Chapter 2

Some Issues on Possible Connections between Creativity in Science and Technology and Old Cultural Frameworks

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Additional information is available at the end of the chapter

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Abstract

The paper presents some results related to the approaches used to identify possible connections between aspects of creativity in science and technology and old cultural topics and paradigms. The analysis is performed for some specific cases for nuclear physics and nuclear energy issues considered of interest in the Romanian environment. Five cases were analyzed. The evaluation method is based on some previous results proposed by the author in order to illustrate the identified, in a systematic manner, connections between creativity in science and technology and old cultural framework. By using the proposed method, a set of connections was identified for the chosen cases. The approach was tested for some specific cases, but it is expected that it may be applied to other examples as well.

Keywords: Belief, knowledge process phase, creative solutions in science, old cultural frameworks

1. Introduction

The goal of this paper is to present some results related to possible connections identified between aspects of creativity in science and technology and old cultural topics and paradigms. The analysis is performed for some specific cases for nuclear physics and nuclear energy issues considered of interest in the Romanian environment. Five cases were analyzed:

- **Case A:**Procopiu magneton and Proca equations and pi meson
- **Case B:** Purica research methods in nuclear experimental physics
- **Case C:** Hulubei researches in nuclear physics and creation of an institute and a “school” of thought

- **Case D:** Romanian nuclear program
- **Case E:** An example of an individual experience of training and working in diverse cultural environments in nuclear energy

The evaluation method is based on some important results available in literature on the aspects analyzed in this paper, as follows:

- Knowledge is acquired in a series of steps, by switching [1–7] from one set of paradigms [8] to another.
- Not only the models (knowledge gained) is described by topological approaches [9–11], but the objects themselves that are considered to be modeled ("real world," "nature," etc.) are defined by topological spaces. The relationship between the models and "real world" is isomorphic.

The change from one step to another in the knowledge management process (KMP) and the creation of a new set of paradigms are driven by the need to find solutions to strong "conflicts" between facts and theories. Those solutions are generated by a process that can be described as being similar to a "syphoning process" between science/technology and culture. Culture is used in the sense of condensed societal set of beliefs acting for all aspects in science and art/ culture, which may be called "mythology." In other words, deep old embedded in the social conscience (old knowledge as reflected in folklore for instance, but not only in it) are the real sources for building the new set of paradigms to solve critical/crisis type of problems in a science.

2. Method

The method used to identify possible connections between aspects of creativity in science and technology and old cultural topics and paradigms was previously communicated [1–7]. It is based on the following basic assumptions:

1. Knowledge is acquired in a series of steps, by switching from one set of paradigms to another. The paradigm notion is in the sense defined in the literature [8]. The process of moving from one phase to another is described in detail in previous papers [1–7] and it is illustrated for some important aspects in the Annex.
2. It is considered that not only the models (knowledge gained) is described by topological approaches, as previously defined in the literature [9–11], but that the objects themselves may be considered to be modeled ("real world," "nature," etc.) are defined by topological spaces and that the relationship between the models and "real world" is isomorphic [12-14].
3. The driving force of changing from one phase to another in the knowledge process is the need to find solutions to strong "conflicts" between facts and theories, in a creative manner, by using solutions to the conflicts from other areas than the science itself. Those

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solutions are generated by a process that can be described as being similar to a "syphoning process" bringing solutions from the "mythological" space to the scientific one. The present paper details the mechanism presented above for some case studies.

2.1. Description of the cases is presented below

2.1.1. Case A represented in Figure 1

- Case A is related to the moment of defining the magneton Procopiu-magnetic momentum of the electron and to the development of the Proca equations.
- The magneton was a synthesis between the Planck theory and the atomic (Bohr) model, while the Proca equations were part of nuclear field researches for a spin −1 and mass *m* particle (that proved to be later on meson pi). The Proca equations implied the need to make a synthesis between the Schrödinger equation and theory of relativity.
- In both cases there was a conflict between the two theories and there is a need to find a solution in compliance with both. The dilemma in the approach to try to solve two conflicting theories was solved by searching a solution using a third way—integrating the two.

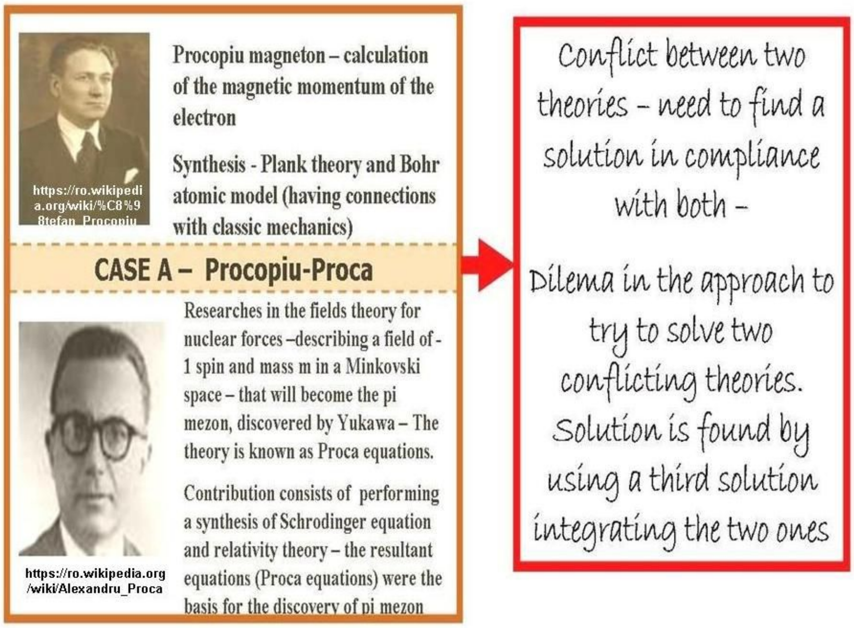

Figure 1. Case A

2.1.2. Case B represented in Figure 2

- Case B is related to development of experimental research methods in nuclear physics and reactor theory by using various types of logics.

