

THE SCIENTIFIC ESSAY

1. THREE TYPES OF SCIENTIFIC DISCOURSES

The semiotic analysis depicts three types of scientific discourses: specialized, didactic and vulgarizing. The first, destined mostly for the specialists in the same field, is allegedly dry, redundancy-free and jargon-ridden. The second, confined to knowledge transfer and skills developing, uses the rhetoric figures of authority in order to organize the communicational flow in a sequence endowed with all the attributes of necessity and irreversibility. The elements of cognition come one after the other, they logically and necessarily follow one another closely, this order is unique and final, nothing can be different than it already is. The receiver is advised to comply and join efforts in furthering the historical progress along a wide and straight road. Finally, the third kind of discourse, the vulgarizing one, is destined for people outside the specialized field, which it aims to lure, convince and, quite possibly, manipulate. The scientific essay is characteristic to this last type of discourse, which is unfortunately too often viewed as a whole, without the necessary distinctions resulting from the characteristics of the target public.

Thus, there is a naive public who believes in the possibility of accumulating knowledge in a quick, easy and even entertaining manner. They are ready to pay in order to acquire countless books of popularization that promise to teach them certain techniques in easy ten-minute lessons, without other previous knowledge or without engaging their cleverness too much. Thirty years ago, Aisberg's books were very popular: "The Radio – Nothing Simpler" or "Television – Nothing Simpler". Today, the market teems with such titles as "Multimedia for Morons" or "Everything You Wanted to Know about Personal Computers and You Were Afraid to Ask". Spreading the technical and the scientific interest among the masses, a process fashioned according to the Soviet style of certain publications such as "The Young Technician" or "I Want to Know Everything", resulted, some time ago, in the proliferation of the brochures in the SSSC (Society for Spreading Science and Culture) collection and the success of the "Știință și tehnică" (Science and Technics) magazine. Written in generally by non-specialists and washouts,

these booklets provided pseudo-explanations for anything – from sun spots to the theory of relativity – without a distinct stylistic strategy, resorting to what Roland Barthes called “the zero level of writing”. As far as the above-mentioned magazine is concerned, it soon left the scientific and technological approach to patronize the SF genre and pave the way for the local variant of cyberpunk literature. The category of public interested in these writings is easy to satisfy, especially as such books are often collected rather than read, their owner having the feeling that, once he has stored the treasure of knowledge, the most difficult step has been made, and what remains to be done is just to go over the respective works whenever he finds the time.

Another, more exacting type of public consists of the bureaucrats or the political factors deciding on the allocation of public money for scientific projects. Long ago, it was the specialists that decided with regard to the opportunity of research themes. The maturation of democracy soon led to the elimination of this type of – **horribile dictu** – elitist practice. As a result, a new kind of vulgarizing genre appeared – the project – destined for people whose ignorance is not an obstacle in taking the best decisions. Devised to convince, projects integrate scientific phrases with a promotional touch – the so-called glitz concepts –, such as the theory of chaos, the theory of catastrophes, artificial intelligence, artificial life, etc. in a context governed by the standard rhetoric of the “wooden language”. The former procedure awakens the reader’s interest, while the latter puts his distrust to sleep.

The essays in this issue belong to neither of the above-mentioned categories. They are addressed to an intellectual public with a predominantly literary training, interested in the circulation of ideas, irrespective of their nature. This type of public is not subjected to the process of systematic education and abhors the didactic discourse. On the other hand, it also includes various specialists in the field, who are interested in a change of perspective, in formulating new, as yet unverified hypotheses, and in the philosophical echo of their own ideas. The intellectual essay is generally written by the very practitioners of the specialized discourse, for various reasons we shall examine further on. Persuasive and polemic, quite often of great literary value, it has been illustrated by such leading scientific personalities like Henri Poincaré (*La science et l’Hypothèse, Science et Méthode*), Ilya Prigogine (*La nouvelle alliance, Entre le temps et l’éternité*), Stephen Hawking (*A Brief History of Time*). The examples we have selected from the Romanian bibliography share the interest and beauty of the above-mentioned works. We shall examine, in the following, their cultural origins.

