IN MEMORY OF STEFAN CZARNECKI, MAN AND SCIENTIST

The outstanding Polish scientist, in the field of acoustics, Prof. Dr. Stefan CZARNECKI died in Warsaw on 1 September, 1982. Stefan CZARNECKI was born in Warsaw on 20 September, 1925. In 1945 he began his studies at the Gdańsk Technical University, to graduate in 1949 from its Electrical Engineering Department (Radiotechnology Section), achieving the M. Sc. degree with his dissertation *The scaling of dynamic microphones by the reversibility method.* After working a few years at the Central Laboratory of the Polish Radio and at the Warsaw Technical University, in 1953 he began to work at the Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw. In 1959 he achieved his D. Sc. degree from the Scientific Council of the Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, for his dissertation *The irregularities of acoustic behaviour in enclosures.* In 1965 he received his habilitation at the Institute of Fundamental Technological Research, for his dissertation *The interaction of Helmholtz resonators with the surrounding medium* and in 1966 he was nominated assistant professor. In 1963-1974, he worked at the Institute of Automation, and subsequently at the Institute of Organization and Management, Polish Academy of Sciences, as head of the Analogy Department. Since 1974 he has worked at the Institute of Fundamental Technological Research, Polish Academy of Sciences, as head of the Aeroacoustics Department. In 1972 he was nominated professor by the State Council and full professor in 1980.

The rich output of Prof. Stefan CZARNECKI's thirty years of scientific research includes more than a hundred publications on subjects related to a variety of fields of acoustics. He has done research in the problems of aerodynamic sound generation, noise control in industrial halls, room acoustics, acoustic screen theory and the identification of sound sources and acoustic energy transmission paths.

His doctoral dissertation already indicated his outstanding researcher's intuition. In this investigation he found and showed the existence of the transient distortions of acoustic behaviour in halls which had not been known before. This discovery became the starting point for further extensive investigations in this field, which have worked towards the development of new criteria for the evaluation of the acoustics of concert halls.

In his habilitation dissertation, on the basis of the fundamental mathematical relations between the laws of reflection and acoustic wave radiation, Stefan CZARNECKI presented analytically the effect of the interaction of the resonator with the surrounding medium. The results obtained he gave in the form of equivalent circuits used in automation. As a result of the relationships derived, he considered theoretically the effect of the surrounding medium on the absorbing properties of Helmholtz resonators in the plane wave field. Subsequently he performed experimental research which fully confirmed his theoretical considerations. The results obtained permitted the explanation of a large number of phenomena occurring in the work of the resonators and can be useful in a variety of fields of acoustics, particularly in noise control.

His other investigations, performed in cooperation with the Institute of Mechanics and Vibroacoustics of the Academy of Mining and Metallurgy, Cracow, have covered a wide range of problems related to the identification of sound sources and vibroacoustic energy propagation paths in various industrial plants. Prof. CZARNECKI has developed a new method for the identification of sound sources which is based on the nearfield methods using the correlation and phase methods, and also the pulse method which has for the first time permitted a practical division of the propagation paths in simple technological systems. He has propagated and developed the methods of energy evaluation of the radiation of surface sound sources, particularly plate systems, seeking significant relationships between the radiated acoustic energy and the vibration of the surface of the source. He has been one of the first in the world to consider the problem of quantitative evaluation of the acoustic field distribution under the conditions of the quasi reverberation field, introducing the method of SPL drops. This method is now used effectively in quantitative evaluation of the acoustic radiation power of sources, eliminating the necessity of reverberation time measurements. Thus the investigations supervised by Prof. CZARNECKI have covered a wide range of the problems of the identification of sound sources and sound transmission paths, both with simple and the complex sources which occur in real industrial conditions.

Prof. CZARNECKI has closely cooperated with a number of research centres in Poland, including the Institute of Mechanics and Vibroacoustics of the Academy of Mining and Metallurgy, Music Academy in Warsaw, the Main Mining Institute in Katowice, Poznań University and Gdańsk Technical University. This cooperation took various forms: common investigations, consultations, seminars and lectures on chosen problems of acoustics.

For a number of years he has had regular lectures on acoustics in Music Academy, Warsaw, and the Engineering School. He has cooperated with Warsaw and Gdańsk Technical Universities. He has tutored a great many M. Sc. degree holders and supervised dozen-odd doctoral dissertations.

One should stress particularly the broad international cooperation in which he has been engaged. He has represented Poland at a large number of

scientific conferences, including the Ist Congress of the Federation of Acoustic Societies of Europe in Paris in 1975, where he delivered the main paper *Acoustic silencers of exhaust noise in industrial installations*. He has also participated in the organization of a number of important international scientific meetings.

His most significant achievements have included the organization of the IInd FASE Congress in Warsaw in 1978 and the International Conference INTER NOISE 79 in 1979. Prof. CZARNECKI has been an active member of the Executive Board of the International Institute of Noise Control Engineering. He has also been a member of the Scientific Council of the International Centre of Building Acoustics of the Council for the Mutual Economic Aid in Bucharest and in 1980 he was nominated *Fellow* of the Acoustical Society of America. The international status of Prof. CZARNECKI is also indicated by his nomination to the session chairman at scientific conferences, e.g. the ICA Congress in Sydney, INTER NOISE conferences in Zurich, San Francisco and Amsterdam.

