

## HEAT TRANSFER BIBLIOGRAPHY

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### APPLICATIONS

- ROGER A. ANDERSON and WILLIAM A. BROOKS, Effectiveness of radiation as a structural cooling technique for hypersonic vehicles. *J. Aero. Space Sci.* **27**, No. 1, 41 (1960).
- PAUL D. ARTHUR and JAMES C. WILLIAMS, Maximum turbulent boundary layer heating rates on a hemispherical nose. *J. Amer. Rocket Soc.* **30**, No. 2, 207 (1960).
- ING H. D. BAEHR, Grundprobleme der Wärmeübertragung in Kernreaktoren. *Allg. Wärmetechn.* **9**, No. 6, 116 (1959).
- J. F. BARNES, *The Calculation of Gas Flow Passage Sizes in Heat Exchangers and Nuclear Reactors When the Heat Transfer Requirements and the Gas Inlet and Outlet Temperatures are Specified*. National Gas Turbine Establishment. (Gt. Brit.) N-77922 (1959).
- T. H. BENZINGER, On physical heat regulation and the sense of temperature in Man. *Proc. Nat. Acad. Sci.* **45**, No. 4, 645 (1959).
- DEAN R. CHAPMAN, *An Approximate Analytical Method for Studying Entry into Planetary Atmospheres*. NASA TR R-11 (1959).
- J. B. CLADIS, *Stimulation of Thermal Environment in Space*. ASME Aviation Conf. Pap. 59-AV-26 (1959).
- G. I. DARCHIYA, Heat-transfer calculation for heating panels (Raschet Teplootdachi Otopitel'nykh Paneley). *Vopr. Otopleniya i Ventilatsii*, V sb., Nr. 3, 5, Moscow (1956).
- ALFRED J. EGGERS, THOMAS J. WONG and ROBERT E. SLYE, Some general considerations of the heating of satellites. *J. Heat Transfer* **81**, No. 3, 308 (1959).
- RUDOLF ERNST, Wärmeübergang und Wärmeaustauschern im Moving Bed. *Chem.-Ing.-Tech.* Heft 1, No. 32, 17 (1960).
- JACK B. ESGAR, ROBERT O. HICKEL and FRANCIS S. STEPKA, *Preliminary Survey of Possible Cooling Methods for Hypersonic Aircraft*. NACA RM E57L19 (1958).
- CARL GAZLEY, The penetration of planetary atmospheres. *J. Heat Transfer* **81**, No. 4, 315 (1959).
- H. HAUSEN, *Wissenschaftliche Fragen auf dem Gebiete der Heizungstechnik*. Aus dem Jahrbuch der Technischen Hochschule Hannover (1955-1958).
- H. HAUSENBLAS, The mean temperature difference in hairpin heat exchangers (in German). *Brennstoff-Warme-Kraft*. **11**, No. 3, 114 (1959).
- J. C. HEAP, *Thermodynamics of Unsteady Flow Processes Involving Transfer of Heat for Vented Containment Systems*. USAEC ANL-5987 (1959).
- WICKLIFFE B. HENDRY, *A Systematic Approach to the Design of Compact Heat Exchangers*. ASME Paper No. 59-A-193 (1959).
- H. HOPPE, Berechnung der Wärmeübertragung in Regeneratoren bei Kreuzstrombetrieb. *Forschung*. Bd. 20, 150 (1954).
- A. HUBER, Parallel flow recuperation with temperature-dependent overall heat transfer coefficient (in German). *Öst. Ing.-Arch.* **12**, 41 (1958).
- W. M. KAYS and T. R. LOESCHNER, *The Heat Transfer and Flow Friction Characteristics of an Elliptical Pin-Fin Heat Exchanger Surface*. Dept. of Mech. Eng., Stanford Univ. TR No. 44 (1959).
- DOUGLAS L. KERR, Radiator areas of thermopile generators in space. *Aero. Space Eng.* **18** (1959).
- WILLIAM H. KINARD, *The Behavior of Beryllium and Beryllium Copper in a 4000°F Supersonic*

- Air Jet at a Mach Number of 2*. NACA RM L57G31 (1957).
- G. K. KULLBERG and H. B. KENDALL, Improve heat transfer coefficients with silicone resin coatings. *Chem. Eng. Prog.* **56**, No. 1, 82 (1960).
- E. H. MANSFIELD, *The Influence of Aerodynamic Heating on the Flexural Rigidity of a Thin Wing*. Aeronautical Research Council (Gt. Brit.) N-59686X (1959).
- M. F. NAGIYEV and P. V. KARAMZIN, An experimental research on heat transfer processes in a tube-in-tube type of exchanger (in Azerb). *Izv. Akad. Nauk Azerb SSR* No. 2, 23-35 (1957). *Ref. Zh. Mekh.* No. 1, Rev. 776 (1958).
- L. W. PHIPPS, Semi-automatic control system for producing constant cooling rates. *J. Sci. Instrum.* **36**, No. 11, 449 (1959).
- BERNARD RASHIS, *Preliminary Indications of the Cooling Achieved by Ejecting Water Upstream from the Stagnation Point of Hemispherical, 80° Conical and Flat-Faced Nose Shapes at a Stagnation Temperature of 4000°F*. NACA RM L57I03 (1957).
- D. H. ROBEY, Cold re-entry of space vehicles at meteor speeds. *Astro. Acta.* **5**, No. 3-4, 224 (1959).
- CHARLES RUMSEY, ROBERT PILAND and RUSSELL HOPKO, *Aerodynamic-Heating Data Obtained from Free-Flight Tests Between Mach Numbers of 1 and 5*. NASA TN D-216 (1960).
- D. A. SPENCE, *Two Heat Diffusion Problems With Shock Tube Applications*. Royal Aircraft Est. (Gt. Brit.) N-78487 (1959).
- FRANCIS S. STEPKA and REEVES P. COCHRAN, *Experimental and Analytical Investigation of Heat Transfer Characteristics of a Return-Flow Air-Cooled Turbine Rotor Blade*. NASA TN D-202 (1959).
- W. A. SUTHERLAND, *Reactor Heat Transfer—A Preliminary Design Procedure*. ASME Semiann. Meet, St. Louis, Mo., Paper 59-SA-16 (1959).
- J. W. TATOM, Transient and steady-state behavior of an idealized solar powered heat exchanger. *J. Amer. Rocket Soc.* **30**, No. 1, 116 (1960).
- F. M. TEETZEL, J. A. WILLIAMSON, A. E. ABBOT and R. L. MADDIX, Screw equipment temperature problems. *Chem. Eng. Prog.* **55**, No. 12, 39 (1959).
- R. G. THOMSON, *Effects of Cross-Sectional Shape, Solidity and Distribution of Heat-Transfer Coefficient on Torsional Stiffness of Wings Subjected to Aerodynamic Heating*. NASA Memo. 1-30-59L (1959).
- G. A. TIRSKIY and V. A. TRENIGIN, The determination of the temperature field of a gas turbine cooling vane (Opredeleniye Temperatur'nogo Polya Okhlazhdayemoy Lopatki Gazovoy Turbiny). *Izv. Akad. Nauk SSSR, Otd. Tekh. Nauk, Energet. Avtomat.* Nr. 2, 45 (1959).
- OTTO F. TROUT, *Exploratory Investigation of Several Coated and Uncoated Metal, Refractory and Graphite Models in a 3800°F Stagnation Air Jet*. NASA TN D-190 (1960).
- V. A. TSIKUNOV, On a method of determining the coefficient of turbulent heat transfer in the surface layer of the sea (Ob odnom Metode Opredeleniya Koeffitsiyenta Turbulentnoy Teploprovodnosti v verkhnem sloye morya). *Tr. Gos. Okeanogr. in-ta.* Nr. 33 (45), 80 (1956).
- HANS C. VETTER, Note on the calculation of equilibrium skin temperatures. *J. Aero Space Sci.* **26**, No. 11, 757 (1959).
- J. P. WELSH and T. J. WALSH, *Handbook of Methods of Cooling Air Force Ground Electronic Equipment*. ASTIA Doc. 148907 (Equipment). RADC TR58-126 (Electronic) (1959).
- V. S. ZARUBIN, On a problem of unsteady heat conductivity (Odná Zadacha Nestatsionarnoy Teploprovodnosti). *Izv. Akad. Nauk SSSR, Otd. Tekh. Nauk, Energet. Avtomat.* Nr. 2, 38 (1959).