2. THE CULTURAL TRADITION

The prestige of literature in Romanian culture is unquestionable. Here, no one is really somebody unless he/she is (also) a writer. The young men who left for Paris at the beginning of the 19th century usually studied literature or law. Even those who chose a scientific curriculum – Ion Ghica, Spiru Haret or Gheorghe Asachi – proved their worth in administration and occasionally in literature. Three cultural models have dominated the Romanian intellectual life. The first one – that of the universal man, a Renaissance mind capable of covering knowledge on the whole – was illustrated by such personalities as Hasdeu, Cantemir, Eminescu, Iorga and Eliade. They initiated ambitious monumental projects that were usually left unfinished. The second one (E. Lovinescu, P. Comarnescu) depicts the type of individual who abhors provincialism, who is synchronous with all models and tendencies in the prestigious cultural centers, who is excellent in terms of accumulation and synthesis, and deficient in terms of originality and the courage of novelty. The third one (Moisil, I. Barbu) is convinced of the profound unity of culture, and has the ability of making connections between the most diverse fields, skillfully applying in one domain the method characteristic of the evolution of another. Interdisciplinarity and transdisciplinarity are the areas in which he feels most at ease. With all three above-mentioned types, it is somehow strange to notice their marked interest in the ethnographic specificity and the singularity of the national cultural voice. Cantemir, Leibniz's colleague at the Academy in Berlin, does not write about monads, he writes about Moldavians. High-class intellectuals waste themselves in dull ethno-psychological considerations. Instead of joining firmly and uninhibitedly in the European discussion of ideas, a great deal of energy is still being wasted on genres that have already been accredited elsewhere.

The scientific essays included in the present selection share almost all the characteristics of the approaches we have described so far. Their authors are outstanding professionals involved in vast projects. Brilliant in establishing interdisciplinary connections, they substantiate their arguments with stylistic magnificence. Perfectly at home in the international flow of ideas, they prefer to borrow other people's methods to solve their own problems, rather than to suggest new methods or formulate new problems. Thus, Octav Onicescu applies Corrado Gini's informational concepts in actuarial statistics, Grigore Moisil studies Lukasiewicz's non-Chrysippian types of logic (not the other way round). Subtle analysts, with a keen sense of criticism, they move about culture elegantly, as in a sumptuous drawing room, without overturning armchairs or breaking vases. Their environment was receptive, consisting of a cultivated – although limited – public, who attended conferences, purchased and discussed magazines and books, organized literary soirées. The state made up for the absence of a cultural market vast enough

to be independent by offering subsidies. All these stimulated the scholars' essayistic manifestations, of which we have chosen a few examples.

3. THE RECOIL AND THE ALTERNATION OF DISCOURSES

Quite often, the open goal of the scientific essay – as it also results from the introduction to Grigore Moisil's "Logical Pluralism" – is to arouse the interest of the well-read public for a certain field of the specialized research. In reality, the stake of the scientist's essayistic effort goes way beyond the spreading of truth by evangelizing the laypersons. The author's interest lies in alternating the specialized and the cultural discourse the semioticians have unfairly called "vulgarizing". Immersed in his researches in the non-classical types of logic, Grigore Moisil necessarily resorted to the formal, symbolic idiom in order to construct and array his reasoning. This facilitates the step-by-step progress into the unknown, and draws clear paths in a field that is to be explored and mapped. Nevertheless, the overall perspective on the field's range of problems, the overall configuration of the subject in question, as well as the connections with other subjects and research methodologies are lost. Specialized idioms are capable of describing the internal structure of a field, but as soon as we try to view it from the outside, a metalanguage becomes necessary. And it is the natural language through which the cultural discourse is being articulated that can play this role perfectly due to its metaphorical force. Certainly, at the cost of ambiguity, because the reverse side of the medal is that any all-inclusive perspective lacks in accuracy.

There is a certain contempt of the "specialists" for the use of the "vulgarizing" discourse, contempt that can be explained through the very "technical" flaws of the natural language which is incapable of making "clear" distinctions. However, such an attitude ignores precisely the recoil, the distancing from details the natural language can offer through its globalizing metaphorical force. And the result is not just good communication with those outside the field – that is, the well-read public –, but also a critical attitude of the researcher with regard to the subject in question. The recoil certainly does not set out in detail the flaws of the prospective progress, but restores the general direction of exploration. A trip in the wood is constructed with the compass – a specialized instrument –, but, now and then, it is worth climbing a tree – therefore, resorting to a natural procedure – to see where the wood ends. Wavering between the specialized and the cultural discourse is not a mere alternation of a stage of creative research and one of communicative relaxation. On the contrary, it is a means of stimulating the constructive scientific effort, because it creates key points of critical examina-

tion and, by pointing out the analogies, it suggests interesting method transfers. Grigore Moisil also remarks that the logic of the natural language is singular – the classical one –, while each non-conventional type of logic has its own formal idiom, exclusive and untranslatable into another formal idiom. The natural language is the only metalanguage in which one can speak simultaneously about more possible – but incompatible – types of logic. The result is a sound basis for essay writing.

