CONTENTS

List of Authors and Panelists xiii
Preface xix
Acknowledgments xxi

Part I

OXYGEN. MECHANISMS OF TOXICITY

The Scope of Chemical Oxygen Poisoning 1
Niels Haugaard

Oxygen Toxicity in Neuronal Elements 9
J. D. Wood

The Intracellular Oxidation-Reduction State at High and Low Oxygen Concentrations 19
Britton Chance

Natural Resistance to Oxygen Poisoning 23
Brian G. D'Aoust

Chemical Protection against Oxygen Toxicity 35
Aaron P. Sanders and William D. Currie

Effects of Oxygen on Blood Formation and Destruction 41
Craig L. Fischer and Stephen L. Kimzey

Discussion 49
R. E. Davies, Chairman

Part II

OXYGEN EFFECTS ON CELLS AND SYSTEMS

Effects of Oxygen upon Ophthalmic Structures 57
Charles W. Nichols and C. J. Lambertsen

Acute Oxygen Toxicity in Working Man 67
J. Murray Young

Discussion 77
K. E. A. Seemann, CHAIRMAN

Part III

PHYSICAL EFFECTS OF PRESSURE AND GASES

Hydrostatic Effects on Cellular Function 85
J. V. Landau

Effects of Inert Gas Pressures on Protein Structure and Function 95
R. M. Featherstone, S. Hegeman, and W. Settle

Effects of Hydrostatic Pressure on Mammals 101
M. J. Lever, K. W. Miller, W. D. M. Paton, W. B. Streett, and E. B. Smith

Discussion 109
R. M. Featherstone, CHAIRMAN

Part IV

FUNDAMENTALS OF INERT GAS EXCHANGE AND BUBBLE FORMATION

Concepts of Inert Gas Exchange in Tissues during Decompression 115
B. A. Hills

Decompression Characteristics of Inert Gases 123
M. J. Lever, W. D. M. Paton, and E. B. Smith

Criteria for Bubble Growth 137
Ruport Hester

Dissolved Gas Washout and Bubble Absorption in Routine Decompression 145
Hugh D. Van Liew

Detection of Bubbles in Tissues and Blood 151
R. Stuart Mackay and George Rubissow

Discussion 161
R. E. Forster, CHAIRMAN

Part V

FACTORS IN DECOMPRESSION. THE INERT GASES

Comparative Approaches to Prophylactic Decompression 167
D. J. Kidd, R. A. Stubbs, and R. S. Weaver

Calibration of Inert Gas Exchange in the Mouse 179
Edward T. Flynn, Jr. and C. J. Lambertsen

Gas Nucleation Concept Applied to Decompression 193
G. Albano and M. Columba

A Pragmatic View of Decompression 205
H. R. Schreiner and P. L. Kelley

Decompression in Saturation Diving 221
A. A. Bühlmann

Discussion 229
H. V. Hempleman, CHAIRMAN

Part VI

**FACTORS IN DECOMPRESSION.
THE CIRCULATION AND THE CIRCULATING BLOOD**

Blood Agglutination in Decompression Sickness 235
Edgar End

Circulating Lipids and Inert Gas Exchange under Hyperbaric Conditions 239
Paul W. Lange, Alf Martinsson, and Hans O. E. Röckert

Coexistence of Lipid and Gas Emboli in Experimental Decompression Sickness 245
A. T. K. Cockett, S. M. Pauley, J. C. Saunders, and F. M. Hirose

Aseptic Bone Necrosis in Royal Navy Divers 251
D. H. Elliott and J. A. B. Harrison

Discussion 263
R. D. Workman, CHAIRMAN

Part VII
SENSES AND COMMUNICATION

Vision and Visibility 271
Jo Ann S. Kinney and S. M. Luria

Hearing Loss in Decompression 277
J. Donald Harris

Vestibular Derangement in Decompression 287
Carl J. Rubenstein and James K. Summitt

Speech Distortion at High Pressures 293
G. M. Fant, J. Lindqvist, B. Sonesson, and H. Hollien

Discussion 301
J. K. Summitt, CHAIRMAN

Part VIII
RESPIRATORY LIMITATIONS OF HIGH AMBIENT PRESSURES

Mechanical Limitations of Exercise Ventilation at Increased Ambient Pressure 307
L. D. H. Wood and A. C. Bryan