## BOOKS

- H. S. CARSLAW and J. C. JAEGER, *Conduction of Heat in Solids*. Oxford University Press, New York (1959).
- D. A. FRANK-KAMENETZKI, *Mass and Heat Transfer in Chemical Kinetics (Stoff- und Wärmeübertragung in der Chemischen Kinetik)*. Springer-Verlag, Berlin (1959).
- J. O. HINZE, *Turbulence*. McGraw-Hill, New York (1959).
- Jet Propulsion Laboratory. *Astronautics Information-Abstracts with Index*. Vol. 1, Abstracts 1001-1726. Jet Propulsion Laboratory, Calif. Inst. of Tech. (1960).
- H. SCHENCK, *Heat Transfer Engineering*. Prentice-Hall, New York (1959).

## BOUNDARY LAYERS

- G. E. ANDERSON, C. J. SCOTT and D. R. ELGIN, *Mass Transfer Cooling Experiments on a Hemisphere at  $M = 5$* . Rosemount Aeronautical Lab., Inst. of Tech., Univ. of Minn. Res. Rep. No. 166 (1959).
- IVAN E. BECKWITH and JAMES J. GALLAGHER, *Local Heat Transfer and Recovery Temperatures on a Yawed Cylinder at a Mach Number of 4.15 and High Reynolds Numbers*. NASA Memo. 2-27-59p (1959).
- M. H. BLOOM and M. H. STEIGER, Some compressibility and heat transfer characteristics of the wall jet. *Proc. Third U.S. Nat. Congr. Appl. Mech.* (1958); Amer. Soc. Mech. Engrs., p. 717 (1958).
- WILLIS H. BRAUN, *Turbulent Boundary Layer on a Yawed Cone in a Supersonic Stream*. NASA TN 4208 (1959).
- WILLIAM B. BUSH, Compressible flat-plate boundary-layer flow with an applied magnetic field. *J. Aero Space Sci.* 27, No. 1, 49 (1960).
- GORDON L. CANN and ADRIANO C. DUCATI, *Research on High Intensity Ionic Jets*. Plasmatyne Corporation, Santa Ana, Calif. AFOSR TN 59-167 (1959).
- HSIEN K. CHENG, Similitude of hypersonic real-gas flows over slender bodies with blunted noses. *J. Aero Space Sci.* 26, 575 (1959).
- A. J. CHONES, *Heat-Transfer and Pressure Measurements on Flat-Faced Fared-Tail Circular Cylinders and Normal Disks*. U.S. Naval Ordnance Laboratory. NAVORD Rep. 6669 (1959).
- PAUL M. CHUNG, *A Simplified Study on the Nonequilibrium Couette and Boundary-Layer Flows with Air Injections*. NASA TN D-306 (1960).
- RAUL J. CONTI, *Heat-Transfer Measurements at a Mach Number of 2 in the Turbulent Boundary Layer on a Flat-Plate Having a Step-Wise Temperature Distribution*. NASA TN D-159, Nov. (1959).
- M. COOPER and P. C. STAINBACK, *Influence of Large Positive Dihedral on Heat Transfer to Leading Edges of Highly Swept Wings at Very High Mach Numbers*. NASA Memo. 3-7-59L, 18p, Apr. (1959).
- R. N. COX, General characteristics of hypersonic flow fields. *J. Roy. Aero. Soc.* 63, 503 (1959).
- BERNARD E. CUNNINGHAM and SAMUEL KRAUS, *Experimental Investigation of the Effect of Yaw on Rates of Heat Transfer to Transverse Circular Cylinders in a 6500-Foot-Per-Second Hypersonic Air Stream*. NACA RM A58E19 (1958).
- N. CURLE, Steady compressible laminar boundary-layer, with arbitrary pressure gradient and uniform wall temperature. *Roy. Soc.—Proc.* 249, No. 1257, 206 (1959).
- D. R. DAVIES and D. E. BOURNE, Heat and mass transfer in a turbulent boundary layer (in English). *Ninth Congrès Int. Méc. Appl. Univ. Bruxelles.* 4, p. 50 (1957).
- ROBERT G. DESSLER and ALBERT L. LOEFFLER, *Analysis of Turbulent Flow and Heat Transfer on a Flat Plate at High Mach Numbers with Variable Fluid Properties*. NASA TR R-17 (1959).
- JEAN-FRANCOIS DORAND, *Explorations de la Couche Limite, en Turbulence Naturelle et en Turbulence Provoquée, dans le cas d'un Ecoulement Supersonique le Long D'une Plaque Plane*. Publications Scientifiques et Technique du Ministère de L'air, Centre National de la Recherche Scientifique, Laboratoire d'Aerothermique Publication No. 123 (1959).
- S. K. FRIEDLANDER and MITCHELL LITT, Rapid chemical reaction in a laminar boundary layer. *Appl. Sci. Res. A* 8, No. 6, 403 (1959).
- R. E. GEIGER, On the frozen flow of a dissociated gas. *J. Aero Space Sci.* 26, No. 12, 834 (1959).
- GLEN GOODWIN, MARCUS O. CREAGER and ERNEST L. WINKLER, *Investigation of Local Heat-Transfer and Pressure Drag Characteristics of a Yawed Circular Cylinder at Supersonic Speeds*. NACA RM A55H31 (1956).
- R. V. HESS, *Some Basic Aspects of Magneto-hydrodynamic Boundary-Layer Flows*. NASA Memo. 4-9-59L (1959).
- ROBERT GOULARD, *Liepmann's Heat Transfer Method in Aerothermochemistry*. Purdue Research Foundation, Research Project No. 1717. Rep. No. A-59-5 (1959).
- HARVEY P. GREENSPAN, *On the Flow of a Viscous Electrically Conducting Fluid*. AVCO Everett Research Laboratory. AFOSR TN 59-1221. Res. Rep. No. 73 (1959).
- J. F. GROSS, J. P. HARTNETT, D. J. MASSON and

- CARL J. GAZLEY, *A Review of Binary Boundary Layer Characteristics*. Engineering Division, The Rand Corporation. P-1729 (1959).
- A. A. HAYDAY, *Mass Transfer Cooling in a Steady Laminar Boundary Layer Near the Stagnation Point*. Heat Trans. and Fluid Mech. Inst. p. 156 (1959).
- M. R. HEAD, *Approximate Calculations of the Laminar Boundary-Layer with Suction, With Particular Reference to the Suction Requirements for Boundary-Layer Stability on Aerofoils of Different Thickness|Chord Ratios*. Aeronautical Research Council (Gt. Brit.) N-57724X (1959).
- M. R. HEAD, *An Approximate Method of Calculating the Laminar Boundary-Layer in Two-Dimensional Incompressible Flow*. Aeronautical Research Council (Gt. Brit.) N-58536X (1959).
- J. A. HILL, Integral methods for laminar forced convection calculations—an evaluation of two approaches (in English). *Ninth Congrès Int. Méc. Appl. Univ. Bruxelles*. 4, 108 (1957).
- H. HOSHIZAKI, The effect of shock-generated vorticity, surface slip and temperature jump on stagnation-point heat-transfer rates. *J. Aero. Space Sci.* 27, No. 2, 135 (1960).
- C. P. HOWARD, *The Effect of Pressure Gradient on the Average Convective Heat Transfer Coefficient for a Two-Dimensional Laminar Compressible Boundary Layer on a Flat Plate*. Dept. of Mech. Engr., Stanford University. TR No. 46 (1959).
- D. S. JOHNSON, Velocity, temperature and heat-transfer measurements in a turbulent boundary layer downstream of a stepwise discontinuity in wall temperature. *J. Appl. Mech.* 24, No. 1, 2 (1957).
- JEROME D. JULIUS, *Measurements of Pressure and Local Heat Transfer on a 20° Cone at Angles of Attack up to 20° for a Mach Number of 4.95*. NASA TN D-179, Dec. (1959).
- R. F. KRAMER and H. M. LIEBERSTEIN, Numerical solution of boundary-layer equations without similarity assumptions. *J. Aero. Space Sci.* 26, No. 8, 508 (1959).
- L. I. KUDRYSHEV and B. M. TEVEROVSKIY, On some new forms of generalized integral relationships for the hydrodynamic and thermal boundary-layer. (O Nekotorykh Novykh formakh Obobshchennykh Integral' nykh sootnosheniy dlya gidrodinamicheskogo i Teplovogo Pogranichnogo Sloya). *Tr. Kuybyshevsk. Aviats. in-ta*. Nr. 3, 3 (1957).
- H. A. LAUWERIER, A diffusion problem with chemical reaction. *Appl. Sci. Res. A* 8, No. 5, 366 (1959).
- DOROTHY B. LEE and ANDREW G. SWANSON, *Heat Transfer Measured on a Flat-Face Cylinder-Flare Configuration in Free Flight at Mach Numbers from 1.6 to 2.7*. NACA RM L58A06 (1958).
- CHING-SHI LIU and ALI BULENT CAMEL, Magnetogas dynamic flow regimes. *J. Amer. Rocket Soc.* 29, 871 (1959).
- K. W. MANGLER, Some special aspects of hypersonic flow fields. *J. Roy. Aero. Soc.* 63, 508 (1959).
- THOMAS J. MARKLEY, *Heat Transfer and Pressure Measurement on a 5-inch Hemispherical Concave Nose at a Mach Number of 2.0*. NACA RM L58C14a (1958).
- A. MCD. MERCER, The growth of the thermal boundary layer in laminar flow between parallel flat plates. *Appl. Sci. Res., Hague A* 8, No. 5, 357 (1959).
- R. J. MONAGHAN, Problems of hypersonic aerodynamics—a survey. *J. Roy. Aero. Soc.* 63, 489 (1959).
- H. T. NAGAMATSU, J. B. WORKMAN and R. E. SHEER, *Hypersonic Nozzle Expansion with Air Atom Recombination Present*. Research Laboratory, G.E., Report No. 60-RL-2332C (1960).
- YOSHINARI NAKAGAWA, Heat Transport by convection in presence of an impressed magnetic field. *Phys. Fluids* 3, No. 1, 8 (1960).
- RICHARD J. NICKERSON, *The Effect of the Free-Stream Oscillations on the Laminar Layers on a Flat Plate*. U.S. Air Force, WADC TR 57-481 (1958).
- E. OFFENHARTZ and H. WEISBLATT, *Experimental Determination of the Turbulent Heat Transfer Rate Distribution Along a Slender Blunt Nosed Body from Shock Tube Tests*. AVCO, Research and Advanced Development Div. RADTR-9-59-18 (1959).
- GEORGE M. PALMER and FRANK L. PARIS, *An Experimental Study of the Operating Characteristic and Electrode Heat Transfer of a*

