Int. J. Heat Mass Transfer. Vol. 31, No. 7, pp. 1331–1333, 1988
Pergamon Press plc. Printed in Great Britain

Alexandr Adolfovich Gukhman on his 90th birthday

THE YEAR 1987 marked the 90th birthday and the 65th anniversary of scientific and pedagogical activity of the Honorary Editorial Advisory Board Member of the *International Journal of Heat and Mass Transfer*, Professor A. A. Gukhman, Doctor of Physical and Mathematical Sciences, Honoured Scientist of the Russian Soviet Federative Socialist Republic, one of the distinguished Soviet thermophysicists, now professor–consultant in the Department 'Processes and Apparatus of Chemical Engineering Technology' of the Moscow Institute of Chemical Machine Building.

A characteristic feature of his scientific work has been the wide range of scientific interests combined with deep and clear statements of the many problems posed. He has demonstrated the ability to perceive the physical mechanism of the various phenomena studied and to analyse the logical structure of available and newly developed theories. His most important works are well known both in the Soviet Union and around the world. A general account of his works till the year 1966 was given earlier in the note "To A. A. Gukhman on his 70th birthday" published in the *International Journal of Heat and Mass Transfer*, Vol. 10, pp. 1645–1648 (1967). Therefore, here attention will be focused on his research work during the past two decades.

Systematically and with unabating interest Professor A. A. Gukhman continued his studies on the development of the theory and methods of generalized analysis. He suggested a general method for determining the form of the governing variables which extends the range of the applicability of the results obtained. This method was termed the method of characteristic scales. The essential point underlying the application of this method is that variables are introduced not by trial and error or by intuitive guess, but in the consequence of the use of a certain series of operations [1, 2].

There has been a further advancement in his investigations on the mechanism of transfer phenomena in turbulent homogeneous flows and in the boundary layer wall region and of the relationships between the intensities of different kinds of transfer effects [3].

In the mid-1960s A. A. Gukhman advanced his idea about the use of non-uniform pressure fields artificially produced in the flow by suitably selecting the shape of the channel. The idea has turned out to be fruitful—several types of surfaces, distinguished by very high efficiency, have been suggested [4].

A special position in the scientific work of A. A. Gukhman is occupied by his investigations in the field of sublimation. The beginning of these studies dates back to the 1950s when he advanced the hypothesis about the discrete location of evaporation sites and the jet mechanism of vapour efflux. Since his works in this area are less known to those who do not specifically

IMT 31:7-A

deal with sublimation and were not surveyed in the earlier note, they will be considered here in more detail.

The site model for evaporation was constructed on the basis of theoretical considerations to explain specific features of transport processes in sublimation. The characteristic feature of the model consists in the jet character of the escape of the vapour phase being formed (the volume of which exceeds by 5–6 orders of magnitude that of the original solid phase), which is responsible for an extremely complex pattern of the flow of the gaseous phase permeated by a system of high-velocity jets. In the subsequent experiments of a number of research workers this hypothesis was largely confirmed and its many essential details were validated [5].

Further investigations were developed with the objective of establishing a quantitative theory for the working process of sublimation dehydration of biological and food products. This research has been vital for setting up those general principles that furnished the bases for various projects and constructions [6].

In addition to the above areas of research A. A. Gukhman supervised investigations into the heat transfer and hydrodynamics of two-phase media (gas–solid bodies) under the conditions of fluidization. Along with an experimental investigation of the local characteristics of fluidized systems theoretical studies were also made. Such problems as the construction of a mathematical model of solid phase motion on the basis of probability representations were considered. Furthermore, analytical solutions to the inverse problem of heat conduction in dispersed systems and the so-called problem of scale transitions were carried out.

Mention should also be made of the studies dealing with thermophysical properties of polymer materials and with the development of the quantitative theory of thermal effects originating during the finishing of polymer materials [7].

Special mention should be made of A. A. Gukhman's work pertaining to the investigation into the foundations of thermodynamics and development of a special system of its construction which has always received his attention. As long ago as 1947, in his monograph "Concerning the Foundations of Thermodynamics", A. A. Gukhman presented the fundamental principles for the construction of a system of thermodynamics distinguished for its great consistency and logical harmony. Later, the basic ideas of this book were extended in his lectures and they furnished the foundation for a series of handbooks on thermodynamics. In 1986, a new edition of this book under the same title was published in which the foundations of thermodynamics were presented in their final form [8].

An organically integral part of the scientific work of A. A. Gukhman is his pedagogical activity. Starting from 1921 he has worked continually at the university level. He is a brilliant lecturer who can consistently, deeply and extremely clearly convey to the listeners the subject matter of the most involved theoretical problems. The originality and novelty of the material, high theoretical level of lectures were combined with an extremely rational construction and stylistic carefulness. This and the charm of A. A. Gukhman attract a great number of listeners from many universities and research institutions of our country. For A. A. Gukhman, lecturing is a creative process.

His great talent as an organizer manifested itself when he set up scientific research institutes and laboratories. He was one of the founders of the thermal engineering group of the Leningrad Physical-Technological Laboratory headed by A. F. Ioffe—the laboratory which later developed into a separate institute known now as the I. I. Polsunov Central Scientific-Research Boiler and Turbine Institute. He also participated in the organization of the Institute of Astronomy and Physics of the Kazakh SSR Academy of Sciences and of the Power Engineering Institute of the same academy where he has been a scientific supervisor for several years. A. A. Gukhman continues to work actively in scientific councils of the U.S.S.R. Academy of Sciences and of a number of ministries.

