THE EARLY MODERN ROMANIAN DISCOURSE IN PHYSICS OF ELECTRICITY[1]

***Abstract**: This paper aims at identifying and analyzing some of the specific linguistic features of Physics of electricity in Romanian, as well as the manner of formation and functioning of scientific discourse in this field. The emergence of new branches of science, in the twentieth century, led not only to the increase in number of terminologies and to referential delimitation of terms, but also to the creation of an emerging interdisciplinary scientific vocabulary. We performed a double analysis, in terms of lexical structure and discursive organization, in an attempt to capture the early technical and scientific discourse features, in its didactic subtype, from the beginning of the twentieth century. Regarding the text syntagmatic features, in this paper we will consider the interference of verbal and non-verbal signs. The semiotic approach aims at an analysis of the share occupied by the two types of signs and of the modality in which they combine to create the Physics of electricity discourse.*

***Keywords**: terminology, technical and scientific discourse, Physics of electricity, discursive organization.*

Terminology referring to electricity and its applications begins to take shape in the second half of the nineteenth century and reaches perfection in the first half of the twentieth century, when Modern Romanian could provide adequate means of expression and lexical enrichment to create specialized terms for the new realities. In this paper, we shall investigate the modalities in which early modern Romanian from the beginning of the twentieth century has created and adapted specific linguistic means to create a specialized language able to express the new and numerous scientific and technological breakthroughs.

We consider our approach useful and necessary, due both to the status of Physics, as fundamental discipline among technical sciences and to the position of electricity terminology, as nucleus of the future of Electrotechnics and Electronics terminology. The analysis we performed is intended to become a diachronic intermediary stage, which is relevant for further overview of how didactic scientific discourse of the referential fields dealing with the study of electricity and its applications create significance.

First, we shall make some clarifications that we consider necessary in connection with the terminology relating to electricity and its applications. The Romanian terminology for electricity and its applications was used in the nineteenth century, especially in the chapters on electricity and magnetism of Physics textbooks and courses, most of them being translated from French and German. It also appears in science popularizing printed materials for a general audience. Due to the status of Physics as fundamental discipline among the technical sciences, this terminology will form the nucleus of the future Electrotechnics and Electronics terminology. We can affirm that the terms of Physics of electricity would become the core of Electrical engineering terminology, a branch which, as defined by MDA[2], studies the applications of electrical phenomena. From English,

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[2] electrotehnic, -ă adj. şi s. f. (At.: LEG. EC. PL.; E.: fr. *électrotechnique*) 1 s.f. Ştiinţă care studiază fenomenele electrice şi magnetice din punctul de vedere al aplicaţiilor lor tehnice. 2 s.f. Ramură a tehnicii care se ocupă cu aplicaţiile fenomenelor electrice şi magnetice, precum şi cu proiectarea, construcţia şi exploatarea utilajului respectiv. 3-4 adj. Care aparţine electrotehnicii (1-2). 5-6 adj.

Romanian has borrowed *electrotehnologie* (from Engl. *Electrotechnology*)[1] (OERD, 2006: 456), which is a synonym of *electrotehnică*.

The first scientific works written by Romanian field scientists have contributed substantially to its development and standardization. Graduate and especially postgraduate study programmes, which they undertook in European technical institutions of education, have facilitated the contact with specialized terminology in force at that time in various European languages, which represented a major advantage for Romanian. Although in its modern stage, Romanian could not form, by internal creation means, and at a fast pace, the necessary words to name the new realities. One consequence of the contact of Romanian scientists with French and German scientific world is reflected in the large number of French and German etymons that Romanian language dictionaries offer for the terminology relating to electricity and its applications, and, to a lesser extent, for Electrotechnics and Electronics terminology.

Partially adapted forms of scientific and technical terms referring to electricity, which entered Romanian, in the nineteenth century, largely coincide with the current forms, thus contributing substantially to the formation of modern Romanian scientific and technical language. The formation of scientific spirit, which was required and supported by scientific and technological breakthroughs in the western European countries, began and continued throughout the nineteenth century, so that, by the year 1900, the first original Romanian works are elaborated and developed by specialists in electricity.

The enrichment of special terminologies continued at an accelerated pace in the twentieth century, the process being required by the progress of science and technology worldwide. The emergence of new branches of science accounts for the increase in number of terminologies and their referential delineation. Gradually, however, the existence of interdisciplinary scientific vocabulary[2] becomes more evident, which emerged as a natural consequence of one of the defining features of modern science, the "interdisciplinarity of referential fields" (Rovenţa-Frumuşani, 1995: 14).

