ERNST RUDOL'F GEORG ECKERT

(ON HIS SIXTY-FIFTH BIRTHDAY)

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Professor Eckert was born September 13, 1904, in Prague (Czechoslovakia). Here he spent his youth and pursued his courses in a technical institute. In 1927 he received his diploma as an engineer, and in 1931 became a doctor of engineering sciences. After defending his thesis, he worked at the same institute, investigating radiant heat exchange in furnaces, and published his results in [1, 2].

In 1935, Ernst Eckert went to Danzig to work with Professor Ernst Schmidt, who at that time headed the engine laboratory. Interested in Schmidt's work on the thermal emission of solids and gases, in 1938 Eckert began to study thermal radiation. At the time the Schmidt laboratory in Danzig was famed for the skillful performance of experiments, and while he was working there, Eckert published several studies that are still in use. He gave a method for measuring the directional emission of metallic and nonmetallic surfaces [3], the directional reflectivity of surfaces facing an emitting blackbody, and also devised an optical projection method for determining the radiant exchange coefficients [5].

At the end of the Thirties, Eckert became involved with the study of gases, and did what is probably his most important work on radiation.

In 1937, he published data on the emissivity of carbon dioxide and nitrogen mixtures within a particular band as a function of the variation in the partial pressures and the thicknesses of the gas layer [6]. He showed that the Beer law can be applied to carbon dioxide at moderate pressures. Eckert, in conjunction with E. Schmidt, published his results [7] on the emissivity of water vapor, which showed a discrepancy between the previous values of Schmidt and the results of Hottel and Mangelsford. It was later found that the Beer law is invalid for water vapor, and that the emissivity depends on the partial pressure. Eckert published his previous results on the properties of water vapor in [8].

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In 1938, Eckert followed Schmidt to Braunschweig. There he held a position as assistant professor in the Technological Institute, and became chairman of a section in the recently created aeronautics organization. During this period, Eckert concentrated on the study of forced convection at external surfaces. He made a great contribution to this field. Eckert and Drewitz [9] found that for high velocities and constant flow properties, the heat-transfer coefficient can be found from the same expression used for heat transfer at low velocities, when allowance is made for the difference between the true and adiabatic wall temperatures; this conclusion is applicable to both turbulent and laminar flows. To measure the adiabatic wall temperature, Eckert developed a cylindrical thermometer [10]. Together with Wise, he determined the recovery coefficients for laminar and turbulent flow past a cylinder [11]. Eckert developed an important approximate method for determining heat transfer in a two-dimensional flow [12]. The Eckert number, which characterizes the temperature increase owing to adiabatic compression, was named after him in honor of his work in the field of heat exchange in high-velocity flows.

In 1943, Ernst Eckert returned to Prague, to the Technical Institute, where he took the position of Professor at the Thermodynamics Institute. He abandoned his academic work in Braunschweig, but continued to work in the Scientific Research Institute for Aeronautics.

Eckert came to the United States in 1945, working as a consultant in a power laboratory between 1945 and 1949.

Eckert participated actively in the design and development of the Mach–Zehnder interferometer. Together with Zoengen, he investigated free convection at the surface of horizontal tubes and vertical plates [13].

In 1949, Doctor Eckert went to Cleveland, where he worked as a consultant in the compressor and turbine section of the Lewis Laboratory, and at the National Consultative Committee on Aeronautics. In addition to his consulting work, he continued to investigate free convection, as well as forced-convection processes.

In 1951, Eckert returned to teaching and research, taking a position as Professor of Mechanics at the University of Minnesota. In 1955, he became Director of the Department of Thermodynamics and Heat Transfer, and also directed the Heat-Transfer Laboratory.

During the past 18 years at Minnesota, Eckert has worked in various areas: convective heat exchange in round and nonround channels, mass transfer in cooling, thermal radiation, film cooling, interferometer studies of free convection, heat exchange at high temperatures, heat exchange in rarefied gases and its analog with thermal radiation, heat exchange in plasma, the influence of mass diffusion and the thermodiffusion effect, the influence of free-flow turbulence on heat transfer, mass transfer in suspensions, and the measurement of transport properties.

He has recently been occupied with problems of heat and mass transfer associated with bionics.