- Direct Current Electric Arc in a Pressurized Argon Environment*. Purdue Research Foundation, Research Project No. 1717, Rep. No. A-59-10 (1959).
- GEORGE M. PALMER, *A Study of the Overall Problems of the True-Temperature, Hypersonic Wind Tunnel Having Semi-Continuous Operation and the Preferred Methods of Solution*. Purdue Research Foundation, Research Project No. 1717, Rep. No. A-59-14 (1959).
- HAROLD S. PERGAMENT and MELVIN EPSTEIN, Approximate method for determining laminar heat transfer rates. *J. Amer. Rocket Soc.* 30, No. 2, 206, Feb. (1960).
- O. E. POTTER, Chemical reaction in the laminar boundary-layer—instantaneous reaction. *Trans. Instn. Chem. Engrs.* 36, No. 6, 415 (1958).
- LEONARD RABB and JOHN H. DISHER, *Boundary-Layer Transition at High Reynolds Numbers as Obtained in Flight of a 20° Cone-Cylinder with Wall to Local Stream Temperature Ratios Near 1.0*. NACA RM E55115, Nov. (1955).
- BERNARD RASHIS and ALECK C. BOND, *Free-Flight Skin-Temperature and Surface-Pressure Measurements on a Highly Polished Nose Having a 100° Total Angle Cone and a 10° Half-Angle Conical Flare Section Up to a Mach Number of 4.08*. NACA RM 157G30 (1957).
- JOHN O. RELLER and FRANK M. HAMAKER, *Temperature Recovery Factors on a Slender 12° Cone-Cylinder at Mach Numbers from 3.0 to 6.3 and Angles of Attack Up to 45°*. NACA RM A55G20 (1955).
- DANIEL E. ROSHER, *On the Effects of Diffusion and Chemical Reaction in Convective Heat Transfer*. AERO CHEM Research Laboratories, Inc. TM-13 (1959).
- CHARLES B. RUMSEY and DOROTHY B. LEE, *Measurements of Aerodynamic Heat Transfer and Boundary-Layer Transition on a 10° Cone in Free Flight at Supersonic Mach Numbers Up to 5.9*. NACA RM L56B07 (1956).
- CHARLES B. RUMSEY and DOROTHY B. LEE, *Measurements of Aerodynamic Heat Transfer on a 15° Cone-Cylinder-Flare Configuration in Free Flight at Mach Numbers Up to 4.7*. NACA RM 157J10 (1958).
- R. W. RUTOWSKI, *Stagnation Point Heat Transfer in a Partially Ionized Gas*. Heat Trans. and Fluid Mech. Inst. p. 110 (1959).
- C. E. SHEPARD and D. R. BOLDMAN, *Preliminary Development of Electrodes for Electric-Arc Wind Tunnel*. NASA Memo. 4-14-59E (1959).
- V. P. SHESTOPALOV, The laminar flow past a plate in the nonlinear theory of the boundary-layer of a viscous, compressible fluid with an arbitrary temperature distribution along the surface (Laminarnoye Obtekaniye Plastinki v Nelineynoy Teorii Pogranichnogo Sloya Vyazkoy Szhimayemoy Zhidkosti pri Proizvol'nom Raspredelenii Temperatury vdol' Poverkhnosti). *Uch. zap. Khar'kovsk. gos. ped. in-ta.* 18, 121 (1956).
- C. J. SCOTT, *Integral Laminar Boundary Layer Solutions Using the Crocco Variables*. University of Minnesota, Engineering Memorandum No. 86, AFOSR TN 59-1304 (1959).
- H. H. SOGIN, Laminar transfer from isothermal spanwise strips on a flat plate. *J. Heat Transfer* 81, No. 4, 53 (1960).
- E. M. SPARROW and J. L. GREGG, *Details of Exact Low Prandtl Number Boundary-Layer Solutions for Forced and for Free Convection*. NASA Memo. 2-27-59E (1959).
- DRAGUTIN STOJANOVIC, Similar temperature boundary layers. *J. Aero. Space Sci.* 26, 715 (1959).
- B. S. STRATFORD and G. S. BEAVERS, *The Calculation of the Compressible Turbulent Boundary Layer in an Arbitrary Pressure Gradient—A Correlation of Certain Previous Methods*. National Gas Turbine Est. (Gt. Brit.) N-77923 (1959).
- WILLIAM J. THIEVON, GERALD A. STERBUTZEL and JOHN L. BEAL, *The Influence of Gas Dissociation of Heat Transfer*. WADC TR 59-450 (1959).
- U.S. Naval Ordnance Laboratory, *Investigation of Flat Plate Hypersonic Turbulent Boundary-Layers with Heat Transfer at a Mach Number of 5.2*. NAVORD Rep. 6631 (1959).
- R. VAGLIO-LAURIN, *Heat Transfer on Blunt-Nosed Bodies in General Three-Dimensional Hypersonic Flow*. Heat Trans. and Fluid Mech. Inst. p. 95 (1959).
- J. WADSWORTH, *The Experimental Examination*

of the Local Heat Transfer on the Surface of a Sphere When Subjected to Forced Convective Cooling. Nat. Res. Council, Canada, Div. Mech. Engrg. Rep. MT-39 (1958).

RICHARD J. WINSNIEWSKI, *Methods of Predicting Laminar Heat Rates on Hypersonic Vehicles*. NASA TN D-201 (1959).

VICTOR ZAKKAY, Heat transfer at a corner. *J. Aero. Space Sci.* 27, No. 2, 157 (1960).

#### CHANGE OF PHASE

M. ALTMAN, R. H. NORRIS and F. W. STAUB, *Local and Average Heat-Transfer and Pressure-Drop for Refrigerants Evaporating in Horizontal Tubes*. ASME Paper 59-A-278 (1959).

J. A. R. BENNETT, J. G. COLLIER, H. R. C. PRATT and J. D. THORNTON, *Heat Transfer to Two Phase Gas-Liquid Systems. Part 1, Steam-Water in the Liquid-Dispersed Region in an Annulus*. (UK AEA) AERE-R 3159 (1959).

A. G. BONDAR', An experimental investigation of the transfer of heat to a boiling sodium-hydroxide solution circulating freely in a vertical boiler tube of an industrial evaporator (Eksperimental'noye Issledovaniye Teplootdachi Kipyashchin Rastvorom Yedkogo Natra v Vertikal'noy Trube pri Yestestvennoy Tsirkulyatsii.) *Izv. Kiyevsk. Politekhn. in-ta.* 17, 83 (1956).