His activity in noise and vibration control in Poland has been particularly significant and fruitful. In 1970, at the initiative of Prof. S. CZARNECKI and Dr. Cz. PUZYNA, the head of the Committee of Science and Technology set up a team of experts to develop means of noise control in order to diminish the annoyance of industrial noise in Poland. As a result of the work of this team headed by Prof. CZARNECKI, in 1971 the Council of Ministers passed Law 169 on noise control in places of work. The passing of this Law was the turning point in noise abatement in Poland.

Since 1964, first every four years and later on every three years, Prof. CZARNECKI has organized national scientific conferences, with foreign participation, on noise control. These conferences were held in 1962, 1970, 1973, 1976 and 1979 (including the INTER-NOISE 79 Congress). He also co-organized the NOISE CONTROL 82 Conference in Cracow in 1982.

In 1960-1964 Prof. CZARNECKI was the Secretary of the Acoustics Section of the Committee on Electronics and Telecommunication, Polish Academy of Sciences.

From 1964, when the Committee on Acoustics, Polish Academy of Sciences was founded, he was its Scientific Secretary and since 1975 he has been vice-president of the Committee. In 1963 he was one of the member-founders of the Polish Acoustical Society and its vice-president in 1967-1971.

Prof. CZARNECKI was the founder and since 1966 the Editor-in-chief of the quarterly of the Polish Academy of Sciences, *Archiwum Akustyki*; and, since 1976, also its English version *Archives of Acoustics*. He was a member of the State Council for the Protection of the Environment and of the scientific councils of a number of institutions.

As follows from the above short review of the activities of Prof. Stefan CZARNECKI, he has always been at the very centre of what has been happening in Polish acoustics. He has been considered the true "spiritus movens" of the acoustical community and has enjoyed an enormous status. This was the effect

of the extraordinary features of his character. Of himself Prof. CZARNECKI used to say, "It is by no accident that I have devoted myself to acoustics. Acoustics originates from physics and motion is a typical property of physics. And motion is my element!". True, he has been motion itself: extremely active, quick in decision and always moving from place to place. Always full of initiative, he has been ready to take on and carry out all difficult tasks, inspiring with his enthusiasm his collaborators.

The enthusiasm and enterprise have also been typical of his private life. He has been vigorously engaged in sports and tourism. He was a co-author of a skier's guide to the Pieniny Mountains and an encyclopedic handbook on skiing. He has gone on long walks in the mountains. Early in his life he was fond of mountaineering, climbing high in the Alps, Pyrenees and in the Caucas mountains. All his life he has skied regularly. He has always been interested in the political and cultural life in Poland. He has always known about the latest artistic events. How he has managed to have enough time for all this has been his undisclosed secret and the object of his colleagues' envy.

However, it is not only his activity in life and science that has contributed to the very high authority of Stefan CZARNECKI. The main contribution has been the extreme righteousness of his character and his great, truly elemental support for people and matters. He has engaged himself in all actions he considered just and in which he has believed he has been able to assist. He has always tried to help people in need; has always been ready to devote part of his so extremely busy time to the problems of others: to a conversation or an arrangement of matters important for someone.

And there has still been another trait that has made him so outstanding: a tremendous, optimistic, as it were, will power. His friends have known him to say "let the weather beware" when the problem of accomodating trips to the weather arose. And, in effect, despite the unfavourable circumstances, he has rarely failed to carry out his plans.

In 1971, during his stay in the USA, he suffered from a grave disease, where it was necessary to amputate his two kidneys. But those who thought that this would curb his enterprise were much mistaken. Even in the convalescence period and in the long period when in all the weeks he had to spend two days in hospital undergoing dialyses, he resumed his full professional activity, making up for all the lost time.

After a successful kidney transplantation in 1973 he returned to a "normal" way of life, a life of activity above the average. And he has remained such until his very last day, never giving in to the weakening organism, never complaining of anything and never changing his plans.

In his departure Polish acoustics has suffered an irretrievable loss.

Zbigniew Engel
Andrzej Rakowski

Publications of Stefan Czarnecki

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2. *The significance of analogy in technology, Fundamental problems of modern technology* (in Polish), PWN, Warsaw 1957, pp. 235-271.
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6. *Electroacoustic elements. Guide to radio and tele-electrical engineering* (in Polish), PWT, Warsaw 1959, **B**, pp. 363-402.
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Patents

1. No. 59040 (2 September, 1975)
Method for selective absorption of acoustic waves
Co-authors: Michał VOGT and Mieczysław CZECHOWICZ
Patentee: Institute of Applied Cybernetics, Polish Academy of Sciences, Warsaw.
2. No. 143305 (26 June, 1981)
Sound absorbing and insulating acoustic barrier
Co-authors: Michał VOGT, Jerzy BOROWIAK, Ewa GLIŃSKA, Ryszard JANKOWIAK, Henryk JAŻDŻYK, Tadeusz MARGANIEC, Marian STEFANIAK and Czesław TRUSZCZYŃSKI
Patentees: Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, and Poznań Cable Products Company, Poznań.