- The dilemmas in choosing the investigation and the specific results interpretation of nuclear and quantum physics by considering the limits of the binary logic lead to specific solutions on the methods proposed.

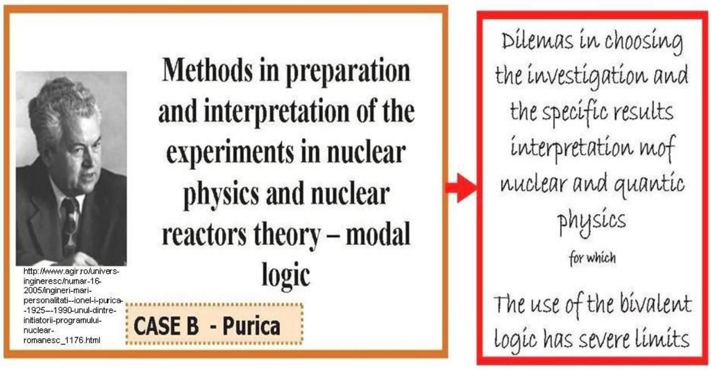

Figure 2. Case B

2.1.3. Case C represented in Figure 3

- Case C is related to the foundation of a research nuclear institute and a founding personality. There were three founding principles:
  - Combine theoretical nuclear and atomic physics with the nuclear technology/engineering
  - Assure continuous interface and update with the state of the art of researches at international levels
  - Inter- and transdisciplinary researches

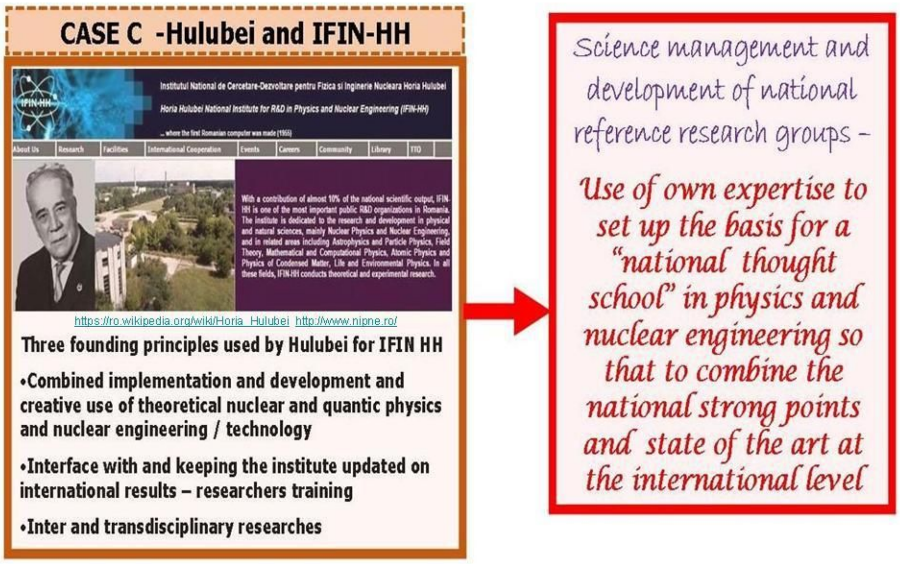

Figure 3. Case C

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The main issue to solve was to assure science management and development of national reference research groups. The approach to solve the task was to use our own expertise to set up the basis for a "national school of thought" in physics and nuclear engineering so that the national strong points and state of the art at the international level can be combined.

2.1.4. Case D represented in Figure 4

- Case D goal was to create research and engineering institutes, manufacturing facilities, including the know-how, general management of the program, and the interface with external partners and national/ international organizations.
- The main issue to solve was to develop a nuclear program management, as management of national critical infrastructure.

The main challenge of the case is to maintain a set of objectives for society segments with diverse political and economic objectives.

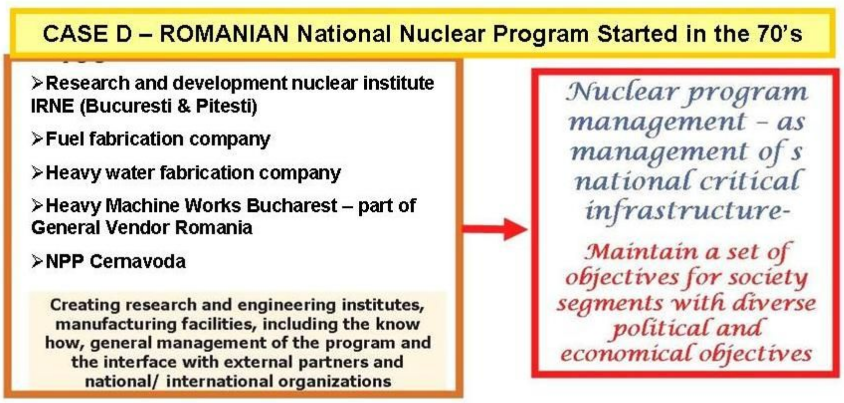

Figure 4. Case D

2.1.5. Case E represented in Figure 5

- Case E is represented by an individual (of an exponent of the generation "baby-boom" in nuclear) experience of education and training in diverse environments
- The specific issues needing to be evaluated were related to the features of this experience:
  - Experience gained during education period in diverse approaches
  - Experience enhanced during PhD studies
  - Training for working place at a new nuclear plant
  - Participation in commissioning and operation-related activities of a new plant built under license from a Western country in an importing country
  - Analyses and studies for new generation reactors in various countries and type of organizations

- Diversity of the experience is a very interesting challenge with specific insight on the driving forces for continuous improvement in such cases.

