

ASPECTS CONCERNING THE HISTORY OF SCIENCE AND TECHNOLOGY IN THE SOUTH-WEST OF ROMANIA BETWEEN 1940–1960

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Abstract. World War II and the period that followed was not an age of great development for the science and technology of the South-West part of Romania. Beside, in this period, as well as in between the two World Wars in Banat, and in its capital city of Timișoara no superior education / nor research institutes existed, but in the technical domain. Until 1948, the Polytechnical School was the only institution of superior education from Timișoara, polarizing the entire scientific and technical activity organized at a high level in this part of the country. Its activity was enforced by the insertion of the High Academy of Agronomical Studies from Cluj, act based on the law emitted on November, 4th, 1938, transforming the institute into a faculty and being subordinated to the Polytechnics from Timișoara, even though it functioned in Cluj until the Vienna dictatorship (August, 30th 1940) when it moved to Timișoara. To conclude, Banat in general, and Timișoara especially throughout the Polytechnic School, later the Polytechnic Institute, contributed to the development of science and technics in Romania in the period between 1940–1960s.

World War II and the period that followed was not an age of great development for the science and technology of the South-West part of Romania. Beside, in this period, as well as in between the two World Wars in Banat, and in its capital city of Timișoara no superior education / nor research institutes existed, but in the technical domain. After the unification of the Romanian state, on December 1st, 1918, the greatest part of the old Romanian territory of Banat, together with Timișoara, was integrated within the great state and consequently, an intense cultural and scientific Romanian life developed¹.

In this respect, the existence of the industrial tradition and civilization determined the foundation of the superior technical education system, of the Polytechnic institute, not an university, as in the case of other great cities from the country. The existence of a powerful siderurgical industry in the region, together with a high level of civilization (for example, Timișoara was the first city in Europe where electric powered illumination was introduced), this determined the rise of the level of higher education, and the foundation of the Polytechnic school a necessity². The decree no. 4822 from 11th of November, 1920 stipulated the foundation

¹ Radu Păiușan, *Mișcarea națională din Banat și Marea Unire*, [The National Movement from Banat and the Great Union], Timișoara 1993, pp. 132–183.

² Toma Dordea, *Baza de cercetări științifice, Filiala Timișoara a Academiei Române, centru de știință și cultură*, [The Scientific Research Base, the Romanian Academy Branch, Centre of Science and Culture] in *Academia Română, Filiala Timișoara, istoric. 1951–1999*, [The Romanian Academy, Timișoara Branch], Timișoara 1999, p. 12.

starting with November 15, of the same year, of a Polytechnic School in Timișoara, finalised that year³.

Around the Polytechnic School from Timișoara, science and technics developed with the necessary disciplines that evoluated after the war towards the existence of an superior educational system. Also as a consequence, in 1951 the first Research Institutes of the Romanian Academy appeared, and with the Ministry Council Decision no. 466 from 1953 a Base for Scientific Research of the Academy was founded in Timișoara⁴.

Until 1948, the Polytechnical School was the only institution of superior education from Timișoara, polarizing the entire scientific and technical activity organized at a high level in this part of the country. Its activity was inforced by the insertion of the High Academy of Agronomical Studies from Cluj, based on the law emited on November, 4th, 1938, transforming the institute into a faculty and being subordinated to the Polytechnic from Timișoara, even though it functioned in Cluj until the Vienna dictatorship (August, 30th 1940) when it moved to Timișoara. But, the first rector of the Polytechnic School was a matematician, *Profesor Traian Lalescu (1882–1929)*, whose family originated from Cornea (Caraș County). Born in Bucharest in 1882, Traian Lalescu followed the courses of the primary school in the capital of the country, and later the secondary school (1896–1900) at colleges from Craiova, Roman and Iași, where his father has been transferred. Between 1901–1903 he studied matematics at “A.I. Cuza” University from Iași, and after graduation, in 1903, he left to Paris being a *Vasile Adamachi* scholarship winner. He sustains his licence in matematics and in 1908 gets his Ph. D. at the same university with a thesis entitled *Sur l'equation de Volterra*, published in *Journal de Mathématique Pure et Appliquée*, a work that remained as his first important contribution to integral ecuations. He left after with a scholarship granted by the Romanian state to Gottingen, Germany, where he studied with a famous matematician. Returned in the country, he functions first as a teacher in Giurgiu, and than in other highschoools from București, later, after getting his docence was named suplinitor teacher at the Faculty for Sciences of the University from București. here he taught courses of analisis and matematical ellements, as well as those concerning the integral ecuations. He also taught at the School for Bridges and Highways from București, a course on graphic statics.

Even during the highschoool years, in 1898, he collaborated at the *Matematics Gazette* from Iași, and during World War I, when the main institutions of the Romanian state transferred to the city, capital of Moldavia provinec, he edited the matematics gazette. he continues his studies, and in 1919 he graduates from the Superior School of Electricity from Paris, with a diploma in electrotechnics. Here in

³ Coleta de Sabata, Ioan Munteanu, *Remember. Profesori ai Școlii Politehnice timișorene*, [Remember. Professors of the Polytechnic School from Timișoara], Timișoara 1993, p. 13.

⁴ Toma Dodea, *op. cit.*, p. 13.

Paris, he published a new theorem about periodical polygonal functions. On his return to the country, he also contributed to the establishment of the Politechnics School from București, being designated its first rector between 1920–1921.

