

Contents*

Fritz London Award Address. <i>A. A. Abrikosov</i>	1
--	---

Quantum Fluids

1. Plenary Topics

Light Scattering As a Probe of Liquid Helium. <i>T. J. Greytak</i>	9
Phase Diagram of Helium Monolayers. <i>J. G. Dash</i>	19
Helium-3 in Superfluid Helium-4. <i>David O. Edwards</i>	26

2. Quantum Fluids Theory

Some Recent Developments Concerning the Macroscopic Quantum Nature of Superfluid Helium. <i>S. Putterman</i>	39
A Neutron Scattering Investigation of Bose-Einstein Condensation in Superfluid ^4He . <i>H.A. Mook, R. Scherm, and M.K. Wilkinson</i>	46
Temperature and Momentum Dependence of Phonon Energies in Superfluid ^4He . <i>Shlomo Havlin and Marshall Luban</i>	50
Does the Phonon Spectrum in Superfluid ^4He Curve Upward? <i>S.G. Eckstein, D. Friedlander, and C.G. Kuper</i>	54
Model Dispersion Curves for Liquid ^4He . <i>James S. Brooks and R. J. Donnelly</i>	57
Analysis of Dynamic Form Factor $S(k, \omega)$ for the Two-Branch Excitation Spectrum of Liquid ^4He . <i>T. Soda, K. Sawada, and T. Nagata</i>	61
Excitation Spectrum for Weakly Interacting Bose Gas and the Liquid Structure Function of Helium. <i>Archana Bhattacharyya and Chia-Wei Woo</i>	67
Elementary Excitations in Liquid Helium. <i>Chia-Wei Woo</i>	72
Long-Wavelength Excitations in a Bose Gas and Liquid He II at $T = 0$. <i>H. Gould and V. K. Wong</i>	76
Bose-Einstein Condensation in Two-Dimensional Systems. <i>Y. Imry, D.J. Bergman, and L. Gunther</i>	80
Phonons and Lambda Temperature in Liquid ^4He as Obtained by the Lattice Model. <i>P. H. E. Meijer and W. D. Scherer</i>	84
Equation of State for Hard-Core Quantum Lattice System. <i>T. Horiguchi and T. Tanaka</i>	87

* Tables of contents for Volumes 2, 3, and 4 and an index to contributors appear at the back of this volume.

Impulse of a Vortex System in a Bounded Fluid. <i>E. R. Huggins</i>	92
New Results on the States of the Vortex Lattice. <i>M. Le Ray, J. P. Deroyon, M. J. Deroyon, M. François, and F. Vidal</i>	96
Superfluid Density in Pairing Theory of Superfluidity. <i>W. A. B. Evans and R. I. M.A. Rashid</i>	101
The ^3He -Roton Interaction. <i>H. T. Tan, M. Tan, and C. -W. Woo</i>	108
Quantum Lattice Gas Model of ^3He - ^4He Mixtures. <i>Y. -C. Cheng and M. Schick</i>	112
The $S = 1$ Ising Model for ^3He - ^4He Mixtures. <i>W.M. Ng, J.H. Barry, and T. Tanaka</i>	116
Low Temperature Thermodynamics of Fermi Fluids. <i>A. Ford, F. Mohling, and J.C. Rainwater</i>	121
Density and Phase Variables in the Theory of Interacting Bose Systems. <i>P. Berdahl</i>	130
Subcore Vortex Rings in a Ginsburg-Landau Fluid. <i>E. R. Huggins</i>	135