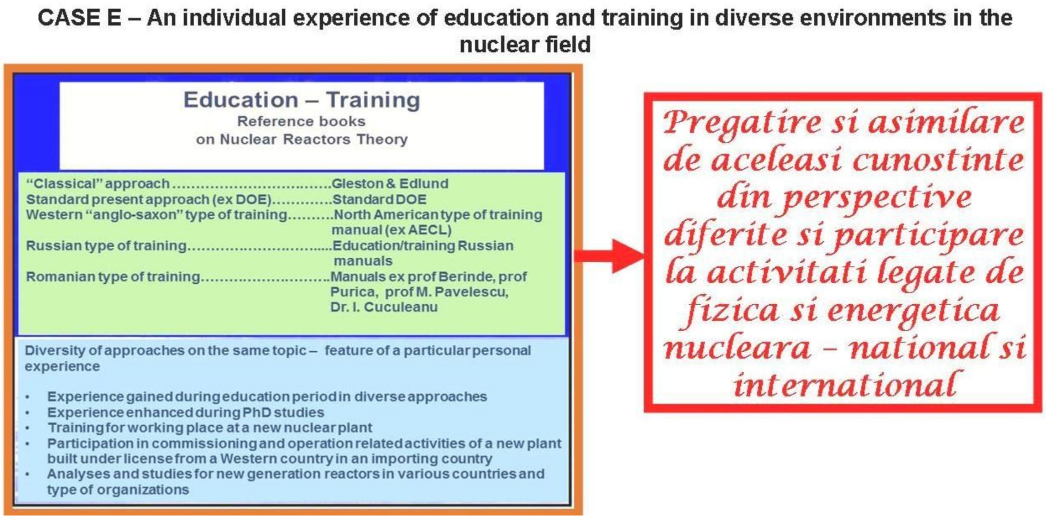

Figure 5. Case E

A set of typical phases as defined by the method proposed [1–7] are defined for all the chosen cases. For all the cases there are some common features related to:

- the fact that the search for a third type of solution while having two strongly conflicting ways to go forward, and
- the fact that the decisions on the creative solutions to be chosen are based on strong beliefs coming (in a "syphoning process" from other knowledge areas, as for instance) from the "mythological" old cultural frameworks.

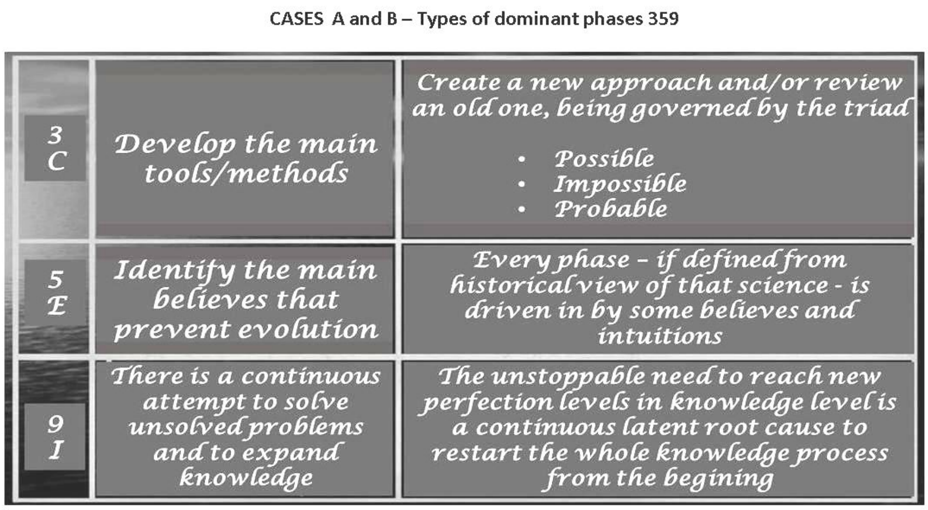

Figure 6. Case A and B typical phases in KMP

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For cases A and B, phases 3-A, 5-E, and 9-I are defined as being dominant. Therefore, the main characteristics (described on the second column in Figure 6) and the impact of the phase features on the potential creative solutions (as per the third column of the same figure) are describing the expected type of solutions on the dilemmas encountered in this case.

For case C and for cases D and E (considered together as having similar features), phases 3-A, 5-E, 6-F, and 8-H (for case C) and 3-A, 5-E, 6-F, and 8-I (for cases D and E) are defined as being dominant. Therefore, there are similar type of conclusions to case A, in the sense that the main characteristics (described on the second column in Figures 7 and 8) and the impact of the phase features on the potential creative solutions (as per the third column of the same figure) are describing the expected type of solutions on the dilemmas encountered in this case.

