

# In Memoriam

## Academician Stefan Borisov Vodenicharov



On Monday 8th of June 2020, Acad. Stefan Vodenicharov passed away at the age of 75.

Acad. S. Vodenicharov was born on September 01, 1944 in Sofia. In 1963, he has completed his secondary education at the Mechano-Technical School of Sofia. At that time, Acad. S. Vodenicharov has felt his first inspirations in metal science and technology of metals, which have become later his destiny. Afterwards, in the late 1960s, as a student in the Faculty of Machine Technology at the Higher Institute of Mechanical and Electrical Engineering (now, Technical University of Sofia), he has directed his interests in the field of Dynamic Properties of Materials. In 1968, he has taken his M. Sc. thesis – the specialty “Technology of Metals”, M. Sc. in Mechanical Engineer.

The professional carrier of Acad. S. Vodenicharov started in 1968 as a technologist in the Central Scientific Research Institute of Machine Building. Shortly after that in 1969, he started working as an engineer and in 1970 as a research fellow in the Institute of Metal Science and Technology of Metals (now, Institute of Metal Science, Equipment and Technologies with Hydro- and Aerodynamics Centre “Acad. Angel Balevski”) at the Bulgarian Academy of Sciences. In fact, Acad. S. Vodenicharov starts his real research in the field of Dynamic Properties of Materials with the development of his Ph. D. thesis at the above mentioned Institute. He has defended his thesis entitled “Impact of High-Velocity Deformation on Mechanical Properties and Plastic Forming of New Alloys, Cast by Method of Counter-Pressure Casting” under the guidance of Prof. H. Kortenski in 1974. The papers published in connection with the thesis have been highly evaluated. After the defiance of his Ph. D. thesis, for few years, he has succeeded to organize a group of young talented engineers and mathematicians, some of them Ph. D. students, who have been enthusiastic in studying the actual problem in global aspect for behavior of metal bodies under dynamic loading. In 1983, Acad. S. Vodenicharov has become an Associate Professor and a Head of the Laboratory “Mechanical Testing of Materials” (1982–1986), a Head of the Scientific Section “Strength and Fracture of Materials” (1986–1991). A great number of papers have been published during this initial period, some of which entered his second thesis for obtaining the scientific degree “Doctor of Technical Sciences” in Fracture of Mechanics in 1991. This fundamental work

entitled “Dynamic Fracture of Metals and Alloys” is dedicated to the development of the knowledge of dynamic fracture of metal structures, i. e., studying the strain-stress state of metal structures, the criteria for brittle and plastic fracture, methods and devices of metals testing, determining the degree of radiation embrittlement of reactor steels and its influence on the change of toughness of metal structures and some others. For the first time, in these studies, the influence of velocity of plastic deformation is taken into account in determining the two-dimensional surfaces of plasticity, and original models for deformation hardening are suggested; the J-integral for nonlinear processes of cracks propagation is defined at the criteria for brittle and plastic fracture; original methods and devices of testing of metals are proposed, including for: testing at high-velocity loading, determining the dynamic crack resistance; recording the residual pressures of first species; method of testing the dynamic behavior of metals, method of microstructure studying the dynamic plastic location and some others. Parts of these studies have formed his habilitation work for obtaining the Professor position in 1998. He is a founder and a Head of the Scientific Section “Technologies and Systems for Protection” from 1991.

Acad. S. Vodenicharov has extended his scientific interests to the research of the degree of radiation impact on the reactor steels and has developed methods of determining: the degree of radiation embrittlement; the dynamic crack resistance, using neutron generator; the rest lifetime of vessels of nuclear reactors. The influence of nickel at embrittlement of reactor steels has been found, and a program for its observation in units 5 and 6 of NPP “Kozloduy” developed. Scientific studies of Acad. S. Vodenicharov for determination of the operational rest lifetime of reactors and steam-generators of units 5 and 6 of NPP “Kozloduy” are particularly significant, as well as the patented methods and the developed devices of radiation cleaning, applied in units 1 and 2 during their out of operation.

After that, his research has taken a new direction with main applications in the national security and defense. Acad. S. Vodenicharov, as an expert, has actively participated in the elaboration of the national strategies for the development of the defense industry and the scientific researches to it. He is the author of a number of developments: the elaboration of intelligent devices for protection and security; armors for protection against kinetic and cumulative ammunition; increasing the protection of light and heavy armored vehicles; devices for ballistic protection, including individual, high-tech sensors for wide application in different fields – industry, transport, energy, environment and security, and highly intelligent (stealth) coatings. His powerful scientific activity has been estimated in time and in 2004 he was elected for a Corresponding Member of the Bulgarian Academy of Sciences. Eight year later, namely in 2012, his organizational abilities and exclusively active purely scientific work have been awarded for second time and he was elected for an Active Member of the Bulgarian Academy of Sciences.