3. Static Films

Multilayer Helium Films on Graphite. <i>Michael Bretz</i>	143
Submonolayer Isotopic Mixtures of Helium Adsorbed on Grafoil. <i>S. V. Hering, D. C. Hickernell, E. O. McLean, and O. E. Vilches</i>	147
Spatial Ordering Transitions in Quantum Lattice Gases. <i>R. L. Siddon and M. Schick</i>	152
A Model of the ^4He Monolayer on Graphite. <i>S. Nakajima</i>	156
Thermal Properties of the Second Layer of Adsorbed ^3He . <i>A. L. Thomson, D. F. Brewer, and J. Stanford</i>	159
Nuclear Magnetic Resonance Investigation of ^3He Surface States in Adsorbed ^3He - ^4He Films. <i>D. F. Brewer, D. J. Creswell, and A. L. Thomson</i>	163
Nuclear Magnetic Relaxation of Liquid ^3He in a Constrained Geometry. <i>J. F. Kelly and R. C. Richardson</i>	167
Low-Temperature Specific Heat of ^4He Films in Restricted Geometries. <i>R. H. Tait, R. O. Pohl, and J. D. Reppy</i>	172
Mean Free Path Effects in ^3He Quasiparticles: Measurement of the Spin Diffusion Coefficient in the Collisionless Regime by a Pulsed Gradient NMR Technique. <i>D.F. Brewer and J.S. Rolt</i>	177
Adsorption of ^4He on Bare and on Argon-Coated Exfoliated Graphite at Low Temperatures. <i>E. Lerner and J. G. Daunt</i>	182
Ellipsometric Measurements of the Saturated Helium Film. <i>C. C. Matheson and J.L. Horn</i>	185
Momentum and Energy Transfer Between Helium Vapor and the Film. <i>D. G. Blair and C. C. Matheson</i>	190
Nuclear Magnetic Resonance Study of the Formation and Structure of an Adsorbed ^3He Monolayer. <i>D. J. Creswell, D. F. Brewer, and A. L. Thomson</i>	195
Pulsed Nuclear Resonance Investigation of the Susceptibility and Magnetic Interaction in Degenerate ^3He Films. <i>D. F. Brewer and J. S. Rolt</i>	200

Measurements and Calculations of the Helium Film Thickness on Alkaline Earth Fluoride Crystals. <i>E. S. Sabisky and C. H. Anderson</i>	206
The Normal Fluid Fraction in the Adsorbed Helium Film. <i>L. C. Yang, M. Chester, and J. B. Stephens</i>	211

4. Flowing Films

Helium II Film Transfer Rates Into and Out of Solid Argon Beakers. <i>T. O. Milbrodt and G. L. Pollack</i>	219
Preferred Flow Rates in the Helium II Film. <i>R. F. Harris-Lowe and R. R. Turkington</i>	224
Superfluidity of Thin Helium Films. <i>H. W. Chan, A. W. Yanof, F. D. M. Pobell, and J. D. Reppy</i>	229
Superfluidity in Thin ^3He - ^4He Films. <i>B. Ratnam and J. Mochel</i>	233
On the Absence of Moderate Velocity Persistent Currents in He II Films Adsorbed on Large Cylinders. <i>T. Wang and I. Rudnick</i>	239
Thermodynamics of Superflow in the Helium Film. <i>D.L. Goodstein and P.G. Saffman</i>	243
Mass Transport of ^4He Films Adsorbed on Graphite. <i>J. A. Herb and J. G. Dash</i>	247
Helium Film Flow Dissipation with a Restrictive Geometry. <i>D. H. Liebenberg</i>	251
Dissipation in the Flowing Saturated Superfluid Film. <i>J. K. Hoffer, J. C. Fraser, E. F. Hammel, L. J. Campbell, W. E. Keller, and R. H. Sherman</i>	253
Dissipation in Superfluid Helium Film Flow. <i>J. F. Allen, J. G. M. Armitage, and B. L. Saunders</i>	258
Direct Measurement of the Dissipation Function of the Flowing Saturated He II Film. <i>W. E. Keller and E. F. Hammel</i>	263
Application of the Fluctuation Model of Dissipation to Beaker Film Flow. <i>L. J. Campbell</i>	268
Film Flow Driven by van der Waals Forces. <i>D. G. Blair and C. C. Matheson</i> ...	272

5. Superfluid Hydrodynamics

Decay of Saturated and Unsaturated Persistent Currents in Superfluid Helium. <i>H. Kojima, W. Veith, E. Guyon, and I. Rudnick</i>	279
Rotating Couette Flow of Superfluid Helium. <i>H. A. Snyder</i>	283
New Aspects of the λ -Point Paradox. <i>Robert F. Lynch and John R. Pellam</i>	288
Torque on a Rayleigh Disk Due to He II Flow. <i>W. J. Trela and M. Heller</i>	293
Superfluid ^4He Velocities in Narrow Channels between 1.8 and 0.3°K. <i>S. J. Harrison and K. Mendelsohn</i>	298
Critical Velocities in Superfluid Flow Through Orifices. <i>G. B. Hess</i>	302
Observations of the Superfluid Circulation around a Wire in a Rotating Vessel Containing He II. <i>S. F. Karl and W. Zimmermann, Jr.</i>	307

An Attempt to Photograph the Vortex Lattice in Rotating He II. <i>Richard E. Packard and Gay A. Williams</i>	311
Radial Distribution of Superfluid Vortices in a Rotating Annulus. <i>D. Scott Shenk and James B. Mehl</i>	314
Effect of a Constriction on the Vortex Density in He II Superflow. <i>Maurice François, Daniel Lhuillier, Michel Le Ray, and Félix Vidal</i>	319
AC Measurements of a Coupling between Dissipative Heat Flux and Mutual Friction Force in He II. <i>Félix Vidal, Michel Le Ray, Maurice François, and Daniel Lhuillier</i>	324
The He II–He I Transition in a Heat Current. <i>S.M. Bhagat, R.S. Davis, and R. A. Lasken</i>	328
Pumping in He II by Low-Frequency Sound. <i>G. E. Watson</i>	332
Optical Measurements on Surface Modes in Liquid Helium II. <i>S. Cunsolo and G. Jacucci</i>	337

6. Helium Bulk Properties

Measurement of the Temperature Dependence of the Density of Liquid ^4He from 0.3 to 0.7 K and Near the λ -Point. <i>Craig T. Van DeGrift and John R. Pellam</i>	343
Second-Sound Velocity and Superfluid Density in ^4He Under Pressure and Near T_λ . <i>Dennis S. Greywall and Guenter Ahlers</i>	348
Superfluid Density Near the Lambda Point in Helium Under Pressure. <i>Akira Ikushima and Giuchi Terui</i>	352
Hypersonic Attenuation in the Vicinity of the Superfluid Transition of Liquid Helium. <i>D. E. Commins and I. Rudnick</i>	356
Superheating in He II. <i>R. K. Childers and J. T. Tough</i>	359
Evaporation from Superfluid Helium. <i>Milton W. Cole</i>	364
Angular Distribution of Energy Flux Radiated from a Pulsed Thermal Source in He II below 0.3 K. <i>C. D. Pfeifer and K. Luszczynski</i>	367
Electric Field Amplification of He II Luminescence Below 0.8 K. <i>Huey A. Roberts and Frank L. Hereford</i>	372
Correlation Length and Compressibility of ^4He Near the Critical Point. <i>A. Tominaga and Y. Narahara</i>	377
Coexistence Curve and Parametric Equation of State for ^4He Near Its Critical Point. <i>H. A. Kierstead</i>	381
Effect of Viscosity on the Kapitza Conductance. <i>W.M. Saslow</i>	387
Liquid Disorder Effects on the Solid He II Kapitza Resistance. <i>C. Linnet, T. H. K. Frederking, and R. C. Amar</i>	393
The Kapitza Resistance between Cu (Cr) and ^4He (^3He) Solutions and Applications to Heat Exchangers. <i>J. D. Siegwarth and R. Radebaugh</i>	398
Heat Transfer between Fine Copper Powders and Dilute ^3He in Superfluid ^4He . <i>R. Radebaugh and J. D. Siegwarth</i>	401