I. I. CHERNOBYL'SKIY and YU. M. TANANAYKO, An investigation of the heat transfer to boiling water flowing through narrow annular openings in the presence of moderate heat fluxes (Under conditions approximating those in industrial evaporators) (Issledovaniye Teplootdachi k Kipyashchey vode v Kol'tsevom Prostranstve pri Umerennykh Teplovykh Potokakh). *Izv. Kiyevsk. Politekhn. in-ta.* 17, 61 (1956).

H. B. CLARK, P. S. STRENGE and J. W. WESTWATER, Active sites for nucleate boiling. *Chem. Engr. Prog. Symposium Series.* 55, No. 29, 103 (1959).

T. FURMAN and H. HAMPSON, *Experimental Investigation into the Effects of Cross Flow with Condensation of Steam and Steam-Gas Mixtures on a Vertical Tube*. Instn. Mech. Engrs., Prepr. (1958).

H. GLASER, Simplified calculation of the diffusion of water vapor through walls consisting of

several layers. Including the effect of water and ice formation. Part II (in German). *Kalte-technik* 10, No. 12, 386 (1958).

MELVIN H. GOTTLIEB, Bubble stability in dimethylsilicone solutions. *J. Phys. Chem.* 63, 1687 (1959).

G. G. HASELDEN and S. A. MALATY, Heat and mass transfer accompanying the absorption of ammonia in water. *Inst. of Chemical Engrs.* 37, No. 3, 137 (1959).

H. S. ISBIN, H. A. RODRIGUEZ, H. C. LARSON and B. D. PATTIE, Void fractions in two-phase flow. *J. Amer. Inst. Chem. Engrs.* 5, No. 4, 427 (1959).

H. KLINGENSPOR, Untersuchungen über die Rektifizierwirkung in einer Füllkörpersäule. *Chem.-Ing.-Tech.* 31, No. 9, 598 (1959).

E. L. KNUTH, Nonstationary phase changes involving a condensed phase and a saturated vapor. *Phys. Fluids* 2, No. 1, 84 (1959).

V. F. KOVALENKO, An experimental investigation of the vibration effect on heat transfer in the process of boiling (in Russian). *Teploenergetika.* No. 2, 76 (1958).

R. YA KUCHEROV and L. E. RIKENGLAZ, On hydrodynamic boundary conditions for evaporation and condensation. *Soviet Physics—J. of Experimental and Theoretical Physics.* 37, (10), No. 1, 88 (1960).

D. A. LABOONTZOY, Heat transfer in film condensation of pure vapors on vertical surfaces and horizontal pipes (in Russian). *Teploenergetika.* No. 7, 72 (1957).

V. LAVROVA, Experimental investigation of heat emission by boiling Freon-12 (in Russian). *Kholodil'naya Tekhnika.* No. 3, 55-61 (1957). *Ref. Zh. Mekh.* No. 6, Rev. 6783 (1958).

H. A. LENIGER and J. VELDSTRA, Heat transmission in a thin-layer evaporator. *Chem.-Ing.-Tech.* 31, 493 (1959).

C. K. LIU, *Heat Transfer Coefficient for a Horizontal Tube of Elliptic Cross-Section in a Condensing Medium*. Army Ballistic Missile Agency. Report DSD-TM-26-59 (1959).

E. L. LUSTENADER, R. RICHTER and F. J. NEUGEBAUER, The use of thin films for increasing evaporation and condensation rates in process equipment. *J. Heat Transfer* 81, No. 4, 297 (1959).

G. R. MOORE, Vaporization of superheated

- drops in liquid. *J. Amer. Inst. Chem. Engrs.* 5, No. 4, 458 (1959).
- D. E. SEVERSON, A. J. MADDEN and EDGAR L. PIRET, Evaporation rates of liquids to flowing gas streams. *J. Amer. Inst. Chem. Engrs.* 5, No. 4, 413 (1959).
- E. SOKOLOVA, Investigation of heat emission during the condensation of Freon (in Russian). *Skolodil'naya Tekhnika* No. 3, 71-75 (1957). *Ref. Zh. Mekh.* No. 6, Rev. 6781 (1958).
- E. M. SPARROW and J. L. GREGG, The effect of vapor drag on rotating condensation. *J. Heat Transfer* 2, No. 1, 71 (1960).
- E. M. SPARROW and J. L. GREGG, Laminar condensation heat transfer on a horizontal cylinder. *J. Heat Transfer* 81, No. 4, 291 (1959).
- L. SZUCS, Analytical examination of changes of state at material and heat transfer at constant liquid temperature (in Hungarian). *Energia es Atomtehnika.* 11, No. 3, 164 (1958).
- M. YU. TANANAYKO, The heat transfer during the boiling of water within the flowing film. (Teplootdacha pri Kipenii vody v stekayushchey plenke). *Izv. Kiyevsk. Politekhn. in-ta.* 17, 75 (1956).
- A. G. TKACHEV, Heat exchange during the melting of ice in freely-moving water. (Teploobmen pri Plavlenii l'da v svobodno Dvizhushchey Vode). *Tr. Leningr. in-ta. Kholodil'noy i moloch. prom. sti.* 4, 48 (1953).
- S. J. D. VAN STVALEN, *Warmteoverdracht Aan Kokende Binaire Vloeistofmengsola*. Dissertation. H. Veenman en Zoen N.V., Wageningen (Holland) (1959).
- V. I. VORONIN, On the calculation of a laminar boundary layer on rotating bodies in a compressible gas (O raschete Laminarnogo Pogranichnogo Sloya na telakh Vrasheniya v Szhimayemon Gaze). *Voronezhsk. in-ta.* 42, No. 2, 11 (1956).
- A. S. Vos, Superheating and distribution of the temperature in the liquid and vapor of boiling liquids (in Dutch). *Ingenieur* 71, No. 7, 0. 17-0. 20 (1959).
- F. VOTTA and C. A. WALKER, Condensation of vapor in the presence of noncondensing gas. *J. Amer. Inst. Chem. Engrs.* 4, No. 4, 413 (1958).

## CHANNEL FLOW

- VEDAT S. ARPACI and JOHN A. CLARK, Dynamic response of heat exchangers having internal heat sources—Part III. *J. Heat Transfer* 81, No. 4, 253 (1959).
- R. B. BIRD, *Zur Theorie des Wärmeübergangs an nicht-Newtonsche Flüssigkeiten bei Laminärer Rohrströmung*. University of Wisconsin. Reprint No. 392, Reprint *Chem.-Ing.-Tech.* 31, 569 (1959).
- R. D. CESS and E. C. SHAFFER, Heat transfer to laminar flow between parallel plates with a prescribed wall heat flux. *Appl. Sci. Res., Hague A* 8, No. 5, 339 (1959).
- S. C. R. DENNIS, A. M. MERCER and G. POOTS, Forced heat convection in laminar flow through rectangular ducts. *Quart. Appl. Math.* 17, 285 (1959).
- L. S. HAN, *Hydrodynamic Entrance Lengths for Incompressible Laminar Flow in Rectangular Ducts*. ASME Paper No. 59-A-82 (1959).
- L. S. HAN, Laminar heat transfer in rectangular channels. *ASME Trans. 81C (J. Heat Transfer)* 2, 121 May (1959).
- H. HAUSEN and L. DÜWEL, Zur Frage nach dem Gleichwertigen Durchmesser Beider Wärmeübertragung in Einseitig Beheizten Spalten. *Kältetechnik.* 11, Heft 8, 242 (1959).
- FRANK KREITH and DAVID MARGOLIS, Heat transfer and friction in turbulent vortex flow. *Appl. Sci. Res., Hague A* 8, No. 6, 457 (1959).
- R. T. LANCET, The effect of surface roughness on the convection heat-transfer coefficient for fully developed turbulent flow in ducts with uniform heat flux. *ASME Trans. 81C (J. Heat Transfer)* 2, 168 (1959).
- M. F. NAGIYEV and P. V. KARAMZIN, Determination of the coefficient of heat emission of the flow in a tubular space when the hydrodynamic regime is in a transition stage (in Russian). *Izv. AzSSR* No. 5, 35 (1957). *Ref. Zh. Mekh.* No. 6, Rev. 6772 (1958).
- S. A. REGIRER, On convective motion of a conducting fluid between parallel vertical plates in a magnetic field. *Soviet Physics—J. of Experimental and Theoretical Physics* 37 (10), No. 1, 149 (1960).
- H. L. RITZ, The polyzonal fuel element. *Heaton Works J.* 8, No. 47, 255 (1958).
- N. W. RYAN and M. M. JOHNSON, Transition

