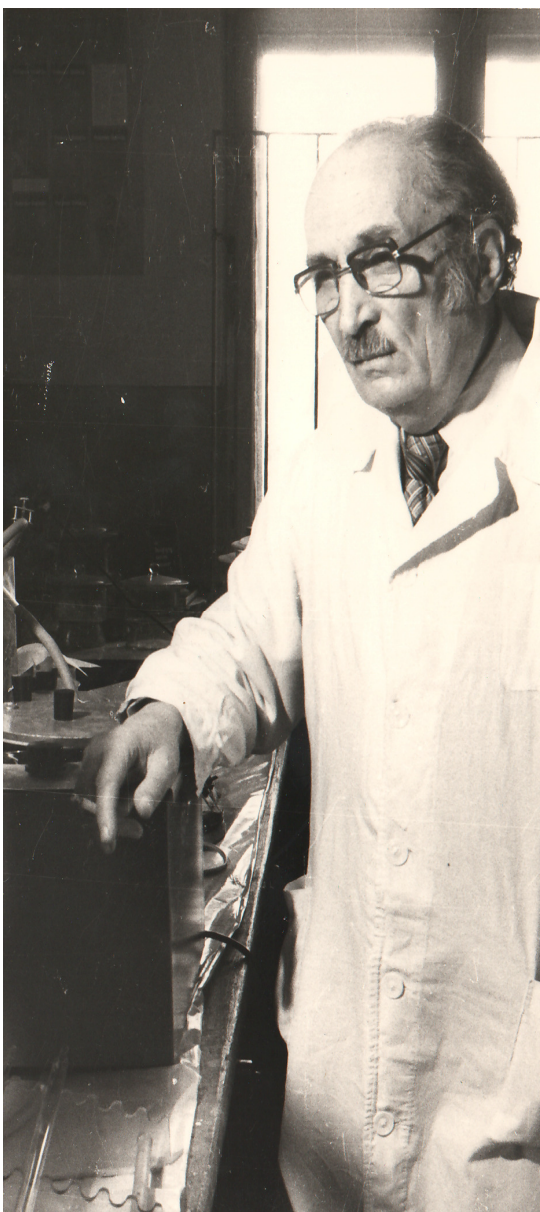


The 100th anniversary of the birth of professor *Cristofor I. Simionescu*, founder of education and research in the fields of natural and synthetic polymers in Romania

This year, we commemorate the 100th anniversary of the birth of Professor Cristofor I. Simionescu, the founder of the Romanian school of natural and synthetic polymers. He was born on the 17th of July, 1920 (Dumbrăveni, Suceava, Romania). In 1944, he graduated the Institute of Chemical Technology, “A. I. Cuza” University, Iasi, as chemical engineer distinguished with “Magna cum laude”, and in 1948, earned his PhD degree at “Gheorghe Asachi” Polytechnic Institute, Iasi. He became Assistant Professor in 1944 and Professor in 1952. He was elected as Corresponding Member of the Romanian Academy in 1955 and as Member in 1963.

On this special occasion, we have the possibility to evidence the outstanding contributions of Prof. Simionescu to the field of natural and synthetic polymers. The research and education activity in the domain of pulp and paper started in Iasi, as early as in 1948, after the first attempt to set up a department in this field was made in the same year in Bucharest, but it failed.



That is why, Academician Cristofor Simionescu, associate professor at that time, received the mission to set up the department of *Technology of Pulp and Paper* in Iasi. Together with one of his colleagues, Professor Vasile Diaconescu, he succeeds in doing this under the hard conditions inherent to any beginning. Later, in 1955, the department acquires the name of *Technology of Pulp, Paper and Rayon Fibers*. Nowadays, as a result of the evolution in the industrial field in Romania, the department is called *Paper Engineering*, being oriented towards providing the industry with the necessary specialists with higher education.