Thermal Boundary Resistance between Pt and Liquid ^3He at Very Low Temperatures. <i>J. H. Bishop, A. C. Mota, and J. C. Wheatley</i>	406
The Leggett–Rice Effect in Liquid ^3He Systems. <i>L. R. Corruccini, D. D. Osheroff, D. M. Lee, and R. C. Richardson</i>	411
Helium Flow Through an Orifice in the Presence of an AC Sound Field. <i>D. Muginski and D. H. Douglass</i>	414

7. Ions and Electrons

Vortex Fluctuation Contribution to the Negative Ion Trapping Lifetime. <i>J. McCauley, Jr.</i>	421
The Question of Ion Current Flow in Helium Films. <i>S. G. Kennedy and P. W. F. Gribbon</i>	426
Impurity Ion Mobility in He II. <i>Warren W. Johnson and William I. Glaberson</i> .	430
Measurement of Ionic Mobilities in Liquid ^3He by a Space Charge Method. <i>P.V.E. McClintock</i>	434
Pressure Dependence of Charge Carrier Mobilities in Superfluid Helium. <i>R. M. Ostermeier and K. W. Schwarz</i>	439
Two-Dimensional Electron States Outside Liquid Helium. <i>T. R. Brown and C. C. Grimes</i>	443
An Experimental Test of Vinen's Dimensional Theory of Turbulent He II. <i>D. M. Sitton and F. E. Moss</i>	447
Measurements on Ionic Mobilities in Liquid ^4He . <i>G. M. Daalmans, M. Naeije, J. M. Goldschvartz, and B. S. Blaisse</i>	451
Influence of a Grid on Ion Currents in He II. <i>C.S.M. Doake and P.W.F. Gribbon</i>	456
Collective Modes in Vortex Ring Beams. <i>G. Gamota</i>	459
Tunneling from Electronic Bubble States in Liquid Helium Through the Liquid–Vapor Interface. <i>G. W. Rayfield and W. Schoepe</i>	469
Positive Ion Mobility in Liquid ^3He . <i>M. Kuchnir, J. B. Ketterson, and P. R. Roach</i>	474
A Large Family of Negative Charge Carriers in Liquid Helium. <i>G. G. Ihas and T. M. Sanders, Jr.</i>	477
Temperature Dependence of the Electron Bubble Mobility Below 0.3°K . <i>M. Kuchnir, J. B. Ketterson, and P. R. Roach</i>	482
Transport Properties of Electron Bubbles in Liquid He II. <i>M. Date, H. Hori, K. Toyokawa, M. Wake, and O. Ichikawa</i>	485
Do Fluctuations Determine the Ion Mobility in He II near T_λ ? <i>D. M. Sitton and F. E. Moss</i>	489

8. Sound Propagation and Scattering Phenomena

Absence of a Quadratic Term in the ^4He Excitation Spectrum. <i>P. R. Roach, B. M. Abraham, J. B. Ketterson, and M. Kuchnir</i>	493
--	-----

Theoretical Studies of the Propagation of Sound in Channels Filled with Helium II. <i>H. Wiechert and G. U. Schubert</i>	497
Developments in the Theory of Third Sound and Fourth Sound. <i>David J. Bergman</i>	501
Thermal Excitation of Fourth Sound in Liquid Helium II. <i>H. Wiechert and R. Schmidt</i>	510
Inelastic Scattering From Surface Zero-Sound Modes: a Model Calculation. <i>Allan Griffin and Eugene Zaremba</i>	515
The Scattering of Low-Energy Helium Atoms at the Surface of Liquid Helium. <i>J. Eckardt, D. O. Edwards, F. M. Gasparini, and S. Y. Shen</i>	518
Inelastic Scattering of ^4He Atoms by the Free Surface of Liquid ^4He . <i>C. G. Kuper</i>	522
The Scattering of Light by Liquid ^4He Close to the λ -Line. <i>W. F. Vinen, C. J. Palin, and J. M. Vaughan</i>	524
Experiments on the Scattering of Light by Liquid Helium. <i>J. M. Vaughan, W. F. Vinen, and C. J. Palin</i>	532
Brillouin Light Scattering from Superfluid Helium under Pressure. <i>G. Winterling, F. S. Holmes, and T. J. Greytak</i>	537
Brillouin Scattering from Superfluid ^3He - ^4He Mixtures. <i>R. F. Benjamin, D. A. Rockwell, and T. J. Greytak</i>	542
Liquid Structure Factor Measurements on the Quantum Liquids. <i>R. B. Hallock</i>	547
The Functional Forms of $S(k)$ and $E(k)$ in He II as Determined by Scattering Experiments. <i>R. B. Hallock</i>	551