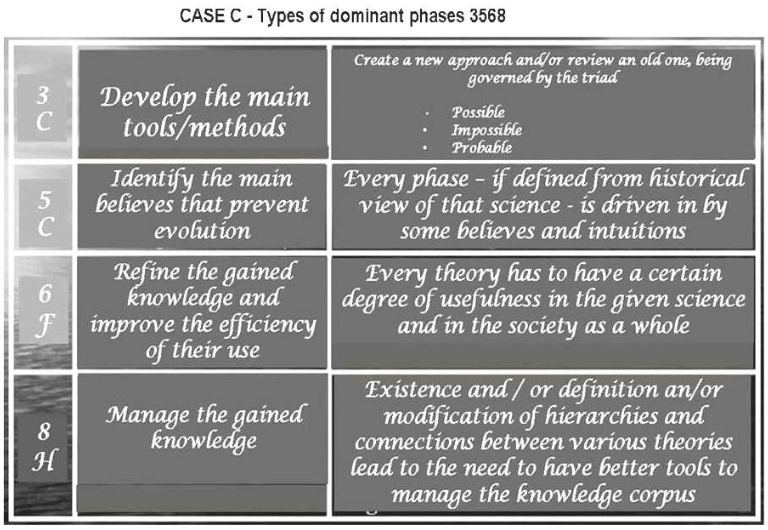

Figure 7. Case C typical phases in KMP

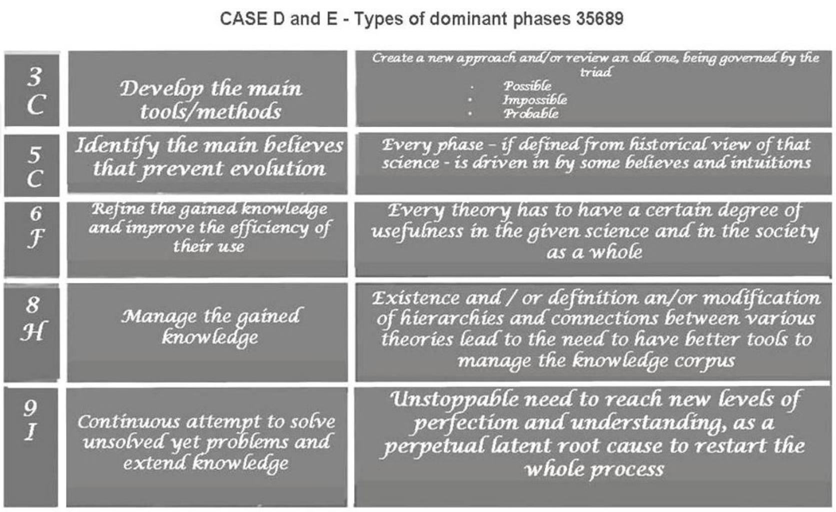

Figure 8. Case D and E Typical phases in KMP

3. Results

The main goal of applying the method [1–7] is to define the main features of the search for creating new theories and/or scientific methods in crucial times/phases. The search is based on the idea, formulated by this method, that the real creative solutions for crisis situations have strong connections with the old cultural frameworks, called in this paper "mythological" areas of knowledge, which may be considered as being specific to our cultural heritage.

As a result of the evaluations, the following results are obtained:

3.1. Results for case A

In this case a type of dominant feature (coded as MS1-A) was identified. This type of dominant "syphoning feature" is called "Trinity, triads, fractals—Pre-, non-, and Christian heritage." Examples are represented in Figure 9.

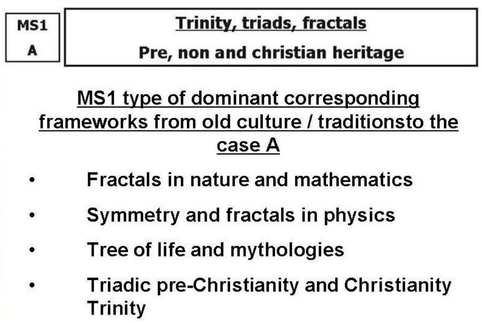

Figure 9. MS1 for Case A

3.2. Results for case B

In this case a type of dominant feature (coded as MS2-B) was identified. This type of dominant "syphoning feature" is called "The gate-The pillar." This feature has the following characteristics (Figure 10):

- It illustrates the separation of the sacred and profane/impure spaces, i.e., the separation of solid, confirmed, recognized knowledge from the new, unconfirmed, and uncertain, and
- It defines the strategies and tactics in the KMP.

3.3. Results for case C

In this case, two types of dominant feature (coded as MS3-C and MS4-C) were identified (Figures 11 and 12). These types of dominant "syphoning features" are called "The world-cosmos" and acquired knowledge on it a set of fractals" and, respectively, "Hora, The spiral." These features define:

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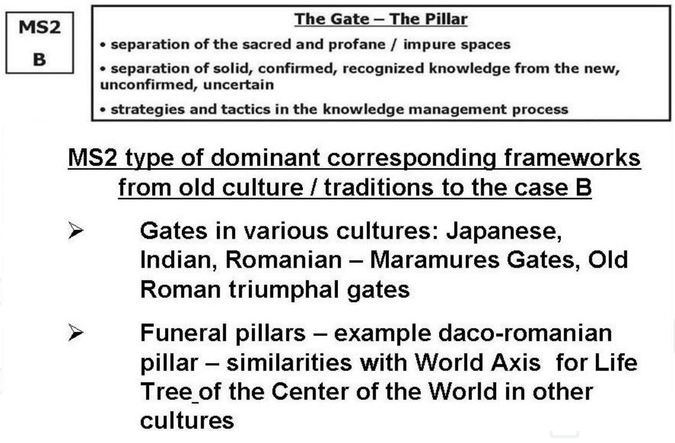

Figure 10. MS 2 Case B

- the tendency to reach the solutions guided by the perfect forms (solar and cosmic symbols), as expression of the force and perfection of feelings, living, and knowledge, and
- the role of collectivity in life and KMP, changes and transformations of the world, and of the corpus of knowledge on it.