To perform the systematic classification required for compiling a corpus of large size specialized texts, we used an artificial closure of the selected texts, both implicit and explicit[3], an operation prompted by the difficult conditions of use for old documents. The functional analysis of Physics of electricity language is meant to perform a classification of signs, on the basis of functional criteria in various subtypes of scientific discourse to determine the "linguistic determination of knowledge and non-linguistic representations" (Rovenţa-Frumuşani, 1995: 14), the latter resulting in significant iconic, indexical and symbolic systems. Of the two levels that are included in the semiotic model developed by

Privitor la electrotehnică (1-2). 7-8 adj. Specific electrotehnicii (1-2). 9 adj. Privitor la aplicarea tehnică a fenomenelor electrice şi magnetice.

[1] electrotechnology = (electrotechnics) the science of the application of electricity in technology

[2] The issue of interdisciplinary scientific vocabulary has been addressed by Angela Bidu-Vrănceanu in several of her works, among which we mention here: Angela Bidu-Vrănceanu, Silvia Savulescu, Alice Toma, Claudia Ene, Alexandra Vrânceanu, *Lexic ştiinţific interdisciplinar*, Publishing House of Bucharest University, 2001 and Angela Bidu-Vrănceanu, *Lexic comun, lexic specializat*, University of Bucharest, 2002, http://ebooks.unibuc.ro/filologie/vranceanu/index.htm

[3] "To be effective, discourse analysis requires finite utterances, limited discursive spaces, which means that the selected texts will be naturally closed, or closing will be achieved by means of various devices: explicitly (by discursive samples) or implicitly (by generalization on the basis of fragments)", J. Dubois, 1978: 3 *apud* Daniela Rovenţa-Frumuşani, 1995, *Semiotica discursului ştiinţific*, Bucureşti, Editura Ştiinţifică, p. 20.

Daniela- Roventa-Frumuşani[1], the literal descriptive level and, respectively, the non literal interpretative level, in this paper, we shall approach only the first floor, regarding "the text syntagmatic features represented by the interference of verbal and non verbal signs" (Rovenţa-Frumuşani, 1995: 20).

Next, we perform an analysis in terms of lexical structure and discursive organization of two Romanian Physics works, in an attempt to capture the features of the didactic subtype of scientific discourse, that was in use at the beginning of the twentieth century, during the stage of early modern literary Romanian, and at the end of the formation phase of electricity relating terminology. We selected the chapters on electricity from two Physics handbooks, which appeared in 1923 (CBCfe) and 1925 (DLf) respectively. The two works reviewed in this paper, a course and a high school handbook, belong to scientific didactic discourse, taxonomic-descriptive par excellence. Verbal layer intermingles with numerous non-verbal elements that are meant to exemplify, offer details and / or supplement the information contained in the text. With respect to non-verbal representations plan, we have to highlight the occurrence of certain similarities between the two instances of didactic discourse of Physics of electricity. Thus, the non verbal is established by iconic elements, signs and symbols, as evidenced by images, various types of static and dynamic diagrams, formulas and mathematical expressions for calculating the electrical measurement units. The semiotic approach, that we apply particularly to didactic and research subtypes of the scientific discourse, is aimed at analyzing the share occupied by the two types of signs and the modalities they combine in order to create the specialized discourse of Physics.

In CBCfe, all iconic signs are only numbered (*Fig. 1*, *Fig. 2*, etc.), and lack any comments or captions, which are normally meant to facilitate a quick access to the transmitted information. This makes the lecture of this work difficult and slow, and the relationship between verbal and non verbal, somewhat poor. Thus, the iconic decreases its primary function to facilitate comprehension by summarizing the key information, the "economic, synthetic and clearly legible storage of data" (author's translation) (Rovenţa-Frumuşani, 1995:40). The situation is different in G. A. Dima's work, where iconic representations are accompanied by explanatory texts, sometimes quite extensive. For structural diagrams, the author uses the word *schiţă*, and for the functional schemes, the expression *reprezentare grafică*. The author does not make appeal to pictures, instead, only a few drawings appear in the text, and, in addition, some graphics representing temporal vector variation. Mathematical expressions are few, and they appear as a synthetic and redundant form of the theoretical knowledge, already expressed by means of linguistic signs or of practical applications.