- from laminar to turbulent flow in pipes. *J. Amer. Inst. Chem. Engrs.* **5**, No. 4, 433 (1959).
- J. A. SCANLAN, Effects of normal surface vibration on laminar forced convective heat transfer. *Indust. Engng. Chem.* **50**, No. 10, 1565 (1958).
- R. SIEGEL and E. M. SPARROW, Turbulent flow in a circular tube with arbitrary internal heat sources and wall heat transfer. *J. Heat Transfer* **81**, No. 4, 280 (1959).
- N. A. SLEZKIN, On the development of the flow of a viscous heat-conducting gas in a pipe. *J. Appl. Math. Mech. (PMM)* **23**, No. 2, 473 (1959).
- JACK M. SPURLOCK, THOMAS W. JACKSON, KENNETH R. PURDY, CALVIN C. OLIVER and HAROLD L. JOHNSON, *The Effect of Resonant Acoustic Vibrations on Heat Transfer to Air Horizontal Tubes*. WADC TN 59-330 (1959).
- KARL STEPHAN, Wärmeübergang und Druckabfall bei nicht Ausgebildeter Laminstromung in Rohren und in Ebenen Spalten. *Chem.-Ing.-Tech.* **31**, No. 12, 773 (1959).
- KARL STEPHAN, *Wärmeübergang und Druckabfall Laminaer Strömungen im Einlauf von Rohren und Ebenen Spalten*. Überreicht vom Kältetechn Institut und Thermodyn. Institut der Technischen Hochschule Karlsruhe (1959).
- M. A. STYRIKOVICH and L. E. FAKTOROVICH, Effect of tube length on the magnitude of critical heat flow with forced convection of steam-water mixtures. *Soviet Phys.-Doklady* **3**, No. 3, 518 (1959).
- N. V. TSARENKO, An investigation of the heat transfer in a turbulent flow of liquid through a narrow rectangular conduit (Issledovaniye Teplootdach pri Turbulentnom Techenii Zhdokostey v Uzkikh Kanalakh Pryamougol'nogo Secheniya). *Izv. Kiyevsk. Politekhn. in-ta.* **17**, 143 (1956).
- L. A. VVEDENSKARA, To the experimental determination of the correction to the hydrodynamic theory of heat exchange for the turbulent flow in pipes (K Eksperimental'nomu Opredeleniyu Popravki k Gidrodinamicheskoy Teorii Teploobmena pri Turbulentnom Dvizhenii v Trubakh). *Sb. Nauch. tr. Kuylshevsk. Industr. in-ta.* Book 1, No. 6, p. 225 (1956).
- HELMUT WOLF, Heating and cooling air and carbon dioxide in the thermal entrance region of a circular duct with large gas to wall temperature differences. *J. Heat Transfer* **81**, No. 4, 267 (1959).
- V. S. YABLESKIY, Analysis of certain problems of the transport of heated viscous liquids through pipelines (Analiz Nekotorykh Voprosov Perekachki Podogretykh Vyazkikh Zhidkostey po Truboprovodam). *Tr. Mosk. Neft. in-ta.* Nr. 17, 3 (1956).

## CONDUCTION

- H. R. BAILY, Heat conduction from a cylindrical source with increasing radius. *Quart. Appl. Math.* **17**, 255 (1959).
- GEORGE BAKER, JR. and THOMAS A. OLIPHANT, An implicit, numerical method for solving the two-dimensional heat equation. *Quart. Appl. Math.* **17**, No. 4, 361 (1960).
- JAMES BECK and H. HURWICZ, Effect of thermocouple cavity on heat sink temperature. *J. Heat Transfer* **82**, No. 1, 27 (1960).
- V. A. BERG, On the construction of the temperature field in a snow and ice cover. (O Postroyenii Temperatur'nogo Polya v Snego-Ledyanom Pokrove). *Tr. Leningr. Gidrometeorol. in-ta.* Nr. 5-6, 59 (1956).
- PAUL L. CHAMBRE, Nonlinear heat transfer problem. *J. Appl. Phys.* **30**, No. 11 (1959).
- S. W. CHURCHILL and R. E. BALZHISER, The radial heat flux. *Chem. Engr. Prog. Symposium Series* **55**, No. 29, 127 (1959).
- FORBES DEWEY, STEWART I. SCHLESINGER and LAWRENCE SASHKIN, Temperature profiles in a finite solid with moving boundary. *J. Aero. Space Sci.* **27**, No. 1, 59 (1960).
- R. E. GIBSON, A heat conduction problem involving a specified moving boundary. *Quart. Appl. Math.* **16**, No. 4, 426, Notes (1959).
- E. P. GROSS and S. ZIERING, Heat flow between parallel plates. *Phys. Fluids* **2**, No. 6, 701 (1959).
- C. F. HANSEN, R. A. EARLY, F. E. AZOFON and F. C. WITTEBORN, *Theoretical and Experimental Investigation of Heat Conduction in Air, Including Effects of Oxygen Dissociation*. NASA TR NR-27 (1959).
- P. R. HILL, *A Method of Computing the Transient Temperature of Thick Walls from Arbitrary Variation of Adiabatic-Wall Temperature and*



- Heat-Transfer Coefficient*. NACA Rep. 1372 (1958).
- G. HORVAY, Freezing of a growing liquid column. *J. Heat Transfer* **82**, No. 1, 37 (1960).
- J. C. JAEGER, The analysis of aquifer test data or thermal conductivity measurements which use a line source. *J. Geophys. Res.* **64**, No. 5, 561 (1959).
- J. C. JAEGER, The use of complete temperature-time curves for the determination of thermal conductivity with particular reference to rocks. *Austral. J. Physics* **12**, No. 3, 203 (1959).
- S. V. LUTKOVSKIY, On the subject of the establishment of the temperature in a shallow section of the sea during the period immediately preceding its icing over (Kovoprosu o Formirovanií Temperatury Morya na Melkovod'ye v Predledostavnyy period). *Tr. Mor. Gidrofiz. in-ta. AN SSR* **7**, 135 (1956).
- T. P. NEWCOMB, *Transient Temperatures in Brake Drums and Linings*. Instn. Mech. Engrs. (1958).
- R. K. PEFLY, *Extension of Cooling Fin Theory—Application to Axial Flow Heat Transfer Surfaces with Longitudinal Fins*. Dept. of Mech. Eng., Stanford University. TR No. 47 (1959).
- S. P. PUSTOVOIT, Transient thermal convection in a spherical cavity. *Appl. Math. Mech. (Prikl. Math. Mekh.)* **22**, No. 4, 800 (1958).
- B. SAELMAR, Integration of some thermal differential equations. *J. Aero. Space Sci.* **26**, No. 11, 754 (1959).
- A. SELLERIO, A method of false position for the approximate solution of the problem of transmission of heat in the stationary regime (in Italian). *Termotecnica* **12**, No. 7, 306 (1958).
- G. STOLZ, Numerical solutions to an inverse problem of heat conduction for simple shapes. *J. Heat Transfer* **82**, No. 1, 20 (1960).
- THOMAS E. STONECYPHER, Periodic temperature distribution in a two-layer composite slab. *J. Aero. Space Sci.* **27**, No. 2, 152 (1960).
- ROBERT T. SWANN, *Calculated Effective Thermal Conductivities of Honeycomb Sandwich Panels*. NASA TN D-171 (1959).
- W. F. G. SWANN, Theory of the A. J. Joffe method for rapid measurement of the thermal conductivity of solids. *J. Franklin Inst.* **267**, No. 5, 363 (1959).
- C. J. THORNE, *Temperature Tables, Part I. One-Layer Plate, One-Space Variable, Linear*. NAVORD Rep. 5562. NOTS 1756 (1957).
- V. VODICKA, Some problems on heat conduction in Stratiform bodies. *J. Phys. Soc. Japan* **14**, No. 2, 216 (1959).
- W. A. WOLFE, Transient response of heated air in an enclosure with heat losses. *Trans. ASME 81C (J. Heat Transfer)* **1**, 19 (1959).