The Soviet government recognized the outstanding contributions of A. A. Gukhman by decorating him with the Order of Lenin and five medals.

As always, A. A. Gukhman is full of creative plans and energy. His unfailing enthusiasm infects all those who work with him. We wish him good health and fulfillment of his creative plans.

R. I. SOLOUKHIN✠
O. G. MARTYNENKO
O. A. GERASHCHENKO
A. I. LEONTIEV
YU. A. MIKHAILOV
I. L. MOSTINSKY
R. I. NIGMATULIN
M. A. STYRIKOVICH
A. A. ZUKAUSKAS

LIST OF THE RECENT PUBLICATIONS BY PROFESSOR A. A. GUKHMAN

1. A. A. Gukhman and A. A. Zaitsev, *Current Problems of the Theory of Heat Transfer and Physical Hydrodynamics.* Novosibirsk (1984).
2. A. A. Gukhman, *Application of the Similarity Theory to the Study of Heat and Mass Transfer Processes.* Izd. Vysshaya Shkola, Moscow (1974).
3. A. A. Gukhman and B. A. Kader, Mass transfer from the tube wall to a turbulent fluid flow at high Schmidt numbers, *Teor. Osnovy Khim. Tekhnol.* **3**(2), 216–224 (1969).
   R. D. Borisova, A. A. Gukhman, V. V. Dilman and B. A. Kader, Experimental investigation of the intensity of turbulent heat and mass transfer over the tube starting length at $Pr \gg 1$. In *Heat and Mass Transfer—V*, Vol. 1, pt. 1, pp. 208–212 (1976).
   B. A. Kader, R. D. Borisova, A. A. Makeyev, A. A. Gukhman and V. V. Dilman, Theoretical and experimental study of the laws governing passive impurity tur-

bulent transfer over the tube starting length at high Prandtl numbers. In *Heat Transfer—1978*, pp. 22–31. Izd. Nauka, Moscow (1980).
B. A. Kader and A. A. Gukhman, The theory of the method for determining the local characteristics of a boundary layer with the aid of tiny film probes. In *Heat Transfer—1974*, pp. 333–339. Izd. Nauka, Moscow (1975).

4. A. A. Gukhman, V. A. Kirpikov, V. V. Gutarev and N. M. Tsirelman, Heat transfer and hydrodynamic resistance of a turbulent gas flow in the field of the longitudinal sign-variable pressure gradient, *J. Engng Phys.* **16**(6), 984–988 (1969).
A. A. Gukhman and V. A. Kirpikov, Heat transfer augmentation by producing pressure nonuniformities in the flow. In *Heat and Mass Transfer*, Vol. 1, pt. 2, pp. 128–137. Minsk (1972).
A. A. Gukhman, Enhancement of convective heat transfer and the problem of comparative assessment of heat transfer surfaces, *Teploenergetika* No. 4, 5–8 (1977).
A. A. Gukhman and V. A. Kirpikov, Concerning the enhancement of convective heat transfer. In *Heat and Mass Transfer—VI*, Vol. 1, pt. 1, pp. 55–66. Minsk (1980).
A. A. Gukhman, V. A. Kirpikov and R. D. Borisova, Comparative assessment of the efficiency of some current methods of convective heat transfer augmentation. In *Heat and Mass Transfer—VII*, Vol. 1, pt. 1, pp. 56–60. Minsk (1984).
A. A. Gukhman, V. A. Kirpikov and A. P. Zynzin, Enhancement of convective heat transfer of tubular bundles immersed in a longitudinal flow. In *Heat and Mass Transfer—VII*, Vol. 8, pt. 1, pp. 44–49. Minsk (1984).

5. A. A. Gukhman and E. A. Ermakova, On specific features of heat transfer in ice sublimation under vacuum, *Zh. Tekh. Fiz.* **23**(8), 1367–1378 (1953).

6. A. A. Gukhman and A. Z. Volynets, Concerning the character of ice sublimation under vacuum, *J. Engng Phys.* **15**(2), 777–781 (1968).
A. A. Gukhman, A. Z. Volynets, V. E. Zhuchkov, V. E. Matkhanova and V. K. Safonov, Vapour desublimation from a vapour–gas mixture flow under vacuum. In *Heat and Mass Transfer—V*, Vol. IV, pp. 189–197. Minsk (1976).
A. A. Gukhman, A. Z. Volynets and V. M. Postnikov, Vapour desublimation from a vapour–air mixture in cross-flow past a circular cylinder, *Izv. Akad. Navuk BSSR, Ser. Fiz.-Energ. Navuk* No. 1, 47–52 (1979).
A. A. Gukhman, A. Z. Volynets, V. I. Vasiliev and E. V. Gavrilova, Thermal deformations in the process of sublimational dehydration. In *Heat and Mass Transfer—VI*, Vol. IV, pt. 2, pp. 44–49. Minsk (1980).

7. B. A. Arutyunov, V. V. Vlasov, A. A. Gukhman and S. V. Ishchenko, Concerning the errors in experimental determination of the thermophysical characteristics of chemically active materials, *J. Engng Phys.* **28**(2), 358 (1975).
V. V. Shvabauer, B. A. Arutyunov and A. A. Gukhman, A mathematical model of the cooling of tubes made from crystallizing plastics, *Teor. Osnovy Khim. Teknol.* **16**(5), 655–662 (1982).

8. A. A. Gukhman, *On the Foundations of Thermodynamics*. Energoatomizdat, Moscow (1986).