In 1921 he returned to the University from Bucharest, teaching certain courses at the Politechnics from the capital of the reunied Romania⁵. Among the courses he taught at the Politechnics from Timișoara and Bucharest, some were printed, thus entering the wide didactic and scientific circuit⁶.

From a scientific point of view, Traian Lalescu had important contributions in the field of trigonometrical series, he introduced the notions of angular and linear leaps, being an element of double value, one connecting him with pure mathematics, the other with mathematics physics and practical applications of pure sciences⁷. At the same time, Traian Lalescu was known and appreciated very early due to his licence thesis, and the work: *Contributions to a theory of integral equations*, that was considered the first world wide level synthesis⁸.

Valeriu Alaci (1848–1955) was Traian Lalescu's follower in teaching mathematics at the Polytechnic School from Timișoara.

He graduated primary and secondary school at *Mihail Kogălniceanu* from Vaslui, and the Codreanu highschool from Bârlad. In between 1905–1909, he followed the courses of the Faculty of Sciences of the University from București. In 1910 he was awarded the *Hillel* prize of the same university, and later in 1921 he got the Ph.D in mathematics in the capital city. In between 1909–1921 he taught in high schools from Bucharest, Mănăstirea Dealu, Constanța and Iași. On November 1st, 1925, he was endowed with a provisory title, professor at the Polytechnic School from Timișoara, and from November 1st 1925 he became full professor teaching Mathematical Analysis. For a better student preparation, as well as a result of his own researches, in 1946 he managed to publish the course of Mathematical Analysis in three volumes, entitled: *Differential calculations, Integral calculations, Differential equations and partial derivatives of 1st order*. Professor Valeriu Alaci had an important part in the study and promotion of mathematics in this part of the country when he took over, from January 1922, the leadership of *Mathematics Revue*, founded by Traian Lalescu in 1921, in Timișoara. Professor Valeriu Alaci prepared and edited over 320 numbers of the magazine, until its interruption in 1949. The magazine was edited with the help of different collaborators

⁵ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 53–61.

⁶ See Traian Lalescu, *Calcul algebric. polinoame. Frațiuni raționale*, [Algebraic Calculus. Polynomials. Rational Fractions], Cultura Națională (ed.), București 1924; *Curs de geometrie analitică*, [Analytical Geometry Course], Gazeta Matematică (ed.), 1923; *Introducere în teoria ecuațiilor integrale*, [Introduction to the theory of Integral Equations], București 1956; *Tratat de geometrie analitică*, [Analytical Geometry Treaty], copy books I–III, București 1938.

⁷ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 64.

⁸ *Ibidem*, p. 80.

at a prestigious scientific level, and addressed both to students and pupils, generally to all mathematics fans around the country.

In 1925, Valeriu Alaci initiated the establishment of the *Student Mathematics Polytechnics Society from Timișoara*, the professor being elected chairman of honor of this prestigious organization. In this respect, he had a major contribution at the establishment in 1933 of the *Mathematical Society from Timișoara*, and in 1930 he became president of the *Polytechnics Scientific Society from Timișoara*, established in 1923. In this position, he led the journal *Bulletin Scientifique de l'École Polytechnique de Timișoara*, between 1933–1937, by imposing it in the scientific national and international circuit⁹. Besides, his scientific work contains over 140 communications and publications, those being distinguished with three Romanian Academy awards¹⁰.

In the opinion of most specialists, Professor's Valeriu Alaci contribution to science is original considering his algebra equations and the problems of the sum and rest of polynomial division, the trigonometrical series, square trigonometry and the integration of square functions, the theory of integral equations, differential equations and partial derivatives, etc¹¹. He had leading functions in the Polytechnic School, being from November 1944, vice dean of the Electronics Faculty, and later head of the department¹².

Mathematical analysis and geometry were among *Ph.D. Professor O. Tina* preoccupations, and we may mention also *Ph.D. Professor Mihail Ghermănescu's* contributions in the field of functional equations, being the first author of a world wide encyclopedic treaty on functional equations¹³. In the same field of mathematics, *Ph.D. Professor Gh.Th. Gheorghiu* published studies concerning the spherical and met spherical functions, and *Ph.D. Professor Emanuel Arghiriade* brought important contributions to geometry, matrices theory and algebra. The traditions of the school of mathematics were continued by *Professors Vasile Mioc* and *Octavian E. Gheorghiu*, together with their collaborators, in the field of geometry, differential equations and partial derivatives, or functional equations, etc, many of them highly applicable in technics: to mention only the algebra problems applied to electronical calculating machines¹⁴.

⁹ *Ibidem*, pp. 135–147.

¹⁰ Valeriu Alaci, *Analiza matematică*, [Mathematical Analysis], vol. I–III, typed, Timișoara 1930; *Trigonometria pătratică*, [Square Trigonometry], Tipografia Românească (ed.), Timișoara, 1939; *Analiza infinitesimală*, [Infinitesimal Analysis] vol. I–III, Librăria Studențească (ed.), Timișoara 1948.

¹¹ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 148.

¹² *Ibidem*, p. 146.

¹³ Coleta de Sabata, *Universitatea "Politehnica" Timișoara. Oameni, idei, fapte*, [Polytechnic University from Timișoara], Excelsior (ed.), Timișoara 1997, p. 142.

¹⁴ *Ibidem*, p. 143.

The activity in the physics department was initiated at the Polytechnic School from Timișoara in 1920, the year when the institution started to exist. It was then when the first laboratory of physics was created and efforts were sustained to start the scientific research. At the beginning, the leadership of this discipline was in the hands of *Ph.D. Professor Engineer Constantin Stăncescu*, with a Ph.D. in physics obtained in France, and then from 1924, *Professor Ion Maghiaru* took over, having a Ph.D. obtained in Italy, and between 1943 and 1948 by *Professor Constantin Sălceanu*¹⁵. It is appreciated that a true research activity started in Timișoara in 1943, when Professor Constantin Sălceanu installed the first experimental devices¹⁶.

Constantin Sălceanu (1896–1981): Born in 1896 in Bucharest, he followed the courses of “Gheorghe Lazăr” high school, absolving them in 1915, and then in 1921, the courses of the university. In the same year he remained as a junior lecturer at the same university, where he will sustain his Ph.D. thesis in 1929. In 1932 he will obtain a second Ph.D. at the Sorbonne University from Paris, studies conducted by the famous scientist E. Cotton. In between 1934–1949 he taught physics at the Polytechnic School from Timișoara, and later moved to the new established university. His entire activity was directed toward original research experiments in the field of physics. At first he was interested in electricity and magnetism, fields that brought him the two Ph.D.’s, and later he turned to bi-magnetic refrigency, neutral magnetic solutions, etc. His researches led him to other fields like: heat, new ways of temperature measurement, gas conductivity, etc. He had contributions in acoustics, optics and astrophysics, photometry of the nebulas and star clusters¹⁷.

Alexandru Cișman (1897–1967) was a graduate of the National High school from Iași in 1919, and of the Faculty of Sciences at the local university. We find him in 1921, senior lecturer at the same faculty he graduated from, and in 1924 he sustained a Ph.D. thesis entitled: *The study of sound movement through liquids* supervised by Academician Petre Bogdan. He followed afterwards specialized studies abroad, between 1922–1923, at the universities from Berlin and Dresda (Germany) and Nancy (France).

In 1926 he built the first radio emission station from Iași. We find him later, in 1929 as reader of industrial physics until 1938 when he becomes deputy radiotechnics professor at the Electrotechnics Faculty from the Polytechnics from Iași. In 1941 he moved together with the Polytechnics to Cernăuți where he teaches physics and becomes dean of the Electronics Faculty, later to move to Turnu Severin and then back to Iași.

¹⁵ Ph.D. Professor Engineer Coleta de Sabata, Ph.D. Professor Cristian Marcu, *Monografia catedrei de Fizică*, [Monograph of the Physics Department], Polytechnics (ed.), Timișoara 2000, p. 9.

¹⁶ *Ibidem*, p. 14.

¹⁷ *Ibidem*, p. 37.

In 1948 he transferred to the Polytechnic School from Timișoara, a head of the newly established Physics Department¹⁸. From 1962 he moved to the University from Timișoara, where he was head of the Electricity Department¹⁹. He was elected a correspondent member of the Romanian Academy in 1963, and led a physics collective that functioned between 1951 and 1960 at the local headquarter of the Romanian Academy. He was rector of the Popular University from Timișoara, and in 1964 he was awarded the first prize of the Education Ministry²⁰. Professor Cișman's studies were directed towards the physics of the solid, magnetic properties of the paramagnetic layers electrochemically deposited. Together with some of his collaborators, he founded a real school studying the magnetism of thin Ferrous layers, recognized on European and international level. The molecular physics of liquids was another research direction, his works being directed especially on the superficial tension. A new theory was imposed in the field of Lagrangeian formalism and field theory, having as a result the establishment of theories with superior derivatives well received by scientists abroad²¹.

Chemistry was institutionalized in Timișoara since 1940, with the sustained effort of the chemists from the Science Faculty of the University from Cluj, moved after the Vienna Dictatorship to Timișoara. Thus, here developed a section of inorganic chemistry led by Coriolan Drăgulescu, and the organic chemistry department led by George Ostrogovici²². Previously, in 1920 the first chemistry laboratory was homologated at the Polytechnical School from Timișoara, under the direct supervision of the rector at that time, Traian Lalescu, and from 1921 the discipline was represented by professor Constantin Câdea, and from 1933 by the future Academician Eugen Matcovschi, from 1934 – Ilie Murgulescu, 1945 – Coriolan Drăgulescu and from 1949 by Professor George Ostrogovici. And as a consequence, from 1929 the first *Chemistry Society* was founded in Timișoara²³. Being exiled to Timișoara, the Faculty of High Agronomical Studies from Cluj, was subordinated in 1940 to the Polytechnic School, and after its return to the town of origin, in 1945, the new Agronomy Faculty was introduced, later after the education reform from 1948, to become the Agronomical Institute from Timișoara, today the well known University of Agricultural Sciences of Banat²⁴. Inside this institute, a department of agricultural chemistry still activates.

Ph.D. Professor Ilie Murgulescu's arrival in Timișoara, substantially increased the research in the field of chemistry, himself being the founder of the Chemistry-

¹⁸ *Ibidem*, pp. 39–40.

¹⁹ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 42.

²⁰ Coleta de Sabata, Cristian Marcu, *op. cit.*, p. 42.

²¹ Coleta de Sabata, *Universitatea Politehnică cit.*, p. 144.