## FLOW WITH SEPARATED REGIONS

- W. O. CARLSON, *Heat Transfer in Laminar Separated and Wake Flow Regions*. Heat Trans. and Fluid Mech. Inst. p. 140 (1959).
- T. FURMAN and H. HAMPSON, Experimental investigation into the effects of cross flow with condensation of steam and steam-gas mixtures on a vertical tube. *J. Inst. Mech. Engr.* No. 5, 147 (1959).
- F. H. GARNER, V. G. JENSON and R. B. KEELY, Flow pattern around spheres and the Reynolds analogy. *Trans. Inst. Chem. Engrs.* **37**, No. 4, 191 (1959).
- F. H. GARNER and J. J. LANE, Mass transfer to drops of liquid suspended in a gas stream. Part II—experimental work and results. *Trans. Inst. Chem. Engrs.* **37**, No. 3, 162 (1959).
- D. M. KUEHN, *Experimental Investigation of Pressure Rise Required for Incipient Separation of Turbulent Boundary Layers in Two-Dimensional Supersonic Flow*. NASA Memo. 1-21-59A (1959).
- HOWARD K. LARSON, Heat transfer in separated flows. *J. Aero. Space Sci.* **26**, No. 11, 731 (1959).
- B. H. LOCHTENBERG, Transition in a separated laminar boundary layer. *J. Aero. Space Sci.* **27**, No. 2, 92 (1960).
- HELMER V. NIELSEN, *Heat Transfer on an Afterbody Immersed in the Separated Wake of a Hemisphere*. NACA RM A57K07a (1958).
- J. F. RICHARDSON and P. AYERS, Heat transfer between particles and a gas in a fluidised bed. *Trans. Inst. Chem. Engrs.* **37**, No. 6, 314 (1959).
- R. A. SEBAN, A. EMERY and A. LEVY, Heat transfer to separated and reattached subsonic turbulent flows obtained downstream of a

surface step. *J. Aero. Space Sci.* **26**, No. 12, 809 (1959).

- L. E. SCRIVEN and R. L. PIGFORD, Fluid dynamics and diffusion calculations for laminar liquid jets. *J. Amer. Inst. Chem. Engrs.* **5**, No. 3, 397 (1959).

#### LIQUID METALS

- V. M. BORISHANSKII and S. S. KUTATELADZE, Heat transfer and hydraulic resistance during flow of liquid metals in circular tubes. *Soviet Phys.-J. Tech. Phys.* **3**, No. 4, 781 (1958).
- S. S. KUTATELADZE, Heat transfer during flow of liquid metals in tubes and on plane plates. *Soviet Phys.-J. Tech. Phys. Nauk SSSR* **28**, No. 4, 848 (1958).

#### LOW DENSITY

- HERBERT L. BOMELBURG, Heat loss from very thin heated wires in rarefied gases. *Phys. Fluids* **2**, No. 6, 717 (1959).
- BARRY L. REEVES, *Aerodynamic Heating in the Slip, Intermediate and Free Molecule Flow Regime*. McDonnell Aircraft Corporation Research Dept. Report No. 6859 (1959).
- K. TAKAO and T. FUJIMOTO, *Heat Transfer in the Rarefied Gases*. Mem. Fac. Engng., Univ. Nagoya **9**, No. 2, p. 379 (1957).
- O. E. TEWFIK and W. H. GIEDT, *Local Heat Transfer, Recovery Factor, Pressure Distribution Around a Circular Cylinder Normal to a Rarefied Supersonic Air Stream*. Heat Trans. and Fluid Mech. Inst. p. 15 (1959).

#### MEASUREMENT TECHNIQUES

- V. P. BABENKO, V. L. BROUDE, V. S. MEDVEDEV and A. F. PRIKHOT'KO, Methods and apparatus for low temperature optical and spectral studies (Metody i Apparatura Nizkotemperaturnykh Opticheskikh i Spektral'nykh Issledovaniy). *Pribory i Tekhnika Eksperimenta*. Nr. 1, p. 116 (1959).
- C. R. BINGHAM, Temperature detectors. *Electronics* **32**, No. 28, 55 (1959).
- B. B. BRENDEN, H. W. NEWKIRK and R. D. BIRKHOFF, *Principles of High Temperature Microscopy*. USAEC HW-58303 (1959).
- D. A. DAVIS, Two thermocouples suitable for measurement of temperatures up to 2800°C. *J. Sci. Instrum.* **37**, No. 1, 15 (1960).
- B. S. DEYCHMAN, Temperature measurement in

a high-speed gas flow (Izmereniye Temperatury v Potoke Gaza bol'shikh Skorostey). *Tr. Ufimsk. Aviats. in-ta*. Nr. 2, 23 (1956).

- T. C. HARMAN, J. H. CAHN and M. J. LOGAN, Measurement of thermal conductivity by utilization of the Peltier effect. *J. Appl. Phys.* **30**, 1351 (1959).
- WILLIAM W. HILL and PAUL E. STANLEY, *Instrumentation Studies for Plasma Jet and Hypersonic Wind Tunnel*. Purdue Research Foundation, Research Project No. 1717, Rep. No. A-59-12 (1959).
- C. E. MOELLER, Special thermocouple solves surface-temperature problem. *J. Instrum. Soc. Amer.* **6**, No. 6, 47 (1959).
- CHARLES C. MORGAN and JACK C. ANDREWS, "Morgandyne" Heat-Transfer Transducer and Flame-Torch Calibration Technique for Hypervelocity Wind Tunnels. Arnold Engineering Development Center. USAF AEDC-TR-60-1 (1960).
- YU. V. SHARVIN, Anthracite thermometers for various temperature ranges (Ugol'nyye termometry iz Antratsita dlya Razlichnykh Temperaturnykh Intervalov). *Pribory i tekhnika Eksperimenta* Nr. 1, 147 (1959).
- C. SHEER, L. H. MEAD, D. L. ROTHACKER and L. H. JOHNSON, *Measurement of Thermal Diffusivity of Various Materials by Means of the High Intensity Electric Arc Technique*. WADC TR 57-226 (PB 131 601; ASTIA AD 142 093) (1957).
- RUDOLF STARITZ, Die Elektronische Messung der Stromungsgeschwindigkeit und der Turbulenz. *Ver. Deutsch. Ing. Zeit.* **102**, No. 3S, 94 (1960).
- WILLIAM F. VAN TASSELL and EUGENE E. COVERT, Relaxation effects on the interpretation of impact-probe measurements. *J. Aero. Space Sci.* **27**, No. 2, 147 (1960).
- K. P. VLASOV, Measuring flame temperature by optical methods. *Teploenergetika* **6**, No. 9, 87 (1959).

#### NATURAL CONVECTION

- V. K. BAYEV, Nonstationary convective flows (Nestatsionarnyye Konvektivnyye Techeniya). *Tr. Tsent. in-ta Prognozov*. Nr. 43 (70), 3 (1956).
- RICHARD P. BABCO, A closed-form solution for

- laminar free convection on a vertical plate with prescribed, nonuniform, wall heat flux. *J. Aero. Space Sci.* **26**, No. 12, 846 (1959).
- YE. M. DOBRYSHMAN, A nonstationary problem on convection near a vertical wall (Nestatsionarnaya Zadacha o Konveksii u Vertikal'noy Stenki). *Tr. Tsent. in-ta Prognozov.* Nr. 43 (70), 57 (1956).
- A. J. EDE, *Natural Convection on Free Vertical Surfaces*. Mech. Engineering Research Lab. Heat 141 (DSIR, Gt. Brit.) (1956).
- J. R. FOOTE, An asymptotic method for free convection past a vertical plate (in English). *Z. Angew. Math. Phys.* **9**, No. 1, 64 (1958).
- ARTHUR W. GOLDSTEIN, *Stability of a Horizontal Fluid Layer With Unsteady Heating From Below and Time Dependent Body Force*. NASA TR R-4, 15p (1959).
- H. HAUSEN, Neue Gleichungen für die Wärmeübertragung bei freier oder erzwungener Strömung. *Allg. Wärmetech.* **9**, Heft 4-5, 75 (1958).
- YOSHINARI NAKAGAWA, Heat transport by convection. *Phys. Fluids* **3**, No. 1, 82 (1960).
- L. V. NESINA, On the effect of the temperature stratification on the heat exchange in water (O Vliyaniy Stratifikatsii Temperatury na Temploobmen v vode). *Tr. Geofiz. Observ.* Nr. 59, 37-39 (1956).
- G. A. OSTROUNOV and V. A. TETIUEV, On the question of the theory of free thermal convection in cylindrical cavities. *Soviet Phys.-Tech. Phys.* **3**, No. 6, 1173 (1959).
- G. A. OSTROUMOV, The temperature of a horizontal wire heated by alternating current. *Soviet Phys.-Tech. Phys.* **3**, No. 7, 1452 (1959).
- D. F. PAVLOV, Formation of a turbulent flow during free convection (in Russian). *Trudi Srednea. In-ta.* No. 91, 67 (1959); *Ref. Zh. Mekh.* No. 5, Rev. 5488 (1958).
- W. H. REID and D. L. HARRIS, Streamlines in Benard convection cells. *Phys. Fluids* **2**, No. 6, 716 (1959).
- I. G. SEVRUK, Laminar convection over a linear heat source. *Appl. Math. Mech. (Prikl. Math. Mekh.)* **22**, No. 4, 807 (1958).
- E. E. SOEHNGEN, Interferometric studies on heat transfer (in English). *Ninth Congrès Int. Méc. Appl. Univ. Bruxelles* **4**, 475 (1957).
- K. A. TER-MKRTCHYAN, Investigation of heat exchange processes by the laminar motion of heat carriers in constructions adopted for water heating (in Russian). *Sb. Nauch. Trudi Erevansk. Politekhn. In-ta.* No. 6, 141-149 (1956); *Ref. Zh. Mekh.* No. 1, Rev. 773 (1958).
- A. A. TOWNSEND, Temperature fluctuations over a heated horizontal surface. *J. Fluid Mech.* **5**, No. 2, 209 (1959).

