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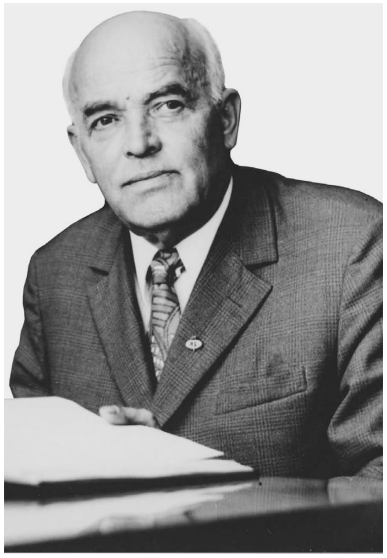
*In memoriam*

# AGU AARNA 100



On October 11, 2015, there will be 100 years from the birth of Professor Agu Aarna, a prominent scientist and corresponding member of the Estonian Academy of Sciences.

Agu Aarna was one of the leading oil shale chemists after World War II. His main research subjects were the genesis, chemical structure and mechanism of thermal decomposition of Estonian oil shale, and study of the properties and utilization possibilities of oil shale products.

Agu Aarna was also one of the main driving forces behind founding the journal Oil Shale and the associate editor as from its first issue.

The major part of Agu Aarna's lifework was connected with Tallinn Polytechnical Institute (now Tallinn University of Technology). In 1951–61 he was head of the Department of Fuels Chemical Technology (later Technology of Organic Substances). It was on Agu Aarna's initiative that in 1957 the Oil Shale Chemistry Problems Laboratory was set up, whose scientific supervisor he was until 1979. For almost 17 years, from 1960 to 1976, he was rector of Tallinn Polytechnical Institute.

Agu Aarna passed away in 1989.

Agu Aarna was actively engaged in scientific research for over 40 years. During that time he published approximately 210 scientific and about 240 popular-scientific works. He was the author of 16 inventions, several of

which have been patented in the USA, Japan, Germany, Great Britain and other countries.

Without doubt it is the campus of Tallinn University of Technology in Mustamäe City District that may be considered a monument to the work of Agu Aarna as rector. The time of designing and erecting the complex coinicided with the heyday of his rectorship. One could also add the organising of the UN Oil Shale Symposium in Tallinn in 1968 – just on the days of putting a violent end to the so-called Prague Spring. Only the one who has done such organisational work himself can imagine how high obstacles those involved had to surmount at that time for the event to succeed.

Earlier the thermal decomposition of kerogen was considered as stepwise thermolysis. But in Agu Aarna's works this process was defined to proceed by a principally different scheme, which consisted in that most of the benzene was generated already in the initial stage of decomposition. Without knowing this regularity it is not possible to direct the low-temperature decomposition of oil shale on an industrial scale.

Of course, one cannot elucidate regularities of low-temperature carbonization without knowing the chemical structure of the object itself. The works of Agu Aarna and his students Endel Lippmaa and Kaarli Urov contributed much to determining the structure of the carbon skeleton of a kerogen macromolecule and distribution of oxygen between functional groups.

Agu Aarna was one of the pioneers of shale oil chemistry. He was the first in Estonia (together with Karl Kask) to apply chromatography, the most popular modern method of analysis ever, in studies of the chemical composition of oil. Together with Harald Sillandi and Vilma Paluoja, respectively, methods of determining sulfur- and oxygen-containing functional groups in oil were worked out, also the distribution of oxygen between functional groups was determined and an explanation for the so-called unknown function of oxygen given.

Agu Aarna, together with the author of this article and Enn Siimer, also put forward an idea that shale oil represents a polyaseotropic system having no main component. This hypothesis evoked a series of investigations into aseotropy (Tiit Kaps), as well as the thermodynamics of solutions of associating compounds and the phase equilibrium of multicomponent systems (Hindrek Tamvelius, Aime Suurpere, Anti Viikna, Arkadi Ebber, Aare Ignat). The related works were initiated already by the writer.

In the 1960s the main trend of research Agu Aarna was engaged in included studies of the fundamentals of synthesis and production technology of polycondensation resins, as well as adhesion technology related problems. The highest value of pertinent works is probably adopting, together with Karl Kiisler, the principle of synthesis according to which the reactivity of components of a mixture is levelled off in such a way that the reaction proceeds in the presence of so-called complex former. It was just this principle that enabled development and implementation into production of so-called DFK-type adhesive resins synthesized from oil shale phenols. The

idea was further elaborated by Peep Christjanson, Tiit Kaps, Jüri Tanner, Kadri Siimer and Helle Lippmaa in their investigations. Later pertinent research was led by Karl Kiisler and Peep Christjanson.

In the mid-1970s, already at his rape age, Agu Aarna was faced with another interesting problem. Namely, upon pyrolysis of hydrocarbons construction metal suffers from intensive corrosion, so-called metal plaque. Agu Aarna together with Jüri Soone succeeded in finding an elegant technological solution to the problem and later, together with Jüri Teder, in determining also the mechanism of this process, consisting in an exothermic, actually explosive decomposition of an intermediate compound of the on-going chain reaction.

As a scientist Agu Aarna brought luck, especially in the first half of his creative period. He achieved results somehow elegantly, with no obvious effort. Therefore it seemed as if these emerged *per se*. Of course, this impression was deceptive. Agu Aarna achieved nothing without work, but he did not work much in vain. It was just the rare ability of his – the habit of rationally setting a goal – that spared him ineffective work.

In scientific acitivities Agu Aarna relied much on his assistants and students. And he was good at choosing them and directing their work. He not only trusted his students – under his supervision more than 40 PhD theses were defended, but was also demanding of them. He never advised students in details, but in principles. He neither thought nor worked for students, he let them think and do work themselves. He told the students to be dis-seminators of his ideas, not blind followers. Therefore it is quite natural that several of his students have gained success in entirely different areas.

As a university teacher Agu Aarna was famous for his lectures. He connected them with research activities, presenting even the most complicated problems in a simple and logical manner, yet disputatiously and excitingly, in his own way. At lectures he kind of verified his scientific arguments. The students breathlessly listened to these lectures as a thriller.

Agu Aarna's personality and abilities were probably best revealed by his activity as an organiser. He was one of the few leaders who make things move as if *per se* and are able to show the most rational way to outcome, so that everyone involved believes the idea to be his own.

Agu Aarna was an optimist, a man of action, to whom prattling and com-plaining were unfamiliar. He made no decisions in a rush and, once taken, did not like to change them. Yielding to any pressure was in contradiction with his nature. He always suggested trust with practical attitude and even temper, but if needed, also with persistence, resoluteness and determinedness.

We all need also today the steadiness, courage to take decisions, and optimism that were inherent in Professor Agu Aarna.

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