In parallel with the organization and development of the educational system, there naturally appeared the necessity of training the teaching staff and approaching the research activity. Thus, having Professor Simionescu as a PhD supervisor, the first doctoral theses were elaborated and defended. The Humboldtian synergy between the educational and research activities has become characteristic of this school and has manifested since the beginning of its existence. There have been extensive investigations in the field of chemistry of wood and annual plants carried out by mixed teams from “Petru Poni” Institute of Macromolecular Chemistry and the teaching staff from the department. The studies performed yielded an impressive volume of data, which were included in a series of monographs.

It is interesting to underline the importance of these contributions from many points of view: (1) the originality of the approached subjects in relation to what was happening at the time at a global level; (2) setting up a data bank to know the potential and biomass reserves with implications in capitalization; (3) recording the evolution of forest vegetation in relation to the environment – trees comprise in their morpho-anatomic structure the influence of the environmental factors over time; (4) the study of annual plants and reed provided data for industrial applications, which have been developed in Romania; (5) marine mono- and macroalgae are currently regarded as renewable raw material resources for biofuels and bioproducts.

Another interesting research area approached with courage was that of plant tumors, many papers being published between 1956 and 1968 (relating to induction, characterization, inhibition, antioxidants). In this sense, the existence of vegetal tumors was identified in some woody species (such as plum), which were chemically characterized. The chemical changes in the lignin content led to the idea that the tumor formation process is propagated through radical reactions, as it was the case of the biosynthesis of the aromatic polymer. Based on this observation, the possibilities of inhibiting the growth of vegetal tumors using antioxidants were demonstrated for the plant *Solanum lycopersicum* infected with the crown gall tumor.

An impressive number of papers have been dedicated over the years to lignin chemistry, materialized in a first stage in proposing a structure formula for reed lignin. Studies in this field continued with investigating the reactions of this polymer and recognizing the contributions of Romanian researchers by including them in programs with national and international participation.

The chemical modification reactions of natural polymers have also been an area that has attracted in-depth investigation, embodied in numerous fundamental and applicative contributions. Presently, the grafting reactions of natural hydrophilic polymers have gained great scientific significance, conferring hydrophobicity to their blends with synthetic polymers with the aim to produce composite materials.

In a research program funded during the global oil crisis (1973), the chemical and energetic potential of vegetal biomass was studied as a renewable source of raw materials. On the basis of the studies carried out at the time, a complex model for complex biomass valorization was developed. Afterwards, the research in this area has been conducted both in Romania and abroad, and the concept of complex valorization was called *biorefining*, aiming at obtaining energy and bioproducts by fractionation of vegetal biomass.

Another large-scale program tackled the issue of synthetic papers. In this case as well, a large body of scientific information has been gathered in publications, patents and applicative tests up to the industrial level for some paper grades.

The international recognition of the school from Iasi was confirmed on the occasion of the 13 international symposiums on *Cellulose Chemistry and Technology* organized under the chairmanship of Academician Cristofor Simionescu, starting in 1961. On the occasion of the symposium of 1965, a group of scientists in the field entrusted Academician Simionescu with the task of setting up the journal *Cellulose Chemistry and Technology* (www.cellulosechemtechnol.ro), published by the Romanian Academy Publishing House. The journal has appeared without interruption for over 50 years, even under the most difficult conditions, enjoying the support of the members of the editorial team everywhere, well-known scientists, not only in the field of wood chemistry and structure of chemical components, but also in that of synthetic polymers.

As known, the scientific contributions of Academician Cristofor Simionescu have been appreciated both at national and international levels. As concerns the field of pulp and paper, it is worth mentioning the award of the Jubilee Medal of American Chemical Society, which has a Division for Cellulose, offered to Academician Cristofor Simionescu in 1976, on the occasion of the celebration of the bicentenary of the USA. The medal was awarded to 20 world-renowned personalities of the field, who were invited to contribute with review-papers included in a special

volume published on this occasion. The medal was handed to Academician Simionescu at the Romania-USA Polymer Seminar, held in Iasi in 1976, an event that can be regarded as the recognition of the Romanian school in the field of polymers.