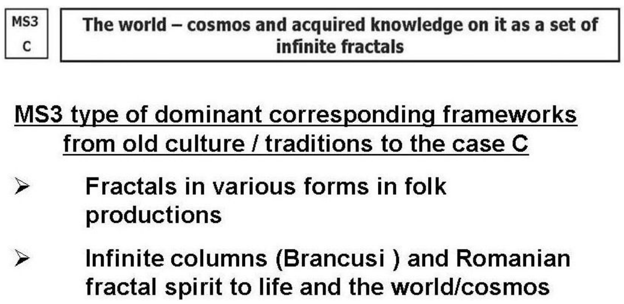

Figure 11. MS4 C Case C

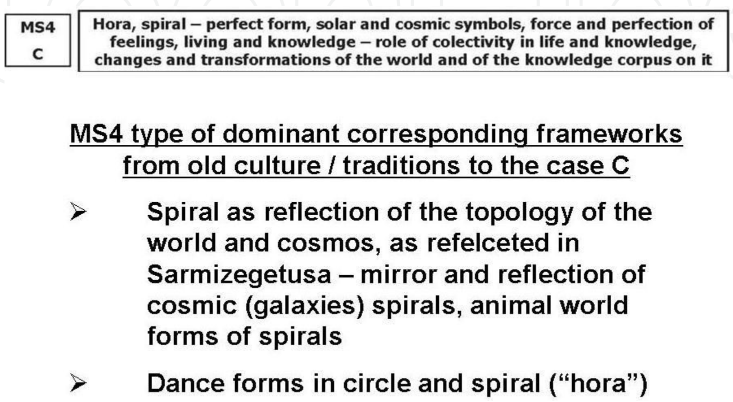

Figure 12. MS4 C Case C

3.4. Results for cases D and E

In those cases there is one type of dominant feature (coded as MS5-D,E) identified (Figure 13). This type of dominant "syphoning feature" is called "Oikonomia – οικονομία" The features of this type of symbolic topological similitude is described by the ability to perform management of community-related issues and its environment, using the lessons learnt and patterns as a guidance for solutions to dilemmas specific to cases D and E. Lessons derived from the natural energy and traditional household, the solutions of traditional household (the ecology "avant la lettre"), and the type of solutions adopted for the knowledge/risk analyses in natural, complex, self-regulating, and reproducing systems (Complex Apoietic Systems, CAS [1–5,12, 13]) may be used, too.

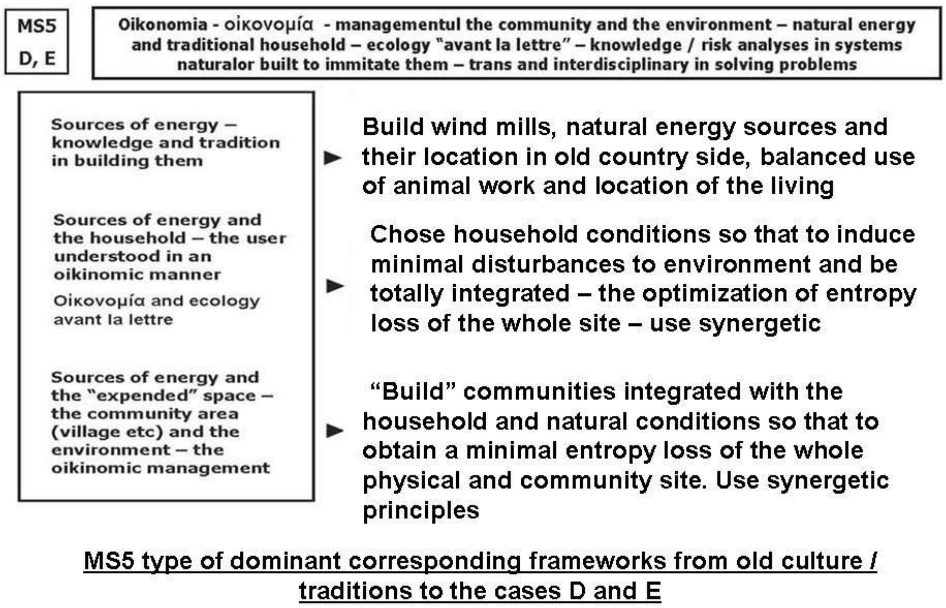

Figure 13. MS5 D and E

4. Conclusions

Based on the particular results for the cases mentioned above, a set of possible and most probable connections between the issues that had to be solved in science and the "old knowledge" was identified.

The approach was tested for some specific cases with very interesting results and it is expected to be applicable to other examples as well. However, it is expected to acquire more in-depth review of the methodology and investigation of more diverse examples during the future work. At this moment of research, it can be noted the well-suited applicability for the evaluated cases and the proposed method proves to be of interest to be considered for other more general examples.