²² Toma Dordea, *op. cit.*, p. 15.

²³ Coleta de Sabata, *Universitatea Politehnică cit.*, p. 137.

²⁴ *Institutul politehnic Timișoara. Anuar jubiliar*, [Polytechnic Institute from Timișoara. Jubilee Year Book], Timișoara, f. e., 1980, p. 36.

Physics School from Timișoara and on the national level as well. He will be rector of the Polytechnic School from Timișoara in a moment in which, in 1948, the Industrial Chemistry Faculty was born, its first dean being the future Academician Coriolan Drăgulescu²⁵.

Coriolan Drăgulescu (1907–1977): Born in 1907 in the Caraș County village of Vărădia, where he followed the courses of primary school, he finished the high school from Oravița, and in 1925 the C.D. Loga high school from Timișoara. In 1930 after graduating from the Chemistry Faculty from Cluj, he remained as junior lecturer at the same faculty. Then, in 1940 he took refuge with the faculty in Timișoara, and in 1945 was named professor of agricultural chemistry at the Agronomy Institute from the same town. When the Industrial Chemistry faculty was founded in July 1948, he was named professor of Inorganic Chemistry, head of the Chemistry department and dean of the newly established institution²⁶. He remained in this function for 14 years, with two pauses: between January 20th 1956 and February 14th of the same year, he was rector of the Polytechnic Institute from Timișoara, and from February 14th, 1956 until November 14th, 1956, when he was appointed vice minister of education. For 6 years he occupied – after a contest – the position of inorganic chemistry professor at the Industrial Chemistry Faculty from the Polytechnic in Bucharest²⁷.

From 1951, at the same time with the establishment – in Timișoara – of the Research Base of the Romanian Academy, he became head of the Chemistry section, and from 1962 manager of the base. In 1966, under his leadership, a Chemistry Centre was also established. In 1955, Professor Coriolan Drăgulescu became corresponding member of the Romanian Academy and from 1965 a full member. Among his other dignities, between 29th November, 1944 and April 30th, 1945 he was mayor of Timișoara²⁸. His scientific activity can be followed in the four books and over 230 studies and articles published in the country and abroad. “Following the themes and the content of his scientific research, we can observe – clearly – that the results he obtained are road openers, being at the same time at the level of the world wide news, and also a progress promoter. The themes are vast, approaching both the fundamental research as well as the practical one, oriented towards the following domains: chemistry-physics, inorganic chemistry, analytical chemistry, capitalization of natural resources”²⁹. He is praiseworthy for establishing the modern inorganic and analytical chemistry school from Timișoara. In this school he managed to group teachers from the Polytechnic School and researchers from the local Academy, school that obtained great appreciation inside and outside the country³⁰. Among the books he

²⁵ Coleta de Sabata, *Universitatea Politehnică* cit., p. 139.

²⁶ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 253–259.

²⁷ Septimiu Policec, Coriolan Drăgulescu, *Academia Română. Filiala Timișoara* cit., p. 41.

²⁸ Coleta de Sabata, Ioan Munteanu, *Remember* cit., p. 256.

²⁹ *Ibidem*, p. 263.

³⁰ *Ibidem*, p. 267.

wrote and published we mention: *Elements of theory and practice of the PH*, “Cartea Românească” (ed.), Cluj 1944; *Volumetric Chemical Analysis*, University (ed.), Cluj 1947; *Introduction to Modern Inorganic Chemistry*, Facla (ed.), Timișoara 1973; *Modern Structural Chemistry. Chemistry of Coordination*, Academy (ed.), București 1971³¹. All these made it possible that in 1974 he was awarded with the dignity of president of the Chemistry Section of the Romanian Academy³².

Another field, well represented in Timișoara and in the South Western part of Romania was that of the electricity. Thus, since the beginning of the superior educational system in this part of the country, a section of electromechanics existed inside the Polytechnic School. Between 1922–1933 only a section of Electromechanics existed, and in 1933 till 1948, the Faculty of Electromechanics, then Electronics. They were represented by well known professors from prestigious European universities: Germany, Switzerland, France, etc³³.

Plautius Andronescu (1893–1976) followed the courses of primary school in Bârlad, and in 1913 graduated the Matei Basarab High school from Bucharest. In between 1914 and 1919 he studied at the Federal Political School from Zurich, and in May 1919 was hired as junior lecturer at the same prestigious institution at the Electrotechnic Department. Here in Zurich he obtains his doctor's degree in 1922, and the title of private reader, equivalent to that of senior reader³⁴.

In October 1925, he is named professor of electricity and electrotechnics at the Polytechnic School from Timișoara. Between 1925 and 1931 he was manager of: the Electric Car Factory “Energia” from Cluj; County Mail, Telegraph and Telephone Office from Timișoara and participated in a series of technical commissions: Commission for the Electrification of the C.F.R. (Romanian Railroads) for the route Câmpina-Brașov, and the Society for Gas and Electrification, etc³⁵.

Between 1941 and 1944 he was rector of the Polytechnic School from Timișoara. Besides, within this institution, many research schools were created, like the one for theoretic Electrotechnics established and developed by Professor Plautius Andronescu³⁶. After some appreciations, Plautius Andronescu was the real creator of the Romanian Electrotechnic School³⁷.

He also had a fulfilling research activity. “He dealt with the problem of sizes and measure units in the electric and magnetic field, also with the representation –

³¹ Septimiu Policec, Coriolan Drăgulescu, *op. cit.*, p. 42.