The diligence and scientific results of Acad. S. Vodenicharov have been estimated and he was elected as a Deputy Director (1991–2007) and as a Director (2007–2012) of the Institute of Metal Science, Equipment and Technologies with Hydro- and Aerodynamics Centre “Acad. Angel Balevski”. He has significant contribution to establishing the leading position of the Institute in the structure of the Bulgarian Academy of Sciences as well as within the Bulgarian research on metal science and technology for machine- building materials; methods of controlling and testing the materials, products and equipment; technologies, machines and systems of processing the materials by plastic deformation; mechanics of solid body fracture. Since December 2012, Acad. S. Vodenicharov is a President of the Bulgarian Academy of Sciences. Now, his efforts are aimed to that the Bulgarian Academy of Sciences with its activities and behavior to confirm its prestige and role not only of the oldest and complex scientific institution in our country, but also of the one of the main and leading cultural institutions in modern Bulgaria.

Acad. S. Vodenicharov has written two monographs, both in Bulgarian: “Dynamic Fracture of Metal Structures” and with co-author Dimitar Angelov “Protection of Ports”. The books can be used both as graduate textbooks for students and reference monographs. The scientific papers of Acad. S. Vodenicharov are more than 260, from which more than 120 are published in refereed journals, including those with impact factor. The considered problems are mainly in the area of mechanical properties of materials, an assessment of the rest lifetime of the vessels of nuclear reactors, new defense products and systems. Thirteen Ph. D. theses have been defended under the guidance of Acad. S. Vodenicharov. He possesses lecture courses on “Metal Science and Testing of Materials” in the Technical University of Sofia, and in the University of Chemical Technology and Metallurgy – “Technologies and Devices for Protection of the Critical Infrastructure during Crisis”.

Acad. S. Vodenicharov is author and co-author of 71 patents in the field of materials testing and the defiance technologies, most of them introduced in practice. He has organized and performed a great number of scientific and applied researches and more than 215 contracts with international, foreign and domestic institutions. Acad. S. Vodenicharov is a Co-Director of two workshops of NATO on cutting-edge technologies, a Chairman of Organizing Committees of 9 International Scientific Conferences, a member of Organizing Committees of 36 International and National Scientific Forums.

From 1992, Acad. S. Vodenicharov is Editor-in-Chief of the “Journal of Materials Science and Technology” and from 2006 of the journal “Science”, he is as well a member of the Editorial Boards of journals “Engineering Sciences”; “Materials Science and Technology”, United Kingdom; “Strength of Materials”, Ukraine; “Metallurgy and New Materials”, Romania.

Acad. S. Vodenicharov is a representative of Bulgaria in NATO Land Groups 7 and 9, and NATO Research and Technology Board; an expert in International Atomic Energy Agency; an estimator in III and IV Framework Programs of the EC; a member of the Council of Education and Science at the President of the Republic of Bulgaria; a member of the Commission on Nuclear Safety at the Nuclear Regulatory Agency of Bulgaria; a President of the National Economic Council, Bulgarian Industrial Chamber; a Co-Chairman of the Bulgarian Defence Industry Association; a Chairman of the Qualification Body for Non-destruction Control of “Kozloduy” NPP. Acad. S. Vodenicharov is a membership of the American Society of Metallurgy, American Institute of Aeronautics and Astronautics, American Chemical Society, American Society for Testing of Materials, Aerospace and Defence Industries Association of Europe.

Acad. S. Vodenicharov possesses an extreme sense for scientific novelty and problem importance, which has helped him to foresee the problem solution and its further implementation. His working capacity and thoroughness are eminent, which is confirmed by the great number of citations and reviews. He is also a famous teacher in metal science, as his descendants have become well-known researchers and/or professors in the Republic of Bulgaria.

For his contributions to the development of the science and the education he was elected for a Doctor Honoris Causa of the Technical University of Varna, as well as he was awarded with Badge of honor “Marin Drinov” for services rendered to the Bulgarian science; Badge of honor of the Ministry of Economics for inventive activities; Badge of honor of the Ministry of Defence for services rendered to the defense technologies; Diploma for entry into the “Golden Book of the Bulgarian Inventors” of the Bulgarian Patent Authority; The Big Prize of the Bulgarian Industrial Chamber for results achieved in creation of high-tech products in the field of national security.

You can pay your last respects in the big hall of the Bulgarian Academy of Sciences on 11.06.2020 from 11:00.