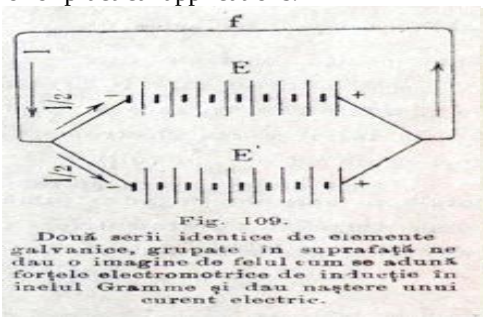


Fig. 109.
Două serii identice de elemente galvanice, grupate în suprafaţă ne dau o imagine de felul cum se adună forţele electromotrice de inducţie în inelul Gramme şi dau naştere unui curent electric.

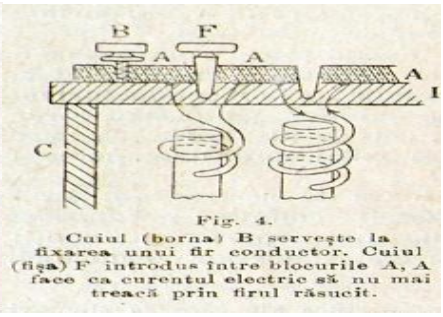
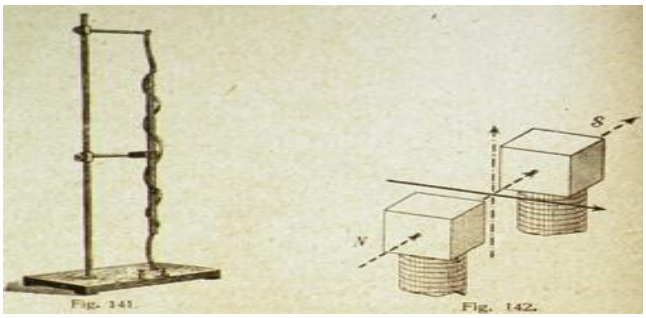


Fig. 4.
Cuiul (borna) B serveşte la fixarea unui fir conductor. Cuiul (fişa) F introdus între blocurile A, A face ca curentul electric să nu mai treacă prin firul răsucit.

[1] Rovenţa-Frumuşani Daniela, 1995, *Semiotica discursului ştiinţific*, Bucureşti, Editura Ştiinţifică.

G. A. Dima, *Lecţiuni de fizică. Electricitate dinamică, Mecanică, Acustică şi Optică. Lucrate conform programei în vigoare pentru clasa VII-a liceală modernă şi reală*



A Ciortea, T. L. Blaga, *Curs de fizică experimentală. Vol. II Căldură, magnetism, electricitate. Apendice: Introducere în principiul relativităţii (Cu 218 figuri în text)*

Both works make use of black and white photographs and scientific drawings, positioned left and right, with square text wrapping, medium sized, well proportioned in relation to the arrangement of text on the page. They render a literal reproduction of the symbolized referent and it has an expressive function due to its realistic depiction of the characteristics that would eliminate the need for interpretation. Mono-chromatism in Physics and technical sciences discourse can be interpreted as "loss of colour iconicity" accompanying "sign iconicity reduction, which is subordinated to discursive specialization" (author's translation) (Rovenţa-Frumuşani, 1995: 57).

Comparing these instances of didactic discourse that were published in the first half of the twentieth century with similar contemporary works, in terms of colour use, we notice a significant change in the appropriate integration of colour elements, in order to "facilitate the rapid and distinct perception of margins and relations between elements" (author's translation), (Rovenţa-Frumuşani, 1995: 57) and, last but not least, to render them more attractive. The underprivileged state of printing technologies of Romanian publishing houses, and the recipient's needs also account for the absence of colour[1].

On the level of discursive linearity, and beyond the descriptive layout, which are characteristic to didactic discourse, we have to emphasize the remarkable dynamic accents induced by means of functional diagrams and assembly diagrams that are accompanied by arrows and / or graphic symbols marking (letters and numbers) of the components or stages. Labelling the iconic representations by indexical signs and geometric or algebraic symbols, that send to verbalizing segment (the explanatory text accompanying the iconic), is an iconic manifestation of the interference of several plans: iconic, indicial and symbolic, characterizing scientific discourse, in general. The analysis revealed the occurrence, mainly, of the following types of associations between the following subcategories of iconic signs and verbal types: structural diagram and graphic - legend, functional diagram and image (photograph, drawing) - title.

In terms of cognition, the discourse of Physics, which "focuses on systematizing and explanatory presentation of knowledge" (author's translation) (Rovenţa-Frumuşani, 1995: 92) primarily uses the following types of logical-discursive operations: definition, explanation, description and classification. Scientific discourse is, like all other types of

[1] A. Ciortea and A. Blaga entitle their work "Course" and G. A. Dima's work is intended for high schools.

discourse, representation of the world and presentation or communication of it, in a manner which is appropriate to referential scope, communication goals and to the receiver. In the particular case of didactic discourse, the author must take into account the absence or limited presence of "encyclopaedic competence" (Rovenţa-Frumuşani, 1995: 48) of the receiver, when it comes to knowledge addressability. The receiver may not possess the competence to adequately interpret the information that is provided, which would annihilate the aim of the communication process. Therefore, the degree of codification and abstraction increment gradually, depending on the type of scientific discourse, from minimum in the popularization subtype, reaching a peak in the research or specialized discourse.

Most engineers and teachers having an important contribution in the field of Electrotechnics were physicists, later specializing in applications of electricity research. Due to the lack of adequate equipment, that was necessary to conduct complex experiments, these scholars have focussed their research on energy theoretical issues, and on the development of the measuring apparatus, which required extensive use of mathematics.

With respect to etymology, the terminology used in the above cited sources indicates a continuation of the French influence, as main source of loans for Romanian, in the process of vocabulary enrichment. While, in other referential areas, internal means of enrichment were already functional, in terms of specialized terminology, the external means of enrichment represent the main source. The terminology for electricity and its applications, that was used by the authors, correspond, for the most part, to the corresponding current forms, it being adapted and fixed since the late nineteenth century. New lexical items continue to penetrate, thus marking the degree of progress and development of the referential domain under discussion in our paper. These include some loans from English, partially adapted: *histeresa* (from Engl. *hysteresis*), *tempestate* (from Engl. *tempest*) for „furtună”[1], *selfinducţiune* (from Engl. *selfinduction*).

Although there is only two year difference between the two works publishing, we noted a number of differences in loan adaptation and the existence of lexical variants. Thus, in CBCfe there appear: *rezistinţă, derivaţiune, variaţiune, discompunere chimică, epruvetă, suteran, drept-proporţional, (elemente galvanice) asociate în serie, polarizaţiune*, *gazuri rărite*, *catodă* and *anodă*, *dinamo*, *iuţeală* for „viteză”, *cal-vapori* for „cai-putere”, *izvorul curentului* for „sursa curentului”. In DLf, G. A. Dima uses instead of some of the forms above: *rezistenţă*, *direct proporţional*, *(elemente galvanice) grupate în serie*, *polarizare*, *gaze rarefiate*, *dinam*, *catod* and *anod*, *putinţă electrică*, the plural forms *motori electrici* (Dima, 1925: 207), *electromotori*, *generatori*, *inime de fier* (Dima, 1925: 181), *cable* (Dima, 1925: 220), etc. Both authors use *observare* for „observaţie" and *experienţă* for „experiment”, *curenţi de selfinducţiune sau de auto-inducţiune* (Dima, 1925: 167; Ciortea, Blaga, 1923: 305), the texts displaying only the former variant, which indicates that the term had not yet been fixed in the language or, considering the partial adaptation, it may express the author’s preference. Electron theory, which is presented in these Physics handbooks, accounts for a series of electrical phenomena, thus prefiguring the emergence of the theoretical field of Electronics.

In G. A. Dima’s work, there appears the French term *entre-fer*[2] (Dima, 1925: 180), a Romanian calque, which is attested later in MDT. A. Ciortea and T. Blaga use a half

[1] We assign this word an English etymology due to the obvious resemblance with the original spelling. Nevertheless, the Italian etymon, *tempestate*, is also possible.
[2] According to NDU: *întrefier* [între + fier].

adapted calqued form after the French, *taie-cercul* (Ciortea, Blaga, 1923: 243) for „scurtcircuit", and some other French forms: *comersant* pentru „comerciant", *amortisement*[1] for „amortizare", etc., which were discarded later, and subsequently replaced by more appropriate and better adapted forms. As it can be seen, awkward and inappropriate forms are still in use, but they exist at any moment in a language evolution, being specific to a certain author style or to a certain lexical trend. In terms of vocabulary, the most important aspect to be emphasized here is that, terms for electricity and its applications are already widespread in common field terminology usage.

The process of enrichment of this terminology, as well as the selection and agreement on the appropriate forms, which best suit modern Romanian, have continued in the first half of the twentieth century, as the Physics of electricity has witnessed continuous progress. The elements of this terminology denote, especially, units of measurement, sizes, measuring instruments, devices used in laboratory experiments: *potenţial, rezistenţă electrică, intensitate, tensiune, conductibilitate, electrometru, baterie de elemente, acumulator, bobină, solenoid, conductor, pilă electrică, reostat, amper, joule, coulomb, ohm, volt*, etc. Translations are replaced by original works written by Romanian authors, mainly due to the fact that the Physics terminology reached the standards established by Romanian linguistic norms.

