

# Biology Data Book

Second Edition

VOLUME III



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COMPILED AND EDITED BY

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Federation of American Societies for Experimental Biology

BETHESDