

ON THE WINGS OF TIME

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Abstract: The paper introduces to the hysterical achievements of the Motor and Thermal Engines group of specialists (university professors) of the Politehnica University of Timisoara, starting from its creation (1920, by King Ferdinand I of Romania and his wife Maria) as Politehnica School, up to present. It covers most relevant and specific areas achieved by the Thermodynamics, Thermal Machineries and Road Vehicles staff, currently active in the MMUT Department, namely in field such as: energy transformation in general and applications in thermoelectric power plants, thermal machines, thermal equipment, environmental protection / air quality, valorization of fossil and renewable energy and greening solutions, road vehicles, and others. The staff has its roots strongly anchored in the history of UPT since its foundation, bringing input and quality in the development of this school, of course in correspondence with the stage of knowledge of the moment.

Keywords: History, Timisoara, Politehnica, Thermal machines and equipment, Internal combustion engines, steam boilers and turbines, environmental pollution and protection.

1. Introduction to the history of the university

The staff of the present Group of Thermal Machines, Thermodynamics and Vehicles from the Department of Mechanical Machines, Utilities and Transportation, has its roots strongly anchored in the history of the University (presently named Politehnica University of Timisoara) since its foundation by 1920, 11th November, through Royal decree Nb. 4822 of King Ferdinand, as *Polytechnic School* [1]. It brought input and quality in the development of this school, of course in correspondence with the stage of knowledge of the moment.

The first and main building of the university, in which the faculty of Mechanical Engineering still operates, is the first pavilion built for the Polytechnic School, being completed in Brâncoveanu style, according to the plans of the architect Duiuiu Marcu (Figure 1), on a terrain of 8.5 ha, offered by the City Major Stan Vidrighin, and cooperating with the first Rector, Professor Traian Lalescu. The building was inaugurated on 11 November 1923, in the presence of King Ferdinand I and Queen Maria. In his word, the king said: "We have chosen Banat, for this school so useful for our growing industrial development, that it is not only a serious work factor for the preparation of future generations of true

pioneers, but also a nest of Romanian thinking and feeling and a coat between the Old Kingdom and the Provinces, which, by our bravery, have been brought to our old country for centuries. *Not the walls make a school, but the spirit that reigns in inside*".

His last words will become the motto of the entire Polytechnic School (first name of the university) and further on.



Figure 1. View of the Faculty of Mechanical Engineering, as build by 1923.

The event is eternalized on a marble slab at the entrance to the building of the faculty of Mechanical Engineering (Figure 2). From the beginning, within the Polytechnic School a single faculty was functional, covering two specializations: (i) Electro-mechanics, which established the basis of training and research in mechanical and electrical fields, and (ii) Mines and Metallurgy, a domain very necessary by that time.



Figure 2. Marble slab with the words of King Ferdinand [2].

2. History of the present Group of Thermal Machines, Thermodynamics and Vehicles

2.1. The Founder

The name of the founder of the present group is undoubtedly Professor MARIN BANARESCU (Figure 3), an outstanding university exponent. He is known as the founder of the Romanian thermal machine school, as author of the first internal combustion engine treaty in Romanian (being also a dean of the faculty of Electro mechanics: 1926-1942, Rector of the Polytechnic School of Timisoara: 1944 - 1946 and Head of the Thermal Machinery Chair: 1948 - 1962).

By 1922, the newly appointed professor at the Polytechnic School of Timisoara, Marin Bănărescu, began teaching the first course of Thermal Machines / Gas Turbines in Romania (1949), being the founder of the Romanian school of this discipline and author of the first book Internal combustion engines (volumes 1 and 2, 1957 and 1959) in Romanian. His concerns in the area of modernization of industrial technologies are solved in 1940 with the homonym patent. This application has brought great advantages in the efficiency and costs of internal combustion engines [3]. In 1946 he supported the students' claims.

2.2. Ioan Vlădea

Immediately after the graduation of Andrei Saguna High School in Brasov, he enrolled at the Faculty of Electromechanics of the Polytechnic School of Timisoara, which he graduated in 1931. He had the privilege to

learn from great professors of the time, Victor Vălcovici, Valeriu Alaci, Plautius Andronescu, Pompiliu Nicolau, Victor Vlad and Marin Bănărescu.

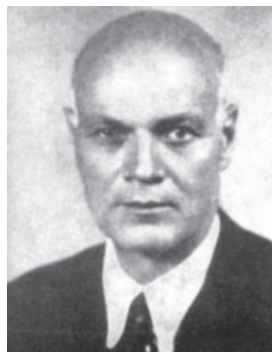


Figure 3. Marin Bănărescu (1890 - 1974).



Figure 4. Ioan Vlădea (1907–1976)

On February 23, 1931, he held his diploma thesis titled Electricity Supply of Brasov, developed under the direction of Dimitrie Leonida [4, 5]. In October 1945, Marin Bănărescu invited him to hold lectures covering the "Light Engines" (airplane engines) at the Polytechnic School of Timișoara. In March 1946 he passed the examination of the chief of the "Thermal Machines" discipline, being titled in August. On 8th December 1948 he was appointed Professor and Head of the Department of Thermotechnics, newly established by the division of the Thermotechnics and Thermal Machinery Chair, whose head was Marin Bănărescu, a quality he will hold until his retirement on September 30, 1973.

Awards that he gained: The Adamachi Award of the Romanian Academy (1940) for the Airplane Compressor, First Prize of the Ministry of Education and Culture (1963), for the work Thermotechnics, Medal of Scientific

Merit (1966), finally the title of Professor Emeritus (1970).



Figure 5. Helmuth Theil, Zeno Ardelean, Ioan Bejan, Corneliu Ungureanu - four of the continuators of professor Vladea's aspirations and achievements, professors who served the development of the Chair for Thermodynamics



Figure 6. Professor Vladea reading in Hall 115 (first auditorium of the university) the referee for the Phd diploma awarded to Marius Peculea, presently member of the Romanian Academy.

Through Diploma no. 122/10 of December 1954, he receives the title of "Doctor of Technical Sciences" and the right to lead doctorates, in which he leads the doctorates of his collaborators, who will become basic teaching staff of other Directions close to Thermotechnics, succeeding in creating a real research school in (1971), Ioan Bejan (1973), Nicolae Boboescu (1959), Corneliu Ungureanu (1961), Virgil Barbu (1961), Zeno Ardelean (1963), Dumitru Oancea (1968), Harald Gutmayer and especially the one who would become the academician Marius Sabin Peculea (1965). Figure 5 presents a later photo with four of his continuators, each taking a different direction in research and study, and upgraded the laboratories from the university.

His most prestigious book is dedicated to Thermodynamics, including Heat transfer and Fluid dynamics. It is a real monograph, that is also today an example of professional and comprehensive literature.

2.3. Gavril Creta



Gavril Creta (1923-2014)

Professor Creta is known as the father of the steam turbines in Romania, authoring not only the best treaty in the area, based on his experience as project engineer in the Resita famous steel factory and engine and locomotive producer (namely Uzinele și Domeniile de Fier din Reșița and *Uzina Constructoare de Mașini Reșița* – UCMR, but also being an eminent expert in turbines and supporting the production of these in Resita.

He started his engineering training attending the courses of the Polytechnic School of Timisoara, the electromechanical specialty, being awarded by a scholarship of the Resita company. In 1947 he defended his diploma project with the qualification «Magna

cum laude». In 1970 he gained his PhD title for the doctoral thesis “Contributions to the study of single-valve valves with a steam turbine diffuser”.



Figure 7. Gavril Creta (1923-2014) and his former students, at an anniversary meeting of 50 years from the graduation (of the so called gold generation).



Figure 8: Turbo reactor RD-500 from the ancient turbine laboratory

2.4. Traian Raica

Traian Raica was born in Sannicolau Mare, Timis County, on November 24, 1922. He attended Gymnasium Prince Carol (1933 – 1937), C. D. Loga High School (1937 – 1941), and further the Polytechnic School (1941 – 1946), which he graduated as an electromechanical diplomat engineer (1949). He was Assistant Professor of Univ. Emeritus Marin Banarescu (1950) and following the steps of the didactic-professional affirmation – conf. (1962), Ph.D. (1973), Professor (1990) and later consultant [6].

In everything he did he was a model for all, particularly modest, with an accomplished academic outfit, an erudite, a wise personality with inclinations towards art. The teacher's life, indeed, was dictated by the dictum: „**Labor omnia vincit improbus!**“



Figure 9. Professor Traian Raica (1922-2013)

His courses were marked by high scientific level, by attractiveness and clarity, so that all those who assisted them, lived both the satisfaction to get enriched of knowledge and the joy of having such a tutor. He has formed us in the spirit of the motto «Honest and passionate work will ultimately be respected and recognized». He enjoyed our respect and respect for all, and, he found the joy to keep himself always young.

Emeritus Professor of Timisoara Polytechnics, a prestigious member of the General Association of Engineers in Romania, Traian Raica represents a model of scientific probity, responsibility and humanity [7].

Among the most important achievements one mentions: (i) Writing a student book on «Construction and calculation of internal combustion engines»; and

(ii) his contribution to the creation of an Internal Combustion Engines Laboratory where practical work is being carried out with students and most PhD research in the field of internal combustion engines. He collaborated permanently with the younger colleagues from the chair, thus preparing the new generation of exchange.

2.5. Ioan Bejan

Ioan Bejan was born on August 20, 1922 in the town Brad, Hunedoara County, from a distinguished family of Transylvanian intellectuals. Father, Silviu Bejan, Romanian language teacher, participant as a «creditor» at the Great National Assembly from 1 December 1918 in Alba Iulia, was the first director of the Constantin Diaconovici Loga High School after the Great Union.

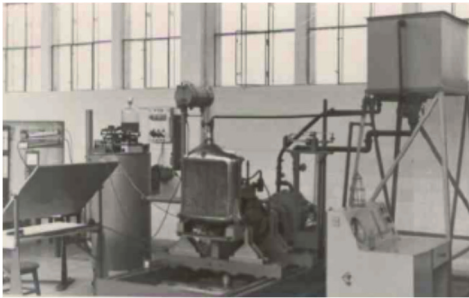
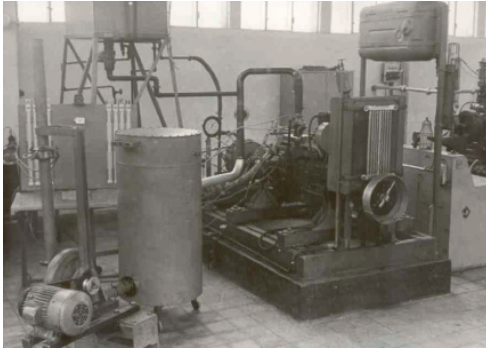


Figure 10. Views from the ancient laboratory for internal combustion engines, first lab in Romania in this domain



Figure 11. Ioan Bejan (1922 – 1991)

The young owner, educated in the same spirit of country and nation love, followed the courses of C.D. Logos from Timisoara, which he graduated in 1941. He then attended the courses of the Polytechnic School of Timisoara, Faculty of Electro mechanics, the 1946 promotion. Appreciating his special professional training, he was appointed assistant in 1949 at the Department of Thermotechnics. Thus, for more than 40 years, he made a tireless work on the scientific and educational field, climbing the steps of the teaching staff from the assistant to the professor. He taught several university

courses, among which are: Thermotechnics and Thermal machines, Steam boilers, fundamental discipline in preparing the students from the Thermal Machines and Rolling Stock sections [8].

In 1973 he successfully defended his doctoral thesis titled Contributions to the study of heat transfer to pipes with internal fins, a reference work for the construction of modern heat exchangers in the internal combustion engines and not only..

Fully trusted by the importance of the existence of textbooks in his own writing, Professor I. Bejan is the main author of the Thermotechnics and Thermal Machines course, published in two volumes, which at that time, was considered one of the most valuable university course, both through the high scientific level and through the clarity of the presentation of the issues addressed.

The high scientific level, the clarity of the exposures and the multilateral training in the technical field as well as the universal culture, the possibility of documenting in German, French and English all contributed to the placement of Professor Ioan Bejan among the most valuable teachers, always appreciated by colleagues and the 40 promotions of students.

On behalf of Professor Ioan Bejan, the creation of the Internal Combustion Engine Laboratory from Porumbescu Street, no. 36-38, Timisoara, was built, intended for students from other specialized departments than heating machines. He has also begun research in the field of thermal pipes with a wide applicability in the construction of heat exchangers. Presently this lab does not exist any more.

Professor Bejan was a talent, full of passion, with a vast technical and humanist culture, with multilateral concerns: violinist in the Banat Philharmonic Orchestra, president of the Politehnica Football Section of Timisoara, during which the team scored through numerous successes (the Romanian Cup, participation in the Danube Cup, etc.).

Through his exemplary conduct and honesty, he imposed the unanimous respect and captured the love of all those with whom he collaborated. As a sign of acknowledging the merits of Professor Ioan Bejan for the development of the chair, the Thermo-technical Laboratory of the 111th Mechanical Faculty Hall, was named, on my initiative, with his name.

2.6. Helmut Theil

Prof. Dr. Theil Helmut (1930-2015) – Professor of Thermodynamics and Heat Exchanger, Prodecan of the Faculty of Mechanics, Vice-Rector of IPTV, Chief of Thermal Machines Chair [9]. He was involved in the process of heat exchange and experimented with a range of equipment and equipment in that sense by providing a special laboratory for heat exchangers, thermosetting and substance transfer. He is co-author of several representative manuals for Romanian thermodynamics. He collaborated with Professor Bazil Popa, together with Professor Teodor Mădărășan at the Industrial Heat Exchangers, Bucharest, published in the Technical Publishing House, 1977. Another national reference paper is the Thermotechnical Engineer's Manual, Volumes I-III, Bucharest: Technical Publishing House, 1984-1986.



Figure 12. View from the Lab for heat exchangers and heat transfer of UPT, developed in time by Professor H Theil.

2.7. Negrea Virgiliu Dan



Fig. 13. Virgiliu Dan Negrea (1942-2009) [10].

The dedication to research and science assisted him since his youth. He attended the courses of the Polytechnic Institute "Traian Vuia" in Timisoara, the Faculty of Mechanics, which he graduated as a graduate of the specialization of Thermal Machines with a

diploma of merit [11]. Dedicated to the study, he was named a university assistant ever since graduating from the faculty and then progressed through all the teaching degrees up to the university professor, title obtained by 1991.

Due to the special organizational qualities Professor Virgiliu Dan Negrea hold various leading positions: Deputy and Scientific Secretary of the Faculty of Mechanics (1972-1977), Head of the Timisoara Polytechnic Branch of the National Institute of Heat Engines in Bucharest (1982-1992), Director of the Center Research for Thermal Machines and Transports from the Faculty of Mechanics (1998-2004), Director of Research Center for Machinery and Thermal Equipment, Transport and Pollution Control. The outstanding results obtained in the scientific research recommended him as Ph.D. in Thermotechnics and Thermal Machines (1995-2009); under his leadership the doctoral thesis was supported by 26 specialists both from the country and from abroad.

The outstanding qualities of Professor Virgiliu Dan Negrea's scientific researcher were awarded with the "Traian Vuia" Prize of the Romanian Academy for the monograph "Internal Combustion Engine Processes. Economics. Fighting Pollution" in 2005. The entire research activity has been materialized through a number of over 300 scientific papers published in volumes of national and international scientific events, 23 scientific books / monographs published in central publishing houses.

He has been a member of the Romanian Academy of Technical Sciences (2006), Doctor honoris Causa of the University of Oradea (2007), Member of the General Association of Engineers of Romania, Member of the Balkan Association for Protection Environment, Chairman of the Anti-Air Pollution Control Committee of the Timisoara Branch of the Romanian Academy [12].

2.8. Ungureanu Corneliu

After graduation of the faculty of Electromechanics of the Politehnica School of Timisoara, by Governmental Decision, he was assigned as assistant at the Chair of Thermotechnics, where he worked uninterruptedly at this chair, as an active teaching staff for 45 years, and after retirement (1996), as a consultant teacher. Under the leadership of the famous professor

dr. Eng. Ioan Vladea, he presents the dissertation thesis in December 1961 and is awarded the scientific title of candidate in science, later converted (1968) into the Doctor of Engineer (Title of the paper "Contributions to the study of spraying low pressure air injecting air injectors").



Figure 14. Corneliu Ungureanu (1929-20012)

Having accomplished with a lot of competence and conscientiousness teaching duties, he taught the courses of over ten basic disciplines in the training of engineers, graduates of the Thermal Machines, Electromechanical or Industrial Energetics departments belonging to the faculties of Mechanics and Electrotechnics.

One of these is the treaty "Steam Generators for Classical and Nuclear Energy Installations", published at EDP Bucharest in 1977, which was used at the time in all the polytechnic institutes in the country with the specialty Thermal Machines (Bucharest, Iasi, Timisoara, Galati). Based on this treaty, three Steam Boiler Design Guides (Thermal and Gas Dynamics 1983, Hydrodynamic Calculations and Resistances, 1985, Thermal Calculation 1993), a collection of problems and a laboratory instructor, were then 2008 in one volume. It is mentioned that Professor C. Ungureanu is co-author of the treaty "Fuels, Combustion Installations and Steam Boilers", published in the Politehnica Publishing House in Timișoara in 1998, representing the node of the collaboration of some prestigious cadres from the Politehnica University of Timișoara, Bucharest and Iasi [13]. Since 1972, when he was assigned with the right to conduct his PhD training, he coordinated the preparation of 45 PhD students, of whom 31 supported his thesis.

Since the beginning of its activity, the realization of a didactic laboratory in the field

of steam boilers has been a permanent concretised concern by providing the necessary material basis for carrying out some laboratory works regarding the determination of the physical and energetic characteristics of the fuels, the research of their normal combustion and intensified burning, apparatus for determining the combustion gases noxious content, providing stands for the testing and approval of small hot water boilers. ABA 2 t/h boiler installed in the laboratory serves to initiate students in servicing such an aggregate, performing thermotechnical measurements, drawing up the thermal balance, etc. He developed several labs, a special one dedicated for the study of combustion and steam boilers, cooling towers (amcient labs from Porumbescu Str.-presntly demolished) etc. They all were unique and build from own efforts, based on research results, and support of his colleagues, acting as a team.

In order to prepare the students as fully as possible, they were constantly concerned with the organization of documentation speeds, starting with the small thermal power stations in the locality, the continuation with CET Timișoara Centru and the South and usually concluded with visits to large CETs like Isalnița, Rovinari, Turceni, Mintia, etc.

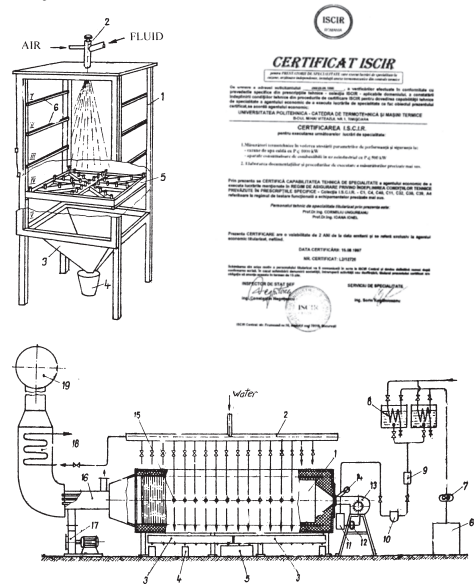


Figure 15. Experimental tests rigs developed for the study of the pulverisation of fuels, respectively combustion and denox systems. Certification of expertise for combustion equipments



Figure 16. Diploma of the Romanian Academy prize offered to Professor C Ungureanu

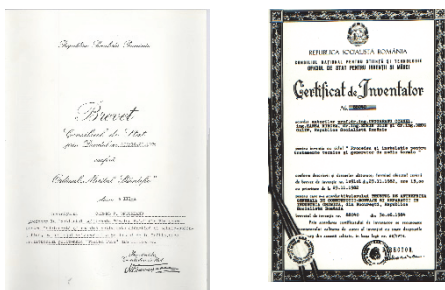


Figure 17. Honorary prize offered to Professor C Ungureanu at the anniversary of 50 years of existence of UPT, and a patent developed

For the same purpose, he has guided and coordinated practice, annual or diploma, in boiler plants (Vulcan, IMGB), study and design institutes (ICPET, ISPE, ICEMENERG) or on the construction sites of thermal power plants.

