thousands of meanings, which can give a glow to hundreds of thoughts, are poor and incapable of encompassing the feelings we try to accompany our distinguished professor Aurel Carol NANU

on the last road. We would like to include in a few words the overwhelming personality of the past person on the paths of Eternity to keep watching us from there.

We have known him as a teacher, as a passionate for the untying of the secrets of science, as a PhD coordinator and especially as a wise and valuable friend. There are thousands of memories that bind many of us, are places, words, facts, written pages that now constitute a connection that cannot be broken by the departure of His reign. Much has been said about His reign. Much will be said, and those who have cherished it and truly cherish it will not forget it. They will have a long time now, a thought of light and those who have loved it, and those who have mistaken to him. Professor Aurel Carol NANU will always stay with us. We will always have something to learn from the great lesson of life that has taught us for years. Professor Aurel Carol NANU will always teach us the lesson of human dignity, professional honesty, wisdom, and the one who devotes his life to a profession of faith. The professions of faith of his reign were the University, the building of values, the formation and guidance of the cruel consciences of those he formed as professionals, of the students who left their treasure to the teaching. We're breaking apart from his reign with the blackened souls, with the conviction that if God would have given him a little respite, we would have had much to learn from his reign, and our invaluable teacher there would have had much more to do.

Farewell, Mr. Professor, heaven to receive you in peace, and when you get to Heaven to pray for us and to take care of us as you did on Earth.

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