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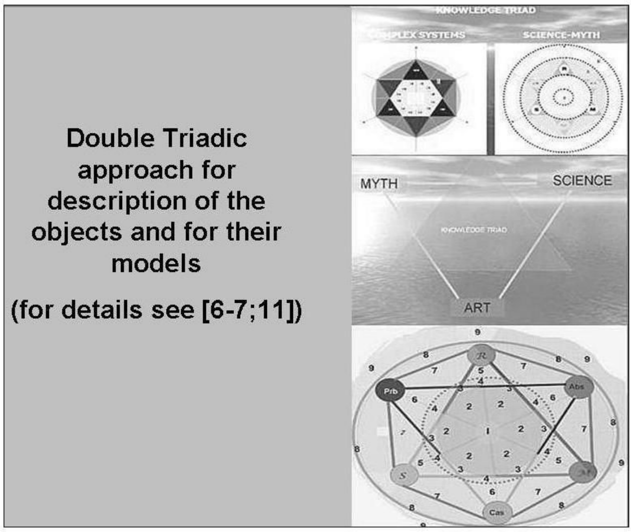

Figure 14. Triadic knowledge approach

Appendices

Annex

The method described in previous papers [1–5,12,13] assumes that the world of scientific studied objects and the models on them are described by topological spaces. Knowledge is acquired in phases. There is a double triad describing the objects to be studied and the methods used to study them (as illustrated in Figure 14).

As a result of the process, scientific theories are built and in various phases generate different topological structures. Each phase is characterized by some dominating features, created by some deep believes. From the point of view of the type of dominating believes (which generate paradoxes and hence become a driving force of knowledge transition from one phase to another), there are three categories of possible situations. This specific feature may be used to refine the general knowledge states depending on the phase in which the knowledge process as a whole is at that moment in time. The change from one phase to another is driven by the mismatch between the truth switch and the belief (paradox creating) switch as represented schematically in Figure 15.

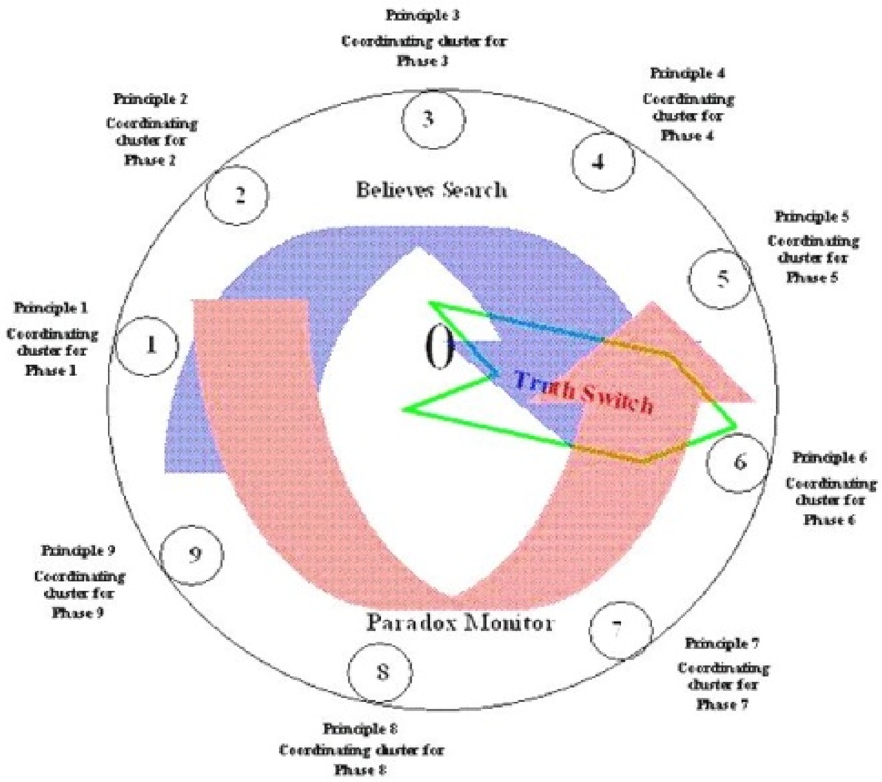

Figure 15. Belief switch

The transition from one phase to another and the building of the topological spaces are described in detail in the literature as defined by the author [1–5,12,13] and represented in a illustrative manner in Figure 16.

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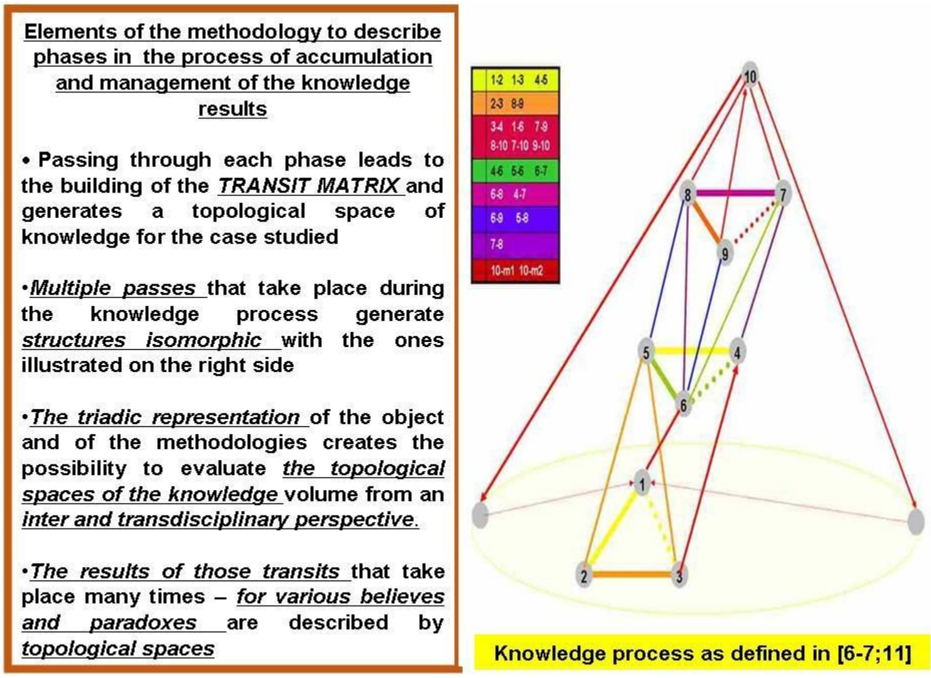

Figure 16. Knowledge matrix

The resulting topological spaces, describing the knowledge space at a given phase, may be similar to the representation from Figure 17 (in which a typical science dominated KMP is represented).