For the work done on the construction of a group of four installation works related to "High Pressure Injection Injectors", the Ministry of Education, by Order no. 92172 / 31.07.68 awarded him the second prize in the field of "Machine Mechanics and Constructions" for 1967. Since 1969 he joined the team led by Professor Ioan Vladea, who researches the heat and substance exchange with application in the field of cooling towers on the basis of the contracts concluded with ICEMENERG Bucharest and ISPE Bucharest. The results of the researches have contributed to the design and design of the whole range of cross-flow cooling towers made in Romania for both domestic and export needs, but at the same time documents of internal scientific manifestations were published in specialized journals (Magdeburg, Paris).

Another area in which it worked with good results was the complete thermal treatment of large, oversized bodies (cylindrical vessels, spherical reservoirs, coke columns or isotopic separation), used at the time by the TAGCEMERIC - Bucharest for the treatment of spherical tanks from the Borzești, Brazi-Ploiești and Midia refineries.

The novelty of these researches is certified by the Patent No. 88040 / 30.06.84, as well as by three prizes I, awarded during the scientific contests of the county (Timiș and Argeș) and national area (Bucharest).

Research on the spraying and burning of liquid fuels allowed him to become co-author of the "Combustion Plant" treaty, published in the 1968 Technical Publishing House. For this this cycle of works, the RSR Academy, meeting in the General Assembly session of January 25-26, 1972, awarded him the "Traian Vuia" Prize.

For his contribution to the development of thermotechnics he was awarded the Special Prize of Thermotechnics for 1994 and for the long and fruitful didactic and technical-scientific activity by Decree of the State Council he was awarded the Order "Scientific merit", 3rd grade on the occasion of the anniversary of 50 years of establishing the Polytechnic Institute "Traian Vuia" in Timisoara. The author of "Romanians in Thermal Engineering" Professor Adrian Bejan (USA) includes the name of Professor C. Ungureanu among the 17 specialists with special activity, and in the collection of scientific bibliographies "Who is Who in the Balkans" his name appears. During his work, Professor C. Ungureanu has performed various functions, including: Scientific Secretary of the Scientific Coordination Commission of the Banat Region (1966-1968) coordinated by Mr. Acad Anton I., Scientific Secretary of the Teaching Council of the Faculty Mechanics (1963-1965), head of department (1976-1984),

Instead of conclusions

The current offer of the present staff to the society developed versus new domains, including environmental protection and renewable energy systems.

Not only that these are strongly necessary to be taught and researched, but love and insight must be spread out between the students, they must also be prepared and

understand, as future fighters, for the benefit of sustainable development and stopping climate change and global warming.

For all of us, I dedicate this article and appreciate the true inheritance we have enjoyed as a contemporary generation celebrating soon a centenary since the founding of the UPT, in an attempt to preserve the cult for quality, moral and professional values. It is a brief review of the history of our forerunners, who were our models in facts, achievements, and works written in a professional manner, being aware of the fact that we represent a connection of the present, that must sustain the future, starting and correlated with the past. These professors have marked by their dedication, personality and achievements the first half of the existence of our polytechnic school. They have created and led the spirit of generation climb to the heights of spiritual and professional powers, raising the level to quality, reputation, deontology and scientific pedantry. All acted, often in silence and anonymity - with the stoicism and the power of the winner - borne the enthusiasm of the beginnings, having the fascination of a didactic and research career, and thus becoming for us a model to follow. They turned in time in mentors and path opening actors of science and spirit. Through their integrity and activity, they proved the burden of change on their shoulders, with no disagreement and no antagonism, perceiving evolution and contributing to it. They left a spirit to continue the tradition and work in * thoughts and feelings *. Thus, we must be proud and appreciate for getting the chance to be their continuators, marking the future.

Acknowledgment

I feel glad that I have known most of the mentioned professors, and could learn not only scientific knowledge, but also how to be human and open to progress. I express deep gratitude towards the memory of the mentioned professors, for having worked at the foundation of the school (Politehnica University of Timisoara-present name), and my respect and appreciation will perpetuate as long as the university will exist, through its students and teaching staff.

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