Ventilatory Limitations on Exertion at Depth 317
J. N. Miller, O. D. Wangensteen, and E. H. Lanphier

Respiratory and Cardiac Responses to Exercise in Subjects Breathing Helium-Oxygen Mixtures at Pressures from Sea Level to 19.2 Atmospheres 325
M. E. Bradley, N. R. Anthonisen, J. Vorosmarti, and P. G. Linaweaver

Mechanics of Breathing with Helium-Oxygen and Neon-Oxygen Mixtures in Deep Saturation Diving 339

N. R. Anthonisen, M. E. Bradley, J. Vorosmarti, and P. G. Linaweaver

Arterial Blood Gases, Heart Rate, and Gas Exchange during Rest and Exercise in Men Saturated at a Simulated Seawater Depth of 1000 Feet 347

J. Salzano, E. M. Overfield, D. C. Rausch, H. A. Saltzman, J. A. Kylstra, J. S. Kelley, and J. K. Summitt

Pulmonary Function and Respiratory Gas Exchange during Saturation-Excursion Diving to Pressures Equivalent to 1000 Feet of Seawater 357

K. E. Schaefer, C. R. Carey, and J. H. Dougherty, Jr.

Discussion 371

C. J. Lambertsen, CHAIRMAN

Part IX

CARBON DIOXIDE, EXERCISE, AND ACCLIMATIZATION TO HYPERCARBIA

The Effects of Breathing a High Density Gas upon Carbon Dioxide Elimination 379

Donald C. Parker and Eugene Nagel

Respiratory Gas Exchange in Animals during Exposure to Extreme Ambient Pressures 385

J. Chouteau

Rate of Acclimatization to Chronic Hypercapnia in Man 399

J. M. Clark, R. D. Sinclair, and B. E. Welch

Comparison of Physiological Responses of Normal Man to Exercise in Air and in Acute and Chronic Hypercapnia 409

R. D. Sinclair, J. M. Clark, and B. E. Welch

Discussion 419

K. E. Schaefer, CHAIRMAN

Part X

TEMPERATURE BALANCE IN SHALLOW AND DEEP EXPOSURES

Heat Exchange between Man and the Water Environment 425

Albert B. Craig, Jr.

Thermal Balance at Depth 435

J. S. P. Rawlins and J. F. Tauber

Discussion 443

J. D. Hardy, CHAIRMAN

Part XI

INFLUENCE OF INERT GASES AND PRESSURE UPON CENTRAL NERVOUS FUNCTIONS

Quantitation of Performance Decrements in Narcotized Man 449

James G. Dickson, Jr., C. J. Lambertsen, and John G. Cassils

Psychological, Physiological, and Biophysical Studies of Narcosis 457

Peter B. Bennett

Neuropsychological Effects of Exposure to Compressed Air 471

P. M. Criscuoli and G. Albano

Human Performance at Great Depths 479

R. J. Biersner

Experimental Studies on the High Pressure Hyperexcitability Syndrome in Various Mammalian Species 487

R. W. Brauer, R. O. Way, M. R. Jordan, and D. E. Parrish

Electrical Activity in the Central Nervous System in Extreme Narcosis 501

P. V. Van Tassel, C. J. Knight, and C. J. Lambertsen

Discussion 507

J. W. Miller, CHAIRMAN

Part XII

UNDERSEA AND MANNED CHAMBER OPERATIONS

Performance Aspects of an Open-Sea Saturation Exposure at 615 Feet 513
Joseph B. MacInnis

1000-Foot Helium Saturation Exposure 519
J. K. Summitt, J. S. Kelley, J. M. Herron, and H. A. Saltzman

Helium-Oxygen Saturation-Excursion Diving for U.S. Navy 529
Robert C. Bornmann

Saturation-Excursion Diving: Operation Ludion II 537
R. W. Hamilton, Jr. and X. R. Fructus

Physiological Effects Observed in the Course of Simulated Deep Chamber Dives to a Maximum of 36.5 Atmospheres in a Helium–Oxygen Atmosphere 545
X. R. Fructus, R. W. Brauer, and R. Naquet

Project Tektite: An Open-Sea Study of Prolonged Exposures to a Nitrogen-Oxygen Environment at Increased Ambient Pressure 551
J. W. Miller and C. J. Lambertsen

AUTHOR INDEX 559

SUBJECT INDEX 571