We, who have worked directly under Doctor Eckert at Minnesota, cannot impartially evaluate the importance of this work. It is best to leave that to others. We know that we willingly share the severe climate of Minnesota with the students and others who wish to become associated with Professor Eckert and his laboratory. Professor Eckert has written five books in German, two of which have been translated into Russian. In English he has published Introduction to the Theory of Heat and Mass Transfer, McGraw–Hill, 1950, Heat and Mass Transfer (with R. M. Drake), McGraw–Hill, 1959, and Introduction to the Theory of Heat and Mass Transfer (translated by J. P. Gross), McGraw–Hill, 1963.

Professor Eckert is also a splendid teacher and experimenter. In 1965, he received teaching awards from the Institute of Technology of the University of Minnesota and from the Western Electric Company, for his training of engineers. In 1961, he was awarded the Max Jacob medal. In 1966, Doctor Eckert was the first of five Professors at the University to be named Regent Professor by resolution of the Faculty Council.

He has not just been concerned with students and graduate students, but has gladly agreed to lecture to medical doctors and physiologists on the fundamentals of fluid mechanics and heat transfer. He has published more than 300 papers.

Professor Eckert has exerted an enormous influence on his students and associates. Under his guidance, twenty-five students have received Doctorates of Science; twenty-two of them remained to work at the University.

Professor Eckert is an active industrial consultant. He lectures at the University of Purdue. He participated actively in the creation of the international journal "Heat and Mass Transfer," and is now Co-chairman of the Honorary Consultative Editorial Council.

Those who know and work with Ernst Eckert realize that he is not just a great scientist but also a fine human being. The time that he generously spends with students and associates, his gentleness, fine sense of humor, and friendliness endear him to us. It is an inspiration to work with him.

We join his many associates and friends throughout the world in wishing Professor Eckert a long life and many years of creative activity.

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In September of this year, Ernst Eckert, an outstanding scientist in the field of heat and mass transfer, reached his sixty-fifth birthday.

Professor Eckert has made a large contribution to the science of heat transfer both in theory, and in the development of new experimental investigations.

In his honor, the Eckert number was named after him: this is found from the boundary conditions as the ratio of the temperature difference to the quotient resulting from division of the square of the characteristic velocity by twice the isobaric heat capacity.

The Eckert number is used to evaluate the proportion of viscous dissipation in heat-transfer processes.

Professor Eckert has visited the Soviet Union more than once, participating actively in three All-Union Conferences on Heat and Mass Transfer, reading lectures, and consulting both at the Institute of Heat and Mass Transfer of the AN BSSR and at other scientific establishments of the Soviet Union.

Speaking to the Third All-Union Conference on Heat and Mass Transfer, Professor Eckert said "I think that these conferences, in which so many scientists have participated, have been very fruitful. They have not only represented a major contribution to science, but also to the advancement of world peace."

The following works of Ernest Eckert have been translated into Russian:

1. E. R. Eckert, Introduction to the Theory of Heat and Mass Transfer, Gosénergoizdat, Moscow–Leningrad (1957), 280 pages.

2. E. R. Eckert and R. M. Drake, The Theory of Heat and Mass Transfer, Gosénergoizdat, Moscow–Leningrad (1961), 680 pages.

The Editorial Board of the Journal of Engineering Physics congratulates Professor E. R. Eckert on his birthday, and wishes him good health and more creative success – Editorial Board.

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MAJOR PUBLICATIONS

1. Hauptverein Atsch. Ingen. Mitt., 483-486 (1931).
2. Arch. Warmewirt, 13, 241 (1932).
3. Forsch. Geb. Ingen., 6, 175 (1935).
4. Forsch. Geb. Ingen., 7, 265 (1936).
5. Z. Ver. Dtsch. Ing., 79, 1495 (1935).
6. VDI, Forsch., 387 (1937).
7. Forsch. Geb. Ingen., 8, 87 (1937).
8. Techn. Strahlungsauschrechnungen, VDI Verlag, Berlin (1937).
9. Forsch. Geb. Ingen., 11, 116 (1938).
10. Z. Ver. dtsch. Ing., 84, 813 (1940).
11. Forsch. Geb. Ingen., 13, 246 (1942).
12. VDI, Forsch., 416 (1942).
13. USAF Technical Report 5747 (1948).
14. E. R. G. Eckert, Introduction to the Transfer of Heat and Mass, McGraw–Hill, New York (1950).
15. E. R. G. Eckert and R. M. Drake, Jr., Heat and Mass Transfer, McGraw–Hill, New York (1959).