³² *Ibidem*, p. 46.

³³ Toma Dordea, (coordinator), *Facultatea de Electrotehnică din Timișoara. 1920–1948–2002. Monografie*. [The Electrotechnic Faculty from Timișoara. 1920–1948–2002. Monograph], Orizonturi Universitare (ed.), Timișoara 2003, p. 11.

³⁴ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 168–170.

³⁵ *Facultatea de Electrotehnică cit.*, coordinator Toma Dordea, p. 23.

³⁶ Coleta de Sabata, *Universitatea Politehnică cit.*, p. 134.

³⁷ *Facultatea de Electrotehnică cit.*, coordinator Toma Dordea, p. 23.

in an unified form – of the functioning of electric generated motors, some results related to how the electrostatic phenomenon should fit into an unitary mathematic structure, brought important contributions to the graphic representation of real, reactive, aparent and deformed powers, also in determination of the medium power factor... Besides pure mathematics works, like, the vectorial calculus, he was concerned with a series of persons, mechanical phenomena, like the material deformation phenomenon within the limits of elasticity... Another field of research takes into consideration the ferous magnetical circuits and the Fourier analysis, the study of electrical circuits with the use of operational calculations³⁸.

Among the books he published, we mention *The Vectorial Calculation* (edited by Monitorul Oficial [Official Gazette], Bucharest 1942); *Theoretical Fundamentals of Electronics*, vol. I, Politehnic Institute (ed.), Timișoara 1954; *Electronics Fundamentals*, vol. I, Didactic and Pedagogic (ed.), București 1972³⁹.

Remus Răduleț (1904–1984) graduated the courses of primary school in his home village of Brădeni, in Făgăraș Country. Between 1914–1919 followed the inferior course at the German high school from Sighișoara, and between 1919 an 1923 the superior course at the Radu Negru high school in Făgăraș. Then, absolved in 1927, the Polytechnic School from Timișoara, being retained as junior lecturer at the Department of Electrotechnics led by Professor Plautius Andronescu⁴⁰.

Between 1928–1930, he studied in Zurich (Switzerland), having a scholarship at the Federal Polytechnic School, where he sustained his Ph.D. On his return to the Polytechnic School from Timișoara he became deputy senior reader for a while and vice manager of this institution. In his entire carieer at the Polytechnic School from Timișoara, he taught physics, electrotechnics, electric cars, general radiotechnics and other contents.

After World War II, he left to the Polytechnic Institute from Bucharest as head of the Electrotechnic Department. In 1955 was appointed corresponding member of the Romanian Academy, and a full member since 1963. The year 1970 brought him the title “honoured man of science”. Between 1961–1964 was elected vice president of the International Electrotechnics Committee, and between 1964–1967 he bacame president of this prestigious scientific institution, and co-president.

He managed the Energetical Institute of the Romanian Academy from Bucharest between 1956–1968, president of the Science and Technology Section of the Academy. from 1965 till 1974 he was vice president of the Romanian Academy and vice president of the National Council for Science and Technology. We also find him as rector of the Cultural-Scientific University from Bucharest between 1964–1984.

³⁸ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 174.

³⁹ *Ibidem*, p. 173.

⁴⁰ *Facultatea de Electrotehnică cit.*, coordinator Toma Dordea, p.37.

From a professional point of view, he is considered “the most significant electrotechnician our country will provide and impose on a world wide level, a professionalist of the highest moral qualities”⁴¹.

His field research ranges from electrotechnics to physics and energetics. “He realized a systematic phenomenology of the magnetic field physics with ten rules and six primary notions, an independent device, uniform and operational. He created the electronic of information on a systematic micro-physics, with five rules and three primary notions, as laws of linear electro-dynamics, and respectively non-linear... He approached the theory of electrical measure units and that of the electric cars, inventing alone, or in collaboration, general data variants of the known theories; he dealt with asynchronous electric engines with the glass shaped rotor or with spinning blades, and he calculated supplementary losses at electrical alternative or high power cars, etc”⁴².

Among his over 200 titles, as the scientific research domain is concerned as well as in the philosophy of science field, we may consider noticeable: General Radiotechnics, 1939; Electrical Measurement Units, 1943; Electric Engines, 1948; Electric Cars, 1950; Theoretical Fundamentals in Electrotechnics, 1955; Introduction to Atomic and Molecular Physics, 1957; Romanian Technic Lexicon, first edition printed in seven volumes, the second in 19 volumes, a lexicon that contains over 80,000 terms; he also directly supervised in the Electrotechnic International Committee, the publication of the third edition of the International Electrotechnic Vocabulary and first edition of Multilingual Electrotechnics Dictionary”⁴³.

Another technic field in which Timișoara was renowned is the welding. The bases of an welding school in Timișoara were established by Academician Cornel Micloși⁴⁴.

Cornel Micloși (1887–1963) graduated from primary school in Covăsânț (Arad County), and in 1905 the courses of Moise Nicoară high school from Arad. He was admitted at the Polytechnic school from Karlsruhe, and between 1906–1909 he went to the courses of the Technic University from Budapest⁴⁵. He came to Budapest after obtaining a scholarship from Emanuil Gojdu Establishment from Sibiu⁴⁶. In 1909, he becomes a junior lecturer at the Technic University from

⁴¹ Coleta de Sabata, Ioan Munteanu, *Profesori ai Școlii Politehnice* cit., p. 205.