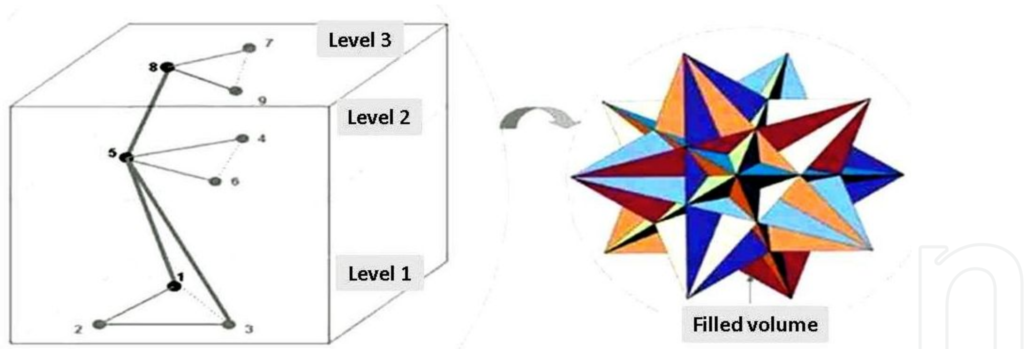

Figure 17. Knowledge process

Depending on the type of dominance, i.e., if there is a dominance of one side of acquiring the knowledge (science, myth, or art) or two or three sides, the author proposed to complement the approach of classification of civilizations based on the energy it may harness (as defined by Kardashev and described in more detail with other further developments [1–5,12,13]). It was proposed to classify the civilizations based on the type of process that describes the KMP (as represented in Figure 18). From this point of view, the type III might be an example of the present multidisciplinary approach specific to many contemporary scientific issues.

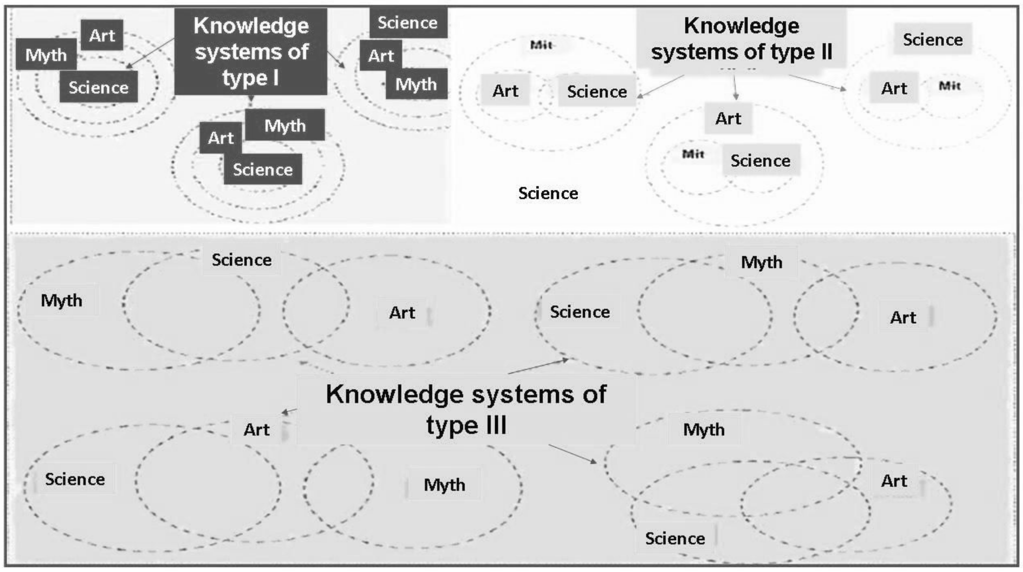

Figure 18. Knowledge and civilizations types

Another aspect of the results obtained with this approach to evaluate KMP proposed for consideration is that the knowledge is the target of a knowledge acquisition after passing through various phases is to define a "continuum" reflecting the "continuum" of the studied world/objects/reality.

The reality is, as Figures 16 and 17 illustrate, that knowledge is a discontinuous space about a discontinuous space of studied objects. It would be helpful for the KMP to understand the importance of answering questions such as the following:

- How to describe and formalize aspects of total knowledge (of everything) versus partial knowledge (of something).
- How to define an x-adic object that is studied with y-adic methods and rules and generate z-adic results/spaces which are being judged with w-adic logical tools.

Other sets of conclusions and applications are related to the practical use of the method. One application described in [1,2] is related to the nuclear physics and nuclear energy technology. Nuclear energy as a technology has an evolution characterized by the technology curve [3–5] as illustrated in Figure 19. The topological spaces representing the change of nuclear science and technology during the years are represented in Figure 20. The use of this method allows better understanding of main challenges encountered by the technology during the years and may make prognosis on some future features [4–7].

The last possible example of using the method is related to the possibility to study in a more systematic manner some amazing similarities from topological spaces point of view illustrated in Figures 21 and 22.

The similarities may be understood to some degree by the use of the method as presented in previous papers [5–7].