4. THE POLYTROPIC ESSAY

The essayistic approach does not provide only a quick change of perspective, but also a remarkable flexibility in choosing the methods. Following Anton Dumitriu's suggestions, the specialist is an Achilles who has frozen in a heroic type of determinacy, while the essayist – he who tries everything and who is constantly tried – is a wandering and polytropic Ulysses. The essayistic attitude is flexible also in the sense that the knowing subject is open to being influenced by the object he studies. The scientist's laboratory is not a cave of magical rituals, it is, on the contrary, a species of formalized idiom. The apparatus and the substances make up the vocabulary, the experiment protocols represent the rules for the correct construction of the assertions. The technical parts are the material variant of the abstract specialized idiom. The latter asks for a clear separation between the observed and the observer, and, although it takes into consideration the changes effected in the studied object by the act of observing – in other words, the act of speaking rigorously about something –, it completely ignores the changes observation might produce in the observer. And the relative endurance of the observer's identity is explained by the very caution with which he stays within the boundaries of a specialized idiom. As soon as he accepts an alternative approach, by resorting to the cultural discourse, the observer's immunity vanishes. He has to choose between the various interpretations of a concept which, while unique within the specialized idiom, proves to be multiple and polymorphous in the cultural language.

In his essay on the role of language in mathematics, Octav Onicescu examines the various cultural meanings of the concept of probability. In the axiomatic language of Kolmogorov's theory, probability is a particular case of the measurable functions, a function with remarkable, precisely defined characteristics. Within the limits of this formal contraction, everybody readily agrees with regard to probability, while the psychic, ethnic, cultural, etc. traits of the scientist who discusses probability with his colleagues is of little consequence. However, as soon as he ventures beyond the limits of the specialized idiom, in a cultural-essayistic effort, an explanation of his option for one interpretation or another is imperative. Is probability a constituent

part of the material objects, such as mass, speed and so on, or is it just the measure of our ignorance with regard to the objective physical properties of objects? Is there a universal law of compensation expressed by the probability quantum, that threshold value under which chances that an event will occur become rigorously null? When Newton said **Hypotheses non fingo**, he expressed fear of cultural contamination when the scientific idiom ceases to be strictly descriptive and becomes metaphorical and explanatory. The essay writer is the one who builds hypotheses, without waiting for the appearance of a protocol for their objective validation. Moreover, his very use of the vulgarizing discourse makes him aware of the impossibility of a definitive and objective decision in favour of a certain interpretation, without the interference of a cultural or even, **horribile dictu**, ideological option. The existence of a determinist order underlying any phenomenon, whose random aspects would be only illusory, as the result of our imperfect cognition, is such a hypothesis that comes easily to my mind as an example.

The interpretative problematization does not necessarily lead to polytropism. Anton Dumitriu makes a thorough analysis of the original Greek term **polytropos** and concludes that it must be interpreted not so much in the sense of character versatility, but in the sense of having a great number of methods, and also the ability to select the method best suited for solving the problem in question. Returning to Octav Onicescu's example, the cultural hypothesis regarding the objective or the subjective character of probability engages various methodologies for statistical inference, i.e. for data processing with the purpose of learning from experience. Ignoring the interpretative cultural aspects – set out only by the essayistic discourse – therefore leads to methodological rigidity, pragmatic inadequacy, in a word, to lack of polytropism. The essay-writing scholar returning to the area of specialization from his cultural excursion can say just as Ulysses did: "I am a little of everything I have come across".

5. MODELS AND REPRESENTATIONS

The specialized discourse produces models, while the essayistic discourse constructs representations. The model of the specialized discourse must not be mistaken for that of the didactic discourse. The latter is normative and exemplary, it dictates rules in an implicit manner, through study cases, while the former is predictive and advances rules for operating on abstract symbols, used in computing conducts that are possible in the future. The essayistic discourse prefers the metaphorical representations as well as the qualitative scenarios in which the conceptual entities are engaged in a sort of theatrical performance of the interactions possible among them.