9. ^3He - ^4He Mixtures

Effective Viscosity of Liquid Helium Isotope Mixtures. <i>D. S. Betts, D. F. Brewer, and R. Lucking</i>	559
The Viscosity of Dilute Solutions of ^3He in ^4He at Low Temperatures. <i>K. A. Kuenhold, D.B. Crum, and R.E. Sarwinski</i>	563
The Viscosity of ^3He - ^4He Solutions. <i>D. J. Fisk and H. E. Hall</i>	568
Thermodynamic Properties of Liquid ^3He - ^4He Mixtures Near the Tricritical Point Derived from Specific Heat Measurements. <i>S. T. Islander, and W. Zimmermann, Jr.</i>	571
Dielectric Constant and Viscosity of Pressurized ^3He - ^4He Solutions Near the Tricritical Point. <i>C. M. Lai and T. A. Kitchens</i>	576
Critical Opalescent Light Scattering in ^3He - ^4He Mixtures Near the Tricritical Point. <i>D. Randolph Watts and Watt W. Webb</i>	581
Second-Sound Velocity, Gravitational Effects, Relaxation Times, and Superfluid Density Near the Tricritical Point in ^3He - ^4He Mixtures. <i>Guenter Ahlers and Dennis S. Greywall</i>	586
Excitation Spectrum of ^3He - ^4He Mixture and Its Effect on Raman Scattering. <i>T. Soda</i>	591

The Low-Temperature Specific Heat of the Dilute Solutions of ^3He in Superfluid ^4He . <i>H. Brucker and Y. Disatnik</i>	598
Spin Diffusion of Dilute ^3He - ^4He Solutions under Pressure. <i>D. K. Cheng, P. P. Craig, and T. A. Kitchens</i>	602
The Spin Diffusion Coefficient of ^3He in ^3He - ^4He Solutions. <i>D.C. Chang and H. E. Rorschach</i>	608
Nucleation of Phase Separation in ^3He - ^4He Mixtures. <i>N. R. Brubaker and M. R. Moldover</i>	612
Renormalization of the ^4He λ -Transition in ^3He - ^4He Mixtures. <i>F. M. Gasparini and M. R. Moldover</i>	618
The Osmotic Pressure of Very Dilute ^3He - ^4He Mixtures. <i>J. Landau and R. L. Rosenbaum</i>	623
Pressure Dependence of Superfluid Transition Temperature in ^3He - ^4He Mixtures. <i>T. Satoh and A. Kakizaki</i>	627
Thermal Diffusion Factor of ^3He - ^4He Mixtures: A Test of the Helium Interaction Potential. <i>W. L. Taylor</i>	631
Peculiarities of Charged Particle Motion in ^3He - ^4He Solutions in Strong Electric Fields. <i>B. N. Eselson, Yu. Z. Kovdrya, and O. A. Tolkacheva</i>	636
First-Sound Absorption and Dissipative Processes in ^3He - ^4He Liquid Solutions and ^3He . <i>N. E. Dyumin, B. N. Eselson, and E. Ya. Rudavsky</i>	637
Contents of Other Volumes	638
Index to Contributors	661
Subject Index	668