⁴² *Ibidem*, pp. 408–409.

⁴³ *Ibidem*, pp. 205–210.

⁴⁴ Academician Toma Dordea, *op. cit.*, p. 15.

⁴⁵ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 181.

⁴⁶ For the importance of this establishment in the formation of the Romanian intellectuals, see also Radu Păiușan, *Gojdu și Banatul*, [Gojdu and the Banat province] in *Emanuil Gojdu. Bicentenar*, [Emanuil Gojdu. Bicentenary] coordinated by Cornel Sigmirean, Aurel Pavel, Academy (ed.), Bucharest 2003, pp. 69–73; Pavel Cherescu, *Apărător al drepturilor națiunii române*, [Defender of the Romanian Rights] in *Ibidem*, pp. 54–61; Alexandru Roz, *Emanuil Gojdu – mecenat al culturii românești*, [Emanuil Gojdu– Romanian Culture Mecena] in *Ibidem*, pp. 61–69; Maria Berenyi

Budapest⁴⁷, where in 1912 he sustains his doctor's degree in Mechanic Technology, and in 1916 obtains the docentship at the same university, teaching the Mechanic Technology course⁴⁸.

After the Great Union from 1918 he returned in Banat and in 1920 was appointed manager of the Communal Tram(ways), and between 1922–1929, manager of the Electromechanic Enterprises from Timișoara. Between 1925 and 1930 he taught at the Polytechnic School from Timișoara, the course of Mechanical Technology and Industrial Alloys. He taught at the Technic University from Budapest a course on Metalography between 1927–1928⁴⁹.

In 1947 he returns to Timișoara where he teaches at the Polytechnic School, being head of the Electric Energy Utilization and Welding Department. Between 1954–1963 he led the Welding Section of the Academy from Timișoara. In 1955 he was elected member of the Romanian Academy, and between 1956 and 1963 he was manager of the Technical Research Centre of the Academy branch from Timișoara. For his contributions to the welding field, he was the promoter of the Welding Magazine, between 1938 and 1945, and in 1936 he founded the Welding Encouragement Group, whose president he was until 1945⁵⁰. Due to his contributions in the welding field he managed to impose the Romanian school on an international level. “An important contribution of Academician Micloși was the rail ends welding machine *in situ*, known as *Taurus*, the first realized on a world wide level”⁵¹. Among his works we mention: *Industrial Welding Procedures*, 1930, published in two volumes; *Welding Transformers and Electric Power Welding Generators*, 1934; *Comparative Study on Different Welding Procedures Applied to Rail Roads*, 1940, etc. All the works dedicated to the theory of the continuous rail road bring an important scientific contribution to the welded rail road behaviour. A new theory appeared, based on close analysis of phenomena that occur in the bedrock welded railroads, when temperature changes appear⁵².

(Budapest), *Emanuil Gojdu: originea, familia și viața publică*, [Emanuil Gojdu: his origins, family and public life] in *Ibidem*, pp. 40–54; Cornel Sigmirean, *Istoria formării intelectualității românești din Transilvania și Banat în epoca modernă*, [The history of Romanian Intellectuals Formation from Transylvania and Banat], Universitary Press (ed.), Cluj-Napoca 2000, p. 600; Radu Păiușan, Ionel Cionchin, *O istorie a românilor din Ungaria*, [An History of the Romanians from Hungary], Eurostampa (ed.), Timișoara 2003.

⁴⁷ For the purpose the Orthodox Church had in maintaining nationality and faith at the Romanians from Hungary, see also the *Archives of the Romanian Orthodox Bishopric from Oradea*, fund *Rapoarte misionare*, [Misionary Reports] unfiled and unpagged and another fund *Reportaje, știri din viața bisericească în Eparhia Oradiei*, [Reportages, News from the church life of the Oradea Diocese] unfiled and unpagged.

⁴⁸ *Facultatea de Electrotehnică din Timișoara cit.*, p. 28.

⁴⁹ Coleta de Sabata, Ioan Muntenu, *op. cit.*, p. 183.

⁵⁰ Dorin Deheleanu, *Academicianul Cornel Micloși*, [Cornel Micloși Academician] in *Academia Română. Filiala Timișoara cit.*, p. 31.

⁵¹ Coleta de Sabata, Ioan Muntenu, *op. cit.*, p. 188.

⁵² Dorin Deheleanu, *op. cit.*, p. 25.

Another school founder was Professor *Aurel Bărglăzan (1905–1960)*, corresponding member of the Romanian Academy. He founded the Hydraulic Engines School in Timișoara.⁵³

Aurel Bărglăzan graduated from primary school in his native Porumbacu de Sus, Sibiu County, and secondary studies in highschools from Blaj, Brașov, graduating the Gheorghe Lazăr high school from Sibiu. He graduated the courses of the Polytechnic School from Timișoara in 1925, being retained as junior assistant- and then all the stages of didactic formation to become a professor, being in the meanwhile head of the department, and dean of the Mechanic Faculty. He sustained his doctor's degree in 1940 with a thesis on: "The Hidraulic Transformer"⁵⁴. In his diploma paper he studied the *Cernavodă-Constanța Shipping Canal*, work developed and amplified to a total of 155 pages and published in 1929. He had chosen as site of amplasament the actual site of the Danube-Black Sea Canal⁵⁵. Among the research fields he approached, we mention: the cavity phenomena at the hydraulic engines, hydrodynamics of aero-hydrodynamic profiles and that of network profiles, hydrodynamics of turbo engines, stations, devices and investigating methods of processes that occur in turbo engines⁵⁶. As corresponding member of the Romanian Academy, professor Bărglăzan founded a veritable Romanian Cavitation School⁵⁷. Taking over, since 1931, the leadership in Hydraulic engines discipline, he published several papers on: *The Hydraulic Transformer*, Timișoara 1940; *Hydraulic Turbo-Transmissions*, București 1957, etc⁵⁸.