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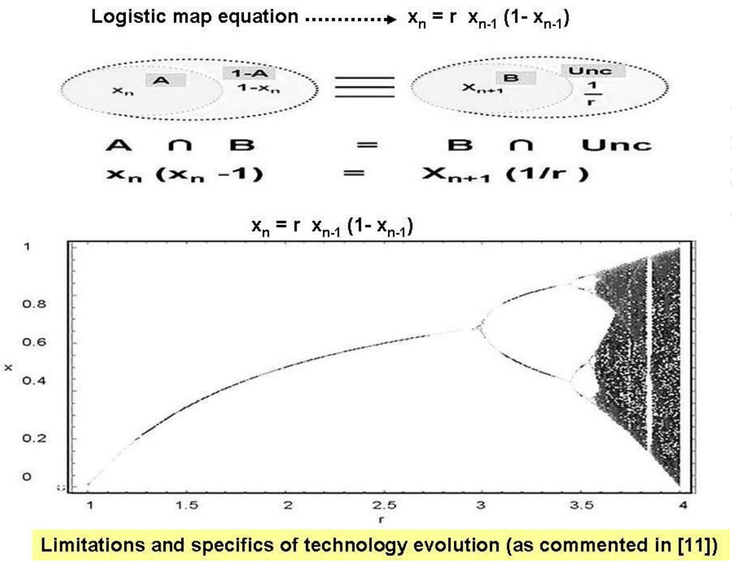

Figure 19. Knowledge and technology

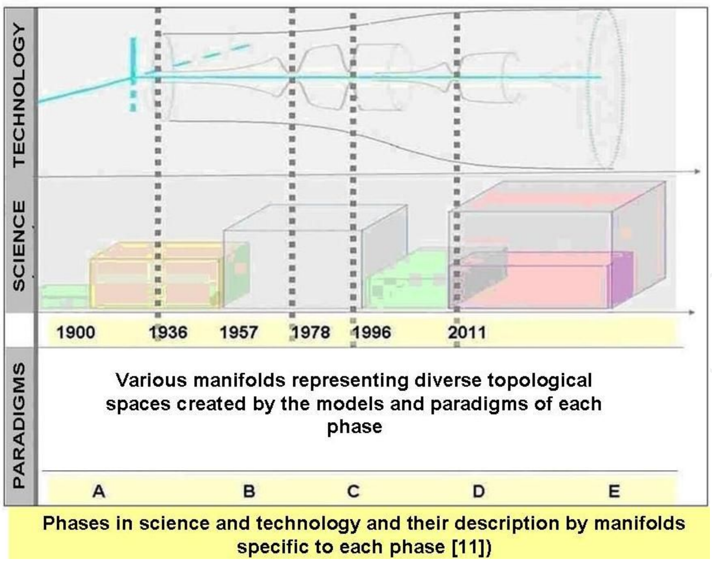

Figure 20. Nuclear knowledge and technology

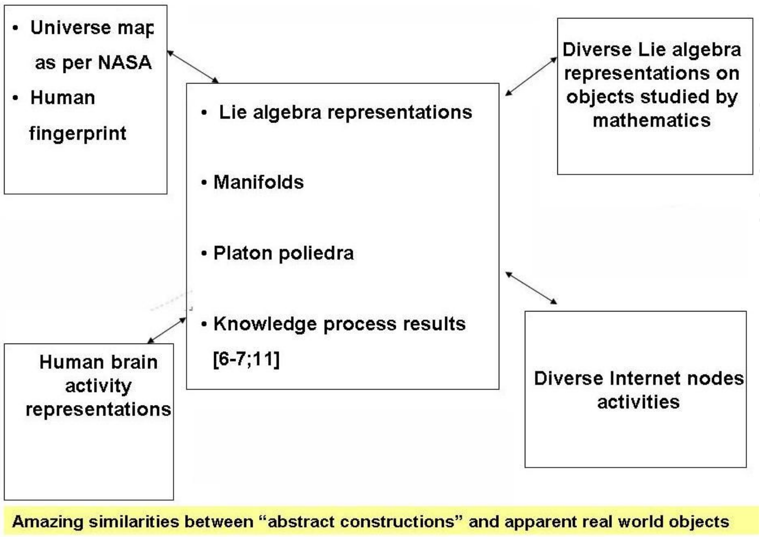

Figure 21. Topology and knowledge results

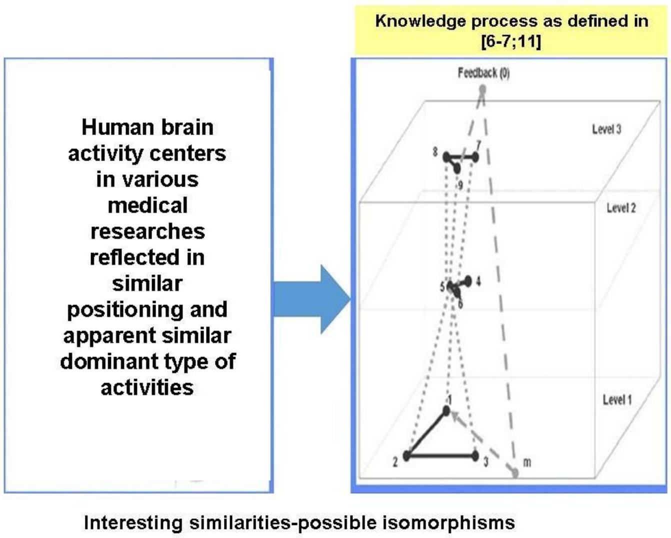

Figure 22. Knowledge topology and brain

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