In his study on the doctrine of substance, Camil Petrescu says that “most brilliant minds have found their death in the chasm between probability and possibility”. This keen observation that seems to spontaneously gush out of the vividness of the essayistic style establishes the distinction between the mathematical concept of probability, capable of modeling random phenomena by gauging eventualities, and the metaphorical and the philosophical representation of the aleatory through the filter of the possible. What cannot be calculated through models is not worthy of being included in the specialized scientific discourse, but, on the other hand, an abstraction lacking in the support of the representation risks to remain only a meaningless game of numbers. In this context, the essayistic discourse tries to recuperate the imaginative concreteness, whereas the scientific modeling tends to isolate itself in sterile computations.

One should not think that the intuitive representation is but a vague image for the use of laypersons the specialists familiar with abstractions could do without. The mental experiment – **Gedankexperiment** – is an instrument currently used by specialists, although it is but the result of the pure qualitative inventiveness. Laplace and Maxwell’s sprightly demons, Einstein’s twins and high-speed trains are romping in the collective imaginary shared by specialists and well-informed intellectuals alike. Even if all these can be just a support of understanding for the latter, they are undoubtedly creation tools for the former. In building mathematical models, the dynamic complex of representation plays a more important part than a source of inspiration; it acts as a constructive guideline. The history of science proves that many theories were born out of the symbolic pressure of a certain cultural moment, although the didactic discourse presents them – by reconstructing them retroactively – as inevitably following from those preceding them, in a linear, simplistic flow. As a result, by circulating trends, essay writing helps in building models, which qualifies it as a creative effort rather than one having to do with communication.

6. ISOMORPHIC WORLDS

50

Ion Barbu tried to maintain a sort of imperviousness between his activity as a mathematician and as a literary man. He did this mainly out of aversion to impurity, but also, we must admit it, out of his concern for an unquestionable reputation. The rabble are too often tempted to sneer: “the greatest poet among the mathematicians, the greatest mathematician among the poets, etc.”. On the other hand, the restrictions of specialization, imposed by the cliques with a say on the market of intellectual values border quite often on the absurd. Astonishment is expressed even in the case of a prose writer who occasionally publishes poetry or plays, while the decision of a mathemati-

cian to be a manager seems to many as extravagant as that of becoming, overnight, an actor. For the select circle of playwrights, Caragiale would be but a loser, because he gave up dramaturgy and started writing sketches. Consequently, Ion Barbu asked for a complete disjunction between the two facets of his activity, saying quite often, with a touch of coquetry, that he respected himself as a mathematician, but very little as a poet.

In one of the rare cases when Ion Barbu mentioned the correlation between his scientific and his literary vocation, his statement was as extravagant as it was false. He claimed that his positive scientific training was reflected on a literary level in a denser and more savoury style, and, in order to substantiate his assertion, he made a favourable but arbitrary connection between Ion Ghica and Vasile Alecsandri, the prose writer. As far as he was concerned, Ion Barbu had too much good taste to versify mathematical concepts. His mathematical world indeed remained insulated from the poetical one, but well informed commentators have revealed that the cycle **Joc secund (Secondary Game)** on the whole makes up a closed universe, like the abstract algebraic structures of the group, ring or body. Moreover, the abstract operations – poetical, in one case, mathematical, in the other – are performed analogically in both worlds, in accordance with the exact requirements of isomorphism. *Ut pictura poesis* thus acquires a noble touch and becomes the expression of the abstract unity of the lucid mind.

Ion Barbu's few essays – in general, drawing room lectures, articles and interviews – are amazing due to the keenness of his observations, although some of them make extensive use of futile paradoxes. For instance, in total opposition to Claudel, he says about Rimbaud that “he is a scientist, a methodist of delirium, not a tramp intoxicated on dew, in a state of mystical osmosis with the invisible”. Despite his clear stands, one can detect again the temptation to explore the hidden communication channels between the various fields of knowledge. And they can only be kept open through the essayistically playful manner of referring to the world.

It is now in fashion to look down on the essay, a frivolous species, lacking in the solemnity and monumentality of the specialized intellectual constructions. A stupid and unfair phrase is being reiterated, that we allegedly are “a nation of essay writers”, incapable to mind more serious business. As I am writing these sentences, a young Cluj psychologist no one has heard of openly states on TV that “a country cannot be modernized through essays, it is modernized through projects”. This anthology as well as the present commentary are meant to show that this is about different species of the same cultural discourse, nevertheless having distinct natures and flavours.

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