## PROPERTIES

- KENNETH P. COFFIN, Effect of Argon and Helium on the thermal conductivity of the  $N_2O_4 \rightleftharpoons 2NO_2$  system. *J. Chem. Phys.* **31**, No. 5, 1290 (1959).
- NATHANIEL B. COHEN, *Correlation Formulas and Tables of Density and Some Transport Properties of Equilibrium Dissociating Air for Use in Solutions of the Boundary-Layer Equations*. NASA TN D-194 (1960).
- JOSEPH KESTIN, WOLFGANG LEIDENFROST and C. Y. LIU, On relative measurements of the viscosity of gases by the oscillating-disk method. *Z. Angew. Math. Phys.* **10**, Fasc. 6, 558 (1959).
- D. B. MANN and R. B. STEWART, Thermodynamic properties of Helium at low temperatures and high pressures. *J. Heat Transfer* **81**, No. 4, 323 (1959).
- CHARLES A. SCHAEFER and GEORGE THODOS, Thermal conductivity of diatomic gases: liquid and gaseous states. *J. Amer. Inst. Chem. Engrs.* **5**, No. 3, 367 (1959).
- ROBERT G. VINES, Measurement of the thermal conductivities of gases at high temperatures. *J. Heat Transfer* **82**, No. 1, 48 (1960).

## RADIATION

- J. G. BARTAS and W. H. SELLERS, Radiation fin effectiveness. *J. Heat Transfer* **82**, No. 1, 73 (1960).
- J. T. BEVANS and R. V. DUNKLE, Radiant interchange within an enclosure. *J. Heat Transfer* **82**, No. 1, 1 (1960).
- R. L. CHAMBERS and E. V. SOMERS, Radiation fin efficiency for one-dimensional heat flow in a circular fin. *J. Heat Transfer* **81**, No. 4, 327 (1959).
- V. I. DANILOVSKAYA, Temperature field and temperature stresses arising in an elastic half-space due to flow of radiant energy falling

- on the boundary of the half-space (Temperaturnoye pole i Temperaturnyye Napryazheniya, Voznikayushchiye v Uprugom Poluprostranstve Vsledstviye Potoka luchistoy Energii, Padayushchey na Granitsu Poluprostranstva). *Izv. Akad. Nauk SSSR, Otd. Tekh. Nauk, Mekh. i Mashinostr.* Nr. 3, 129 (1959).
- R. V. DUNKLE, F. EHRENBURG and J. T. GIER, Spectral characteristics of fabrics from 1 to 23 microns. *J. Heat Transfer* **82**, No. 1, 64 (1960).
- D. M. FINCH (I), J. M. CHORLTON and H. F. DAVIDSON (II), ISSAC GOODBAR (III), The effect of specular reflection on visibility. (I) physical measurement for the determination of brightness and contrast. (II) field measurements of loss of contrast. (III) new charts for brightness contrast calculations. *Illum. Engng.* **54**, 474 (1959).
- P. E. GLASER and H. H. BLAU, A new technique for measuring the spectral emissivity of solids at high temperatures. *ASME 81C (J. Heat Transfer)* **1**, 92 (1959).
- R. GOULARD and MADELEINE GOULARD, *Energy Transfer in the Couette Flow of a Radiant and Chemically Reacting Gas*. Heat Trans. and Fluid Mech. Inst. 126 (1959).
- R. GOULARD, *Fluxes and Non Dimensional Parameters in Radiant Gases*. Purdue Research Foundation, Research Project No. 1717, Rep. No. A-59-8 (1959).
- GEORG HASS, L. F. DRUMMETER and MILTON SCHACH, Temperature stabilization of highly reflecting spherical satellites. *J. Opt. Soc. Amer.* **49**, 918 (1959).
- E. H. HUBBARD, Comparison of different methods of fluidatomizing oil flames and the effect on flame emissivity and radiation of the addition of carbon black to liquid fuels. Comparison of different methods of fluidatomizing oil flames. *J. Inst. Fuel.* 328 (1959).
- F. B. HILL and R. H. WILHELM, Radiative and conductive heat transfer in a quiescent gas-solid bed of particles: theory and experiment. *J. Amer. Inst. Chem. Engrs.* **5**, No. 4, 486 (1959).
- J. C. KECK, J. C. CAMM, B. KIVEL and T. WENTINK, Radiation from hot air. *Ann. Phys.* **7**, No. 1, 1 (1959).
- BENNETH KIVEL, *Radiation From Hot Air and Stagnation Heating*. AVCO Everett Research Laboratory, Res. Rep. 79, AFBMD TR 59-20 (1959).
- BERT K. LARKIN and STUART W. CHURCHILL, Heat transfer by radiation through porous insulations. *J. Amer. Inst. Chem. Engrs.* **5**, No. 4, 467 (1959).
- SEYMOUR LIEBLEIN, *Analysis of Temperature Distribution and Radiant Heat Transfer Along a Rectangular Fin of Constant Thickness*. NASA TN D-196 (1959).
- GUNTER LUCK, Bestrahlung Strahlungsdurchlässiger Körper. *Chem.-Ing.-Tech.* Heft 1, No. 32, 29 (1960).
- A. K. OPPENHEIM and J. T. BEVANS, *Geometric Factors for Radiative Heat Transfer Through Absorbing Medium in Cartesian Co-ordinates*. ASME Paper No. 59-A-206 (1959).
- W. J. O'SULLIVAN and W. R. WADE, *Theory and Apparatus for Measurement of Emissivity for Radiative Cooling of Hypersonic Aircraft with Data for Inconel and Inconel X*. NACA TN 4121 (1957).
- WILLIAM H. ROBBINS, *Analysis of the Transient Radiation Heat Transfer of an Uncooled Rocket Engine Operating Outside Earth's Atmosphere*. NASA TN D-62 (1959).
- JOHN STRONG and G. A. VANASSE, Interferometric spectroscopy in the far infrared. *J. Opt. Soc. Amer.* **49**, 844 (1959).

#### TRANSFER MECHANISMS

- DARWIN CLUTTER and A. M. O. SMITH, Analysis of further data on the effect of isolated roughness on boundary-layer transition in supersonic flow. *J. Aero. Space Sci.* **27**, No. 1, 70 (1960).
- D. W. DUNN and W. H. REID, *Heat Transfer in Isotropic Turbulence During the Final Period of Decay*. NACA TN 4186 (1958).
- J. C. GIBBINGS, On the effect of a narrow band of distributed roughness upon boundary-layer transition. *J. Aero. Space Sci.* **26**, No. 12, 843 (1959).
- P. C. JAIN, A theory of homogeneous isotropic turbulence. *Appl. Sci. Res., Hague A* **8**, No. 2-3, 219 (1959).
- ROBERT J. MCCARTER and LEROY F. STUTZMAN, Transfer resistance and fluid mechanics. *J. Amer. Inst. Chem. Engrs.* **5**, No. 4, 502 (1959).
- R. R. MILLS, A. L. KISTLER, V. O'BRIEN and

- S. CORRSIN, *Turbulence and Temperature Fluctuations Behind a Heated Grid*. NACA TN 4288 (1958).
- R. MICHEL, Present knowledge of high speed transition. *Rech. Aeronaut.* No. 71, 29 (1959).
- A. S. MONIN, Of diffusion with a finite velocity (in Russian). *Izv. Akad. Nauk SSSR, Ser. Geofiz.* No. 3, 234 (1955); *Ref. Zh. Mekh.* No. 6, Rev. 6805 (1958).
- J. ROTTA, Über den Einfluss der Machschen Zahl und des Wärmeübergangs auf das Wandgesetz Turbulenter Strömung. *Z. Flugwissenschaft.* 7, 264 (1959).
- KENNETH F. STETSON, Boundary-layer transition on blunt bodies with highly cooled boundary-layers. *J. Aero. Space Sci.* 27, No. 2, 81 (1960).