The interest of Academician Cristofor Simionescu in synthetic polymers was marked by the conference *Aspects in the Field of Huge Molecules*, presented in The Aula of the Polytechnic Institute of Iasi, on March 16, 1948. After the reform of the education in 1948, at the faculty of Industrial Chemistry of the Polytechnic Institute of Iasi, there were two sections: Inorganic Industries and Organic Industries. At the latter, during the academic years 1952/1953 and 1953/1954, the discipline *Macromolecular chemistry* was taught, which became *Macromolecular compounds* between 1960-1962. The specialty *Technology of macromolecular compounds* begins opens in the academic year 1962/1963, with a separate curriculum, due to Academician Cristofor Simionescu's initiative.

Many of the research directions in the area of synthetic polymers initiated by Academician Simionescu either have evolved under his leadership, or have been taken up creatively by his coworkers (mechanochemistry of polymers, photo- and semiconductor polymers, modification of natural polymers and, especially, obtaining cellulose derivatives). Thus, the research efforts in the field of mechanochemistry of polymers are remarkable, some of them being developed and appreciated abroad. The contributions in the field of photo- and semiconductor polymers have materialized in the synthesis of some polymers used in the construction of computers and solar energy reception systems. The reactions of modification of natural polymers, and especially those for obtaining cellulose derivatives have opened the way for the creation of supports for the immobilization of enzymes and drugs, the origin of life. Thus, different initiators and monomers were studied to achieve controlled release systems for drugs. This direction was also taken up in the 70s, when researchers, such as Robert Langer (1948), from MIT, began to develop systems based on modified polymers to be used for drug delivery for medical applications. Aspects of the field of biocompatible and bioactive polymers were reviewed and developed in many researches.

One of the fields that were very close to Academician Cristofor Simionescu's heart, which he initiated and coordinated, was the origin of life, a domain approached at that time in important schools of scientific research worldwide (*e.g.* Sidney Walter Fox (1912-1998), USA). The team led by Professor Simionescu proposed a model, which involved the synthesis of some precursors of the living matter from the possible constituents of the primary atmosphere of the earth under the conditions of the cold plasma discharge. In these studies, certain compounds have been evidenced,

and are now confirmed by current researches, which led to the identification of the living matter precursors in the universe.

Recently, two teams of astrophysicists have identified prebiotic molecules in the vicinity of protostars similar to our Sun in the early stages of evolution. Thus, the presence of *methyl isocyanate* involved in the synthesis of amino-acids and peptides was observed (Niels Ligterink-Leiden, Netherlands, and Rafael Martin-Domench, Institute of Astrobiology, Madrid, 2017). Supernova SN 1987 ended violently in 1987, and in the area where the explosion occurred, the formyl ion (HCO^+) and sulfur monoxide were identified (2017). The presence of the mentioned intermediates was also found in the products resulting from the decomposition in cold plasma of the mixtures of methane, ammonia and water, considered as a model for the primary atmosphere of the earth.

All these constitute examples illustrating that the education and research projects founded by Academician Cristofor Simionescu have never been conjunctural, instead, they demonstrated his clear and all-embracing vision over the whole domains of natural and synthetic polymers, so that the results attained appear as the basic elements of a long-lasting, sustainable structure, now substantiating important areas of common investigation, towards which renewed interest is being manifested in scientific communities all over the world. Many of the fields dealt with in the scientific research of Professor Simionescu have been taken over and are being successfully continued by his coworkers.

It is a great honor to recognize that the 100th anniversary of the birth of Professor Cristofor Simionescu represents an important event for the scientific world and the academic community, to express our gratitude for his contributions to the progress of natural and synthetic polymers in Romania, appreciated at national and international levels.

Valentin I. Popa