

Prof. Dr. Simeon Oka
80th Anniversary
56 Years of Scientific Activity
20 Years Acting as the Editor-in-Chief
of the Journal *Thermal Science*



The Laboratory for Thermal Engineering and Energy, Vinca Institute of Nuclear Sciences, and the Society of Thermal Engineers of Serbia have the pleasure and honor to present this Special Issue of the journal *Thermal Science* dedicated to the celebration of the 80th anniversary of Prof. Dr. Simeon Oka, Editor-in-Chief, and to his 56 year-long scientific activity. This year we also mark the 20th anniversary of the publication of the journal *Thermal Science*, initiated by Prof. Simeon Oka, the Editor-in-Chief.

Prof. Simeon Oka has profoundly influenced the scientific profile of the Laboratory for Thermal Engineering and Energy and its development during many years, and he has also influenced the professional and, to some extent, personal lives of many of us during our joint activity and co-operation over the past years.

Acting upon his personal wish, we have invited a large number of internationally reputed scientists who have been in close research collaboration with Prof. Simeon Oka for many years, to send their contributions for this issue. Many of them have been personal friends of Prof. Simeon Oka since the days of their youth. We are deeply grateful to Prof. Bo Leckner, Acad. Vladimir Nakoryakov, Prof. Anatolii Burdukov, Prof. Viktor Terekhov, Prof. Arun Mujumdar, Prof. Edward Anthony, Acad. Gligor Kanevce, Prof. Jovan Jovanović, Prof. Mladen Stojiljković, and Prof. Vladimir Stevanović for their valuable contributions.

In addition to invited papers, this issue comprises a number of scientific papers written by the members of the Laboratory for Thermal Engineering and Energy and the Faculties of Mechanical Engineering of Belgrade and Nis (many of them have been Prof. Oka's Ph. D. students), covering the topics in which Prof. Simeon Oka made the major scientific contribution and the topics initiated by him working as a project manager or mentoring/supervising many M. Sc. and Ph. D. theses.

Due to the limited volume of this special issue, we apologize to many close research colleagues of Prof. Simeon Oka who did not have an opportunity to be involved in this issue.

Prof. Simeon Oka was born on October 3rd, 1935, in Belgrade in a highly educated family, to father Nikola Oka, a university professor, and mother Milana. His sister Olga was a lecturer of French. As an outstanding student of the Faculty of Mechanical Engineering of the Belgrade University, he received a scholarship from "Boris Kidrič" Institute of Nuclear Sciences in Vinca, Belgrade, graduated in 1960 and the same year he started his scientific career in the Laboratory for Reactor Thermal Engineering (today's Laboratory for Thermal Engineering and Energy). He upgraded his knowledge in internationally reputed scientific institutions, twice – in Laboratory for Fluid Mechanics, University Orsay, Paris (1964/1965), and in the Institute of

Thermophysics, the Siberian branch of USSR Academy of Science in Novosibirsk during 1968/1969. Simeon Oka defended his M. Sc. thesis in 1966 and Ph. D. thesis in 1971 in fluid dynamics at the Faculty of Mechanical Engineering of Belgrade. In the period 1976-1980 he was director of the Laboratory for Thermal Engineering and Energy. In 1986 he became a scientific advisor of the Vinca Institute of Nuclear Sciences and the same year he was elected a full professor at the Faculty of Mechanical Engineering of the University of Belgrade.

Prof. Simeon Oka retired in 2002 after 42 years of intensive scientific activity dedicated to thermal processes (fluid mechanics, heat and mass transfer and combustion) in the Laboratory for Thermal Engineering and Energy, always supported by his family – his wife Jasmina, a university professor of biochemistry, and his sons Vladimir and Nikola, both engineers.

Prof. Simeon Oka was elected a full member of the Serbian Scientific Society in 1996, and a full member of the Academy of Engineering Sciences of Serbia in 1999. In 2012 he was elected a foreign member of the Macedonian Academy of Sciences and Arts.