#### TRANSPIRATION AND MASS TRANSFER COOLING

- ROY E. BARTLE and BERNARD M. LEADON, Experimental evaluation of heat transfer with transpiration cooling in a turbulent boundary-layer at  $M = 3.2$ . *J. Aero. Space Sci.* 27, No. 1, 78 (1960).
- J. R. BELL and A. H. NISSAN, Mechanism of drying thick porous bodies during the falling rate period. Part II: A hygroscopic material. *J. Amer. Inst. Chem. Engrs.* 5, No. 3, 344 (1959).
- ALECK C. BOND, BERNARD RASHIS and L. ROSS LEVIN, *Experimental Ablation Cooling*. NACA RM L58E15a (1958).
- F. BURGGRAF, J. H. CHIN and L. E. HAYES, *Film-Cooling Data for Multiple Rows of Discrete Louvers, Overall Effectiveness Downstream of One to Twenty Rows of Punched Crescent Louvers*. General Electric Co., Cincinnati, Technical Information Series No. R59FPD804 (1959).
- J. H. CHIN, F. BURGGRAF and L. E. HAYES, *Design Data for Multiple-Slot Film Cooling. Part II—Generalized Correlation Downstream of N Slots*. General Electric Co., Cincinnati, Technical Information Series No. R59FPD803 (1959).
- PAUL M. CHUNG, *Shielding Stagnation Surfaces of Finite Catalytic Activity by Air Injection in Hypersonic Flight*. NASA TN D-27 (1959).
- ALAN Q. ESCHENROEDER, The compressible laminar boundary layer with constant injected mass flux at the surface. *J. Aero. Space Sci.* 26, No. 11, 762 (1959).
- F. H. GARNER and P. KENDRICK (I), F. H. GARNER and J. J. LANE (II), Mass transfer to drops of liquid suspended in a gas stream (I). Experimental work and results (II). *Trans. Inst. Chem. Engrs.* 37, No. 3, 155 (1959).
- S. GEORGIEV, H. HIDLAGO and M. C. ADAMS, *On Ablation for the Recovery of Satellites*. Heat Trans. and Fluid Mech. Inst., Univ. Calif. p. 171 (1959).
- S. GEORGIEV, H. HIDALGO and M. C. ADAMS, *On Ablating Heat Shields for Satellite Recovery*. AVCO Everett Research Laboratory, Res. Rep. 65 (AFBMD-TR-59-7) (1959).
- T. R. GOODMAN, Aerodynamic ablation of melting bodies. *Proc. Third U.S. Nat. Congr. Appl. Mech.* (1958); *Amer. Soc. Mech. Engrs.* 735 (1958).
- LEON GREEN and KENNETH L. NALL, Experiments on porous-wall cooling and flow separation control in a supersonic nozzle. *J. Aero. Space Sci.* 26, No. 11, 689 (1959).
- G. G. HASELDEN and S. A. MALATY, Heat and mass transfer accompanying the absorption of ammonia in water. *Trans. Inst. Chem. Engrs.* 37, 137 (1959).
- HENRY HIDALGO, *A Theory of Ablation of Glassy Materials for Laminar and Turbulent Heating*. AVCO Everett Research Laboratory, Res. Rep. 62 (AFBMD-TN-59-13) (1959).
- WILLIAM H. KINARD, *Feasibility of Nose-Cone Cooling by the Upstream Ejection of Solid Coolants at the Stagnation Point*. NACA RM L57K22 (1958).
- PAUL A. LIBBY and ROBERT J. CRESCI, *Experimental Investigation of the Downstream Influence of Stagnation Point Mass Transfer*. PIBAL Rep. No. 520, WADC TN 59-210 (1959).
- MITCHELL LITT and S. K. FRIEDLANDER, An experimental study of diffusion-controlled reactions in a laminar boundary layer. *J. Amer. Inst. Chem. Engrs.* 5, No. 4, 483 (1959).
- R. I. MACEY, A quasi-steady-state approximation method for diffusion problems. Part I. concentration dependent diffusion coefficients. *Bull. Math. Biophys.* 21, No. 1, 19 (1959).
- H. J. MERK, The microscopic equations for simultaneous heat and mass transfer in

- isotropic, continuous and closed systems. *Appl. Sci. Res., Hague A* 8, No. 1, 73 (1958).
- A. H. NISSAN, W. G. KAYE and J. R. BELL, Mechanism of drying thick porous bodies during the falling rate period. Part I—Pseudo-wet-bulb-temperature. *J. Amer. Inst. Chem. Engrs.* 5, No. 1, 103 (1959).
- BERNARD RASHIS, WILLIAM G. WITTE and RUSSELL N. HOPKO, *Qualitative Measurements of the Effective Heats of Ablation of Several Materials in Supersonic Air Jets at Stagnation Temperature up to 11,000° F.* NACA RM L58E22 (1958).
- L. ROBERTS, *Stagnation-Point Shielding by Melting and Vaporization.* NASA Report No. 10 (1959).
- F. R. SEDLUND and C. C. CHANG, Blunt-nosed bodies in a high-temperature gas jet. *Nature, Lond.* 184, 812 (1959).
- S. M. SCALA, *A Study of Hypersonic Ablation.* GE MSVD, Technical Information Series R59SD438 (1959).
- S. M. SCALA and N. S. DIACONIS, The stagnation-point ablation of Teflon during hypersonic flight. *J. Aero. Space Sci.* 27, No. 2, 140 (1960).
- S. M. SCALA, Sublimation in a hypersonic environment. *J. Aero. Space Sci.* 27, No. 1, 1 (1960).
- S. M. SCALA, *Vaporization of a Refractory Oxide During Hypersonic Flight.* Heat Trans. and Fluid Mech. Inst., Univ. Calif. p. 181 (1959).
- C. J. SCOTT, G. E. ANDERSON and D. R. ELGIN, *Laminar, Transitional and Turbulent Mass Transfer Cooling Experiments at Mach Numbers 3–5.* University of Minnesota, Research Report No. 162. AFOSR TN 59–1305 (1959).
- I. T. SHVETS, YE. P. DYBAN and N. M. KONDAK, Investigation of the cooling of turbine wheels by means of air blown through the gaps in the swallow-tail mountings of the blades (Issledovaniye Okhlazhdeniya Diskov Turbin Produvkoy Vozdukha Cherez Montazhnyye Zazory Yelochnykh Khvostovikov Rabochikh Lopatok). *Sb. Tr. In-ta Teploenerg. AN UkrSSR.* Nr. 13, 20 (1956).
- G. W. SUTTON, A comparison of several approximate theories of melting ablation. *J. Aero. Space Sci.* 26, No. 6, 397 (Readers' Forum) (1959).

#### ROTATING

- D. C. BRIGGS, *Heat Transfer in Rotating Turbulent Pipe Flow.* Stanford University TR No. 45 (1959).
- D. R. DAVIES, Heat transfer by laminar flow from a rotating disk at large Prandtl numbers. *Quart. J. Mech. Appl. Math.* 12, No. 1, 14 (1959).
- L. A. DORFMAN, Influence of radial temperature gradient on heat transfer from a rotating disk (in Russian). *Izv. Akad. Nauk SSSR. Otd. Tekh. Nauk.* No. 12, 64 (1957).
- L. A. DORFMAN, Thermal boundary layer on a rotating disc. *Soviet Phys.-Doklady.* 3, No. 2, 248 (1958).
- F. KREITH, J. H. TAYLOR and J. P. CHONG, Heat and mass transfer from a rotating disk. *ASME 81C (J. Heat Transfer)* 2, 95 (1959).
- D. W. MOORE, The flow past a rapidly rotating circular cylinder in a uniform stream. *J. Fluid Mech.* 2, No. 6, 541 (1957).
- G. A. TIRSKII, Nonstationary flow with heat transfer in a viscous, incompressible fluid between two revolving discs accompanied by fluid influx. *Soviet Phys.-Doklady.* 3, No. 2, 237 (1958).
- G. A. TIRSKII, On non-stationary heat transmission through a system of discs rotating in a Viscous Liquid (O Nestatsionarnoy Teploperedache Cherez Sistemu Diskov, Vrashchayuschchikhsya v Vyazkoy Zhidkosti). *Izvestiya Akademii nauk SSSR, Otdeleniye Tekhnicheskikh nauk.* p. 106 (1958).
- G. VERONIS, Cellular convection with finite amplitude, in a rotating fluid. *J. Fluid Mech.* 5, No. 3, 401 (1959).