TABLE OF CONTENTS

Personnel v
Publications and Reports xiii
Introduction xvi

GENERAL PHYSICS

I. Molecular Beams 1
   Achromatic Corrected Electron Foil Lenses 1

II. Microwave Spectroscopy 7
    Surface Effects in the Magneto-Surface Impedance of Metals 7
    Critical-Point Fluctuations in Superconducting Thin Films 8

III. Radio Astronomy 11
    Very Long Baseline Interferometric Study of the Water-Vapor
    Emission Regions in Orion A 11
    Radio Survey of the Spiral Nebulae M31 and M33 16
    Stellar Interferometer 20
    Infrared and Microwave Transmission in the Atmosphere
    of Venus 34

IV. Physical Electronics and Surface Physics 43
    Quasi-Equilibrium Analysis of the Reaction of Atomic and
    Molecular Fluorine with Tungsten 43
    Creep-Rupture Behavior of Doped Tungsten Wire at High
    Temperature (1600-2925°C) 45

V. Electrodynamics of Media 51
    Analysis of Transversely Excited Atmospheric (TEA)
    CO₂ Laser 51
    Gain and Relaxation Studies of a Transversely Excited
    Atmospheric (TEA) CO₂ Laser 59

PLASMA DYNAMICS

VI. Plasmas and Controlled Nuclear Fusion 71
    Waves and Radiation 71
    High-Speed Nonlinear Plasma Waves 71
    Even Moments of the Nonlinear Distribution Function
    \[ f = n_o \sqrt{\beta/\pi} \ e^{-\beta(u+c)^2} \] 75
    The Maximum Amplitude of a Nonlinear Plasma Wave 79
CONTENTS

Plasma Diagnostics 86
   Stark Profiles of the He I 4471 Å Line and of Its Two Forbidden Components, Measured in a Laser-Produced Plasma 86
   High-Temperature Toroidal Plasmas 93
   Feasibility of Stationary Tokamak 93

VII. Gaseous Electronics 99
   Tonks-Dattner Resonances in Ion Laser 99

VIII. Relativistic Beams 103
   Beam-Plasma Investigations Using Marx Generator Technology 103

COMMUNICATION SCIENCES AND ENGINEERING

IX. Speech Communication 111
   On Predicting the Duration of the Phonetic Segment [s] in English 111
   The Perception of Temporally Segmented Speech 126
   Digital Ladder Filter Structures and Coefficient Sensitivity 129

X. Linguistics 139
   Outline of the Accentuation in Inflectional Paradigms of Literary Lithuanian with an Appendix on the Accentuation of Nominal Derivatives 139
   On Algorithms for Applying Phonological Rules 159

XI. Communications Biophysics 165
   Effect of Dimethyl Sulphoxide (DMSO) on the Conduction Velocity of Homarus Axons 165
   Effects of Refractoriness on Auditory-Nerve Statistics 172

XII. Signal Processing 177
   A Quantitative Definition of Percussiveness 177

Author Index 181