After his retirement in 2002, Prof. Simeon Oka dedicated his scientific activity to energy efficiency and he was appointed as *Director of the National Energy Efficiency Program* (2001-2009) of the Ministry of Science and Technology Development of the Republic of Serbia (he was also the *Chairman of the Expert Group for Energy Technologies and Mining* in the period 1991-1995 and the *Chairman of the Expert Board for Energy Efficiency*, 2009-2010). As Director of the National Energy Efficiency Program he coordinated the formulation of the R&D Scientific program aimed to increase energy efficiency and use of renewable energy sources in the whole chain, from energy generation to final energy consumption, in the periods 2001-2005 and 2005-2009. At the same time, he was a member of several expert groups for preparing strategic documents for the development of the Serbian energy strategy and increase of energy efficiency.

Since 2009 Prof. Simeon Oka has been a member of the International Scientific Committee of the Conferences on Sustainable Development of Energy, Water and Environment Systems and a member of the Advisory Board of SDEWES Center in Dubrovnik, Croatia.

In 1960, at the time when Prof. Simeon Oka started his scientific activity, the research staff in the Laboratory for Reactor Thermal Engineering consisted of two groups: a group of internationally experienced researchers having deep knowledge of the current research of the heat and mass transfer processes in gas and water cooled nuclear reactors, and a group of young graduated engineers, full of enthusiasm, including Simeon Oka. Being involved in the fundamental research of flow and heat transfer in gas cooled reactors, for almost 10 years Simeon Oka investigated complex laminar and turbulent boundary layer flows in complex geometries, and flows with closed vortex regions, especially flows around single cylinder and group of cylinders, as the basis for enhancing heat transfer in exchangers with tube bundles in cross-flow. He designed, constructed and built two experimental aerodynamic channels equipped with modern measuring methods and formulated long-term research programs.

His investigations were focused on near-wall turbulence using hot-wire anemometry (specifically on evident influence of wall proximity on measurements) and on flow structure between cylinders in cross-flow. As a result of intensive research, the advanced, new knowledge of wall influence and flow field between cylinders was published in 1972 (*DISA Information*, No. 13, May 1972, pp. 29-33, *DISA Information*, No. 15, Oct. 1973, pp. 21-24, and *Int. J. Heat and Mass Transfer*, Vol. 15, 1972, pp. 279-299). The above-mentioned papers have been cited many times (up to now).

At the end of the 1960s, the state made a decision to shift research from nuclear energy technology to the heat and mass transfer processes in conventional, advanced and modern energy technologies and other industrial applications in process and chemical industry. The Laboratory had to define a new research program and development strategy. Most of the

leading researchers from the Laboratory were assigned other duties and, therefore, a group of younger leading researchers, including Dr. Simeon Oka, prepared the strategy and the long-term research program of the Laboratory. The aim of the program was the co-operation with industry for the improvement of the existing technologies, development of new technologies and implementation of the best ones. In order to accomplish this difficult task, the following research activities were proposed as necessary:

- oriented fundamental research in fluid mechanics, thermodynamics and combustion, in order to understand and solve complex problems of heat and mass transfer in advanced industrial equipment and processes, including complex geometries, turbulent flows, high temperature multiphase, multi-component fluid flows, with or without chemical reactions, *etc.*,
- technology development through applied research, including experimental research on laboratory and pilot installations (small and middle scale), and on large scale demonstration and industrial installations, and
- intensive international co-operation, in order to learn, use and implement internationally achieved knowledge in fundamental and applied research and technology development.

This concept of applied scientific research was promoted by Prof. Simeon Oka throughout his professional career. As a team leader of the group dealing with industrial processes in the period 1972-1976, he formulated, proposed and realized, with a group of younger colleagues, the oriented fundamental research project *Flow, Heat and Mass Transfer in Gas-Solid Particulate Systems*, and established a very successful co-operation with numerous industry partners. Based on the fundamental knowledge achieved in this project and extensive experimental research, including determination properties of granular and powdered materials, successful industrial pilot installations were developed for the investigation: (a) atmospheric fluidized bed combustion, (b) drying of granular agriculture products and other powdered solid materials, and (c) pneumatic transport, storage and dosing of different granular/powdered materials. Subsequently, based on those investigations in the Laboratory, several new technologies were implemented in industry – FBC furnaces, drying equipment and equipment for pneumatic transport of granular materials.