He founded in Timișoara, a School for the Strength and Material Tests, as a department of the Polytechnic School, consolidated later by Academician *Ștefan Nedeșan (1901–1967)*⁵⁹.

Ștefan Nedeșan followed the inferior high school courses in Timișoara, his home town and the superior courses at the Military High School from Eissenstadt, Austria, having his school-leaving examination at the Győr Civil Real High School, Hungary. Later in 1924, he graduated the courses of the Polytechnic School from Timișoara⁶⁰.

He becomes junior assistant at the Department for Material Strength of the Polytechnic School from Timișoara, a full time professor from 1942, and head of

⁵³ Toma Dordea, *op. cit.*, p. 15.

⁵⁴ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 214.

⁵⁵ *Ibidem*, p. 217.

⁵⁶ Ion Anton, *Prof.dr. ing. Aurel Bărglăzan, membru corespondent al Academiei Republicii Populare Române*, [Ph.D. Professor Engineer Aurel Bărglăzan, corresponding member of the Popular Republic Romanian Academy] in *Academia Română. Filiala Timișoara. cit.*, p. 80.

⁵⁷ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 218.

⁵⁸ *Ibidem*, p. 221.

⁵⁹ Toma Dordea, *op. cit.*, p. 15.

⁶⁰ Voicu Safta, *Academicianul Ștefan Nedeșan [Ștefan Nedeșan Academician]*, in *Academia Română. Filiala Timișoara cit.*, pp. 34–35.

the department since 1950. He had a major contribution at the establishment in 1949, at Timișoara of the Plan Institute for Engine Building, later known as I.P.R.O.M, institute he led between 1949 and 1954, and in 1954 his contribution was important in the establishment of the Metrological Institute⁶¹.

He had sustained his Ph.D in 1939, with the first Ph.D. in the Polytechnic School from Timișoara, and in 1949 he became dean of the Electrotechnic Faculty. He worked at the Metalurgy Ministry Department in Bucharest in 1947, and in 1953 became corresponding member of the Romanian Academy, and full member in 1963⁶².

Between 1956 and 1957 he held the leader position of the Technic Council, and between 1961–1963 he was president of the National New Technic Council, between 1963–1966, we find him vice president of the Romanian Academy. In 1953 he founded, inside the Romanian Academy the Wearyness and Fragile Breakings Section, section that he led, and in 1963 he was appointed manager of the Technical Research Centre of the Romanian Academy. He collaborated since 1961 with the Technic University from Budapest, being elected in 1965, honorary member of the Hungarian Science Academy⁶³. He was also an engineer at the National Railway Company (C.F.R), in different positions. “The years he worked at the National Railway Company marked his entire future activity, after decades, he will become one of the greatest specialists our country will own in the field of material strength, and in this respect, he will face important problems in the economical function of the rolling material, problems that will keep him preoccupied and passionate about, and he will have important contribution to”⁶⁴. He published 87 national and international recognized works, 10 treaties, courses and monographs concerning material strength and test, “entirely new in the Romanian scientific bibliography”⁶⁵. Throughout his entire scientific activity, “he is considered the true founder of the Romanian Material Testing School”⁶⁶.

In the constructions field, the Polytechnic School from Timișoara had important contributions due to its professors. One of them, was *Victor Vlad (1889–1967)*. He graduated from the primary school in his home town of Lugoj, Timiș County, and secondary studies in Lugoj and Beiuș; he sustained his bacalaureate in 1908 at the Andrei Șaguna high school from Brașov. Later, he enrolled himself at the Architecture Faculty of the Superior Technic School from Budapest, and after a short break of studies, between 1910 and 1912, when he worked as drower for a private company in Budapest, retook his forming education which he finalised in

⁶¹ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 153–155.

⁶² *Ibidem*, pp. 162–164.

⁶³ Voicu Safta, *op. cit.*, pp. 36–39.

⁶⁴ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 155.

⁶⁵ Voicu Safta, *op. cit.*, p. 36.

⁶⁶ *Ibidem*, p. 39.

1914, being the beneficiary of a Emanoil Gojdu Foundation from Budapest scholarship⁶⁷. He graduated the courses of the Bridges and Roads Faculty from Budapest, obtaining in 1917 a diploma as an architect engineer, with architecture as major and constructions as minor⁶⁸.

After the Great Union from December 1st, 1918, he was named by the Dirigent Council of Transylvania, from Sibiu, engineer for the Technic Service of the mentioned city, and on November 15th 1920 he was named deputy professor for the Descriptive Geometry Department of the Polytechnic School from Timișoara, where in 1920 he became full professor. At the beginning, he taught the Descriptive Geometry course, and then only for a period the Civil Constructions course. In 1941, at the establishment of the Construction Faculty from the Polytechnic School in Timișoara, Professor Victor Vlad became its first dean, and remained in this position till 1948. It was in this period that he taught courses like: Urbanism and Ruralism, Construction Proceedings, etc. From 1948 he became head of the Civil, Industrial and Agricultural Construction Department, and between 1956–1961 was appointed again as dean of the Construction Faculty. Due to the efforts of the first promotion of the construction engineers of the Construction Faculty in 1945, they became known as Professor Architect Victor Vlad promotion. As a very talented constructor, he elaborated over 20 projects, buildings and works of art, raised all around the country, among these the actual location of the County Council and Prefecture of Timișoara. His work was and still is appreciated for the fact that he used in his works elements of the vernacular Romanian architecture. Besides, from a didactic point of view, he can be considered a true, superior construction education promoter in our country⁶⁹.

In the Polytechnic School from Timișoara there were another research school in the Construction Materials department, founded by Professor *Constantin Avram (1911–1987)*⁷⁰.

Constantin Avram (1911–1987) followed the first three years of the primary school courses in his home village of Ciumași, Ițești commune, Bacău County, and later secondary studies at the “George Bacovia” high school from Bacău. Between 1930–1932 he was a student of the sapper officer preparatory school from București, whom he graduated from with the second lieutenant title. He was sent, between 1933–1935, as Romanian state scholar student at École Militaire et d’Application du Génie from Versailles (France), and between 1936 and 1939 he followed the courses of the Construction Faculty of the Polytechnic School from Bucharest, where he remained as an junior assistant after graduation. At the same

⁶⁷ The Romanian Paroch Archive from Budapest, fund *Emanoil Gojdu Fondation*, file 1914, unpagged.

⁶⁸ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 70–71.

⁶⁹ *Ibidem*, p. 76.

⁷⁰ Toma Dordea, *op. cit.*, p. 15.

time, between 1940 and 1944 he functioned as military engineer at the Road and Military Constructions Department of the National Defence Ministry, realizing over 40 important military objectives: fortifications, barracks, etc⁷¹. Thanks to his intense, good professional education, he was transferred in 1941, at the Construction Faculty of the Polytechnic School from Timișoara. It was there he taught the Wired Concrete discipline until he retired in 1975, after, as consulting professor teaching others: Wired Concrete Bridges, Construction Statics, Material Strength and theory of elasticity, Construction Statics and Dynamics, etc. He contributed to the establishment of the Construction Faculty from Cluj, where he taught between 1954–1959, the Wired Concrete discipline. He preoccupied himself with the scientific research, the way it interacts with the education, being the founder of the I.C.E.R.C from Timișoara in 1955, and later in 1965 of the Construction Materials Section of the Academy Base from Timișoara⁷².

Between 1953 and 1975 he was head of the Wired Concrete and Buildings Department of the Polytechnic School from Timișoara, and in between 1963 and 1971, rector of the mentioned institution. He was elected corresponding member of the Romanian Academy in 1963, and in 1970 was appointed *honorable professor*, being head of the Construction Materials section of the Romanian Academy⁷³.

He published valuable works in the field of concretes and constructions in general: *Continuous Trabs*, Technical (ed.), Bucharest, with several editions 1949, 1952, 1959, 1965, 1981); *Wired Concrete. Projection and section Dimensions* (1952); *Constructions Manual* (1959), *Spatial Structures* (1978), etc⁷⁴.

The sayings of a famous culture historian “taught treasures and authentic deposits in the field of exact sciences are not places where they should be. We are concerned with the question: What was done for remembering Trajan Vuja, Pavel Vasici, Trajan Lalescu, V. Vâlcovici, Valeriu Alaci, E. Arghiriade, Corneliu Micloși, Ștefan Nădășan, etc?”⁷⁵.

Regarding the scientific research carried out by Professor Constantin Avram, we notice novelty and originality. “Receptive to the rapid evolution of the construction technics and the efforts made on a world wide level to enhance quality parameters of construction materials, he was preoccupied with the research, realisation and economic utility, in our country, of special concretes with dispersedly armed,

⁷¹ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 235.

⁷² Corneliu Bob, *Profesorul emerit Constantin Avram, membru corespondent al Academiei R.S.R.*, [Professor Constantin Avram, corresponding member of the R.S.R. Academy] in *Academia Română. Filiala Timișoara cit.*, pp. 90–91.

⁷³ Coleta de Sabata, Ioan Munteanu, *op. cit.*, p. 299.

⁷⁴ Corneliu Bob, *op. cit.*, p. 92.

⁷⁵ Ion Iliescu, *Considerații asupra acțiunii de valorificare a moștenirii culturale în Banat*, in *Academia Română și Banatul. Perioada 1866–1920*, [Romanian Academy and the Banat province. The period 1866–1920], volume revised by Ion Iliescu and Sergiu Drincu, University Press, Timișoara 1982, p. 213.

prepared with special polymers or impregnated and polymerised. Also for the first time in the country, under his direct supervision, began in 1972, at the Polytechnic School from Timișoara, researches on fiber glass and steel armed concrete”⁷⁶.

To conclude, Banat in general, and Timișoara especially throughout the Polytechnic School, later the Polytechnic Institute, contributed to the development of science and technics in Romania in the period between 1940–1960.

⁷⁶ Coleta de Sabata, Ioan Munteanu, *op. cit.*, pp. 293–295.