Extensive scientific papers, that were published in the first half of the twentieth century, belonged to the didactic subtype. They were written mostly by the first Romanian field teachers who were also engineers. These works came to meet the increasing need of teaching materials necessary for the training of future engineers in Electrotechnics and Electronics. Another category of works consists of scientific articles and reports[2] presenting the results of the research at field scientific meetings, particularly from abroad, since Romania could not provide the necessary framework. The translations before 1900 are replaced with original works, which demonstrates a scientific style and functional format, which would be refined later, as it creates a tradition in this respect. We have to mention the existence and normal functioning of all scientific style subtypes, though, with a slight dominance of the didactic.

The two works, that we considered for analysis in this paper, for the purpose of highlighting the main features of early scientific discourse, demonstrate the intermingling of linguistic with the non-linguistic signs. This main feature is rendered mainly by the co-functioning of iconic, sign and indicial plans consisting in the use of pictures, structural and functional diagrams of various types, accompanied by arrows, different symbols and figures as , letters, captions and comments. In the simultaneous functioning of the three plans above, the iconic signs play a schematic-designative role, while arrows indicate the direction, and the symbols explain and carry out the graphics synthetism. In our future work, we plan to conduct a similar analysis of the representation and transmission construction of specific knowledge embedded in the Romanian research work in Electrotechnics and Electronics, elaborated in the second half of the twentieth century.

[1] In NDU, the word „amortisment", borrowed from French (*amortissment*), belongs to Economy and has as unique meaning „stingere treptată a unei datorii (rambursînd capitalul)", which is a semantic shift that appeared, probably, later, since the current form is „amortizare", formed by suffixation from v. *amortiza.*

[2] *Semicentenarul 1881-1931. Istoricul desvoltării tecnice în România. Vol. II. Mecanică. Maşini. Industrii. Electricitate*, Societatea Politecnică din România, Bucureşti, 1931.

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Abbreviations

CBCfe - Ciortea, A., Blaga, T. L., 1923, *Curs de fizică experimentală. Vol. II Căldură, magnetism, electricitate. Apendice: Introducere în principiul relativităţii (Cu 218 figuri în text)*, Ediţia a II-a modificată de A. Ciortea, Cluj, Editura Institutului de Arte Grafice «Ardealul».
DLf - Dima, G. A., 1925, *Lecţiuni de fizică. Electricitate dinamică, Mecanică, Acustică şi Optică. Lucrate conform programei în vigoare pentru clasa VII-a liceală modernă şi reală*, Ediţia I-a, Bucureşti, Editura Librăriei SOCEC&Co., Soc. Anon..
DLR - *Dicţionarul limbii române*, Serie nouă, Tomul I, Partea a 7-a, Litera E (E-Erzaţ), 2009, Bucureşti, Editura Academiei Române.
DN3 – Florin Marcu, Constant Maneca, 1978, *Dicţionar de neologisme*, ediţia a III-a, Bucureşti, Editura Academiei Republicii Socialiste România.
DŞL - A. Bidu-Vrânceanu, C. Călăraşu, L. Ionescu-Ruxăndoiu, M. Mancaş, G. Pană-Dindelegan, 2005, *Dicţionar de ştiinţe ale limbii*, Bucureşti, Editura Nemira.
LEG. EC. PL. – *Legislaţia economiei planificate*, 1949, Bucureşti.
MDA - *Micul dicţionar academic*, 2002, Academia Română, Institutul de Lingvistică „Iorgu Iordan – Al. Rosetti", Vol. I (Literele A – C), Vol. II (Literele D - H), Vol. III (Literele I – Pr) şi vol IV (Literele Ps – Z), Bucureşti, Editura Univers Enciclopedic.
MDT – *Mic dicţionar tehnic*, 1950, Bucureşti, Editura tehnică.
NDU - Ioan Oprea, Carmen-Gabriela Pamfil, Rodica Radu, Victoria Zăstroiu, 2008, *Noul dicţionar universal al limbii române*, Ediţia a 3-a, Bucureşti-Chişinău, Editura Litera Internaţional.
NPR 07 – Paul Robert, Josette Rey-Debove, Alain Rey, 2007, *Le Nouveau Petit Robert. Dictionnaire alphabétique et analogique de la langue française*, Paris, SEJER.
OERD – *Oxford English Reference Dictionary*, 2006, Oxford University Press.