In the period 1976-1982, with his research team, Prof. Simeon Oka formulated, proposed and realized the oriented fundamental and R&D project: *Investigation of High Temperature Gas Flows*. Several laboratory installations for the generation and diagnostics of high temperature gas flows were designed and constructed. The project generated new knowledge necessary for the future work on industrial high-temperature processes. Even more, he initiated and established long lasting successful international co-operation in this field, *Transport Phenomena in Single- and Two-Phase Flows at High Temperatures*, with the Institute of Thermophysics of the Russian Academy of Sciences, Siberian Branch, Novosibirsk. The results of the joint research activity were published in three books of papers, in 1982, 1986, and 1990, edited by Acad. S. S. Kutateladze, Acad. V. R. Nakoryakov, and Prof. Simeon Oka. Due to continuous support and success of this scientific co-operation, in 1994 Prof. Simeon Oka was elected an honorary member of the Scientific Council of the Institute of Thermophysics in Novosibirsk, and a member of the editorial boards of the *Russian Journal of Engineering Thermophysics* and *Journal of Aerothermomechanics*.

As director of the Laboratory for Thermal Engineering and Energy (in the period 1976-1980), Prof. Simeon Oka initiated and established international co-operation with Institute of Fluid Mechanics of the Technical Faculty of the Friederich-Alexander University Erlangen-Nuremberg, Erlangen, Germany – LSTM, which was also financed by the Government of the Federal Republic of Germany. Through the co-operation, a new measurement method Laser Doppler Anemometry – LDA, was implemented for the diagnostics of high temperature turbulent flows, and mathematical and numerical models and software codes

were developed for the computation of momentum, heat and mass transfer in different processes with turbulent flows (Computational Fluid Mechanics – CFD). Based on this co-operation, specific mathematical models and numerical codes were developed for simulation, calculation, parameter influence analysis and optimization of momentum, heat and mass transfer processes and combustion within different experimental and pilot installations, reactors and industrial equipment. In the Laboratory, the CFD simulation became a useful additional tool for optimization of complex momentum, heat and mass transfer processes, and modern engineering design method, whose importance and applicability increased through time, especially for new technology development.

Prof. Simeon Oka initiated, proposed and realized, with a group of younger colleagues, a research and development project (in the period 1980-2002) aimed to investigate combustion of coal, waste fuels and biomass in fluidized bed, and oriented to development of this new, clean, combustion technology. Under leadership of Prof. Simeon Oka, laboratory and pilot experimental installations were designed and built and extensive experimental results were obtained. Mathematical and numerical models for simulation of two-phase flow, heat and mass transfer including combustion processes in fluidized bed and optimization of the furnaces parameters were developed and verified by experimental results in pilot and demonstration plants. New research methodology was defined for determination of solid fuel properties relevant for the design and calculation of the fluidized bed combustion industrial furnaces, optimization of parameters, and for determination of optimum working regimes. Successful co-operation with industry was established and the first implementation of industrial fluidized bed furnaces and boilers was achieved in 1982, followed by the production of FBC furnaces and boilers in industry. Prof. Oka summarized the results of these long-term investigations in a number of papers and in the monograph FLUIDIZED BED COMBUSTION – Processes and Application, published in 1994 in Belgrade by the Society of Thermal Engineers of Serbia (in Serbian). The English version is published by Marcel Dekker, New York, USA. in 2003.

Prof. Simeon Oka received the October Scientific Award of the City of Belgrade twice. In 1986, with his research team, for the Development of Fluidized Bed Combustion Technology, and in 1994 for the book Fluidized Bed Combustion – Processes and Application.

International activities of Prof. Simeon Oka resulted in the membership (in the period 1985-2003) of the Laboratory for Thermal Engineering and Energy in *Implementing Agreement of the OECD countries for development of FBC technology* under auspices of the International Energy Agency. In the period 1985-2002, Prof. Simeon Oka was a member, and in the period 1989-1990, he was the Chairman of the Executive Committee of the Implementing Agreement, which had an important role in the dissemination of the knowledge on this new combustion technology. In the field of fluidized bed combustion, Prof. Simeon Oka also established a successful scientific co-operation with the Chalmers Institute of Technology in Gothenburg, Technical Faculty of Aachen and Likov Heat and Mass Transfer Institute of the Belarus Academy of Sciences.

In order to disseminate knowledge in the countries of the region, in 1998 Prof. Simeon Oka had initiated a regional co-operation: *Implementing Agreement for co-operation with the aim to research, develop and implement new energy efficient and ecologically acceptable technologies applied to energy production, chemical and environmental engineering of the South-East European Countries*, signed in the Vinca Institute of Nuclear Sciences, Belgrade, by 18 scientific institutions from the South-East European countries. Within this Agreement, five symposia were organized in the period up to 2002.

One of the important characteristic of the scientific activity and personal character of Prof. Simeon Oka is his permanent care for education of young researchers and transfer of his ideas and knowledge to his co-workers. In parallel with participation in and organization and

supervision of the research activities in the Laboratory for Thermal Engineering and Energy, Prof. Simeon Oka had an active role in education of graduate and postgraduate students and supervision of numerous M. Sc. and Ph. D. theses (10 M. Sc. theses and 16 Ph. D. theses in the fields of turbulent flows and fluidized bed combustion), at the faculties of mechanical engineering of Belgrade, and Nis in Serbia, and Skopje and Bitola in Macedonia.

Prof. Simeon Oka initiated and was the first lecturer (in the long period from 1972 to 1998) of the academic course: *Incompressible Turbulent Flows* at postgraduate studies at the Faculty of Mechanical Engineering, and he was also a lecturer of undergraduate and postgraduate courses at the Faculty of Transport and Traffic Engineering at the University of Belgrade and the Faculty of Mechanical Engineering of the University of Skopje, and the Technical Faculty of the University of Bitola.

Prof. Simeon Oka always pointed out that there should be no restrictions for international scientific communication and that researchers should struggle against barriers that restrict international scientific co-operation. (This opinion has been accepted by the international community since the 1960s when the leading researchers from Laboratory for Thermal Engineering and Energy, of the “Boris Kidrič” Institute of Nuclear Sciences, together with the leading international scientist in the field of heat and mass transfer, initiated in 1968 and later on established the International Center on Heat and Mass Transfer – ICHMT, which was situated in the Institute up to 1992. ICHMT successfully organized many international conferences on different topics in heat and mass transfer, which gathered scientists from all over the world). Due to international sanctions imposed against Yugoslavia in May 1992, which caused extreme problems for the scientific research institutions in Yugoslavia, including barriers for their international co-operation, in 1994 Prof. Simeon Oka initiated the publication of one issue per year in English of the Journal *Termotehnika* (published in Serbian by the Vinca Institute of Nuclear Sciences), and in 1996 he initiated and started editing the international journal *Thermal Science* with scientific papers from the relevant international community. Despite numerous difficulties and barriers, Prof. Simeon Oka, full of enthusiasm and energy as ever, and thanks to his excellent personal contacts and supported by relevant international research colleagues, with systematic work, with his special capability to organize, motivate and gather creative members into an excellent executive team, managed to pass a long way and to create an exceptional International Scientific journal with a brand name *Thermal Science*. Since 1996, Prof. Simeon Oka as the Editor-in-Chief has been the main creator of the amazing success and high reputation of the International Journal *Thermal Science*, which has been on SCI list since 2009, with a constant increase of the number of published papers and Impact factor value. In 1997 two issues were published per year, while in 2015 five issues and two supplements were published, and the Impact factor for the year 2014 was 1.222, resulting in the first half position on Thomson list of relevant scientific journals.

We wish Prof. Simeon Oka good health, many more joyful moments with his family and continuation of his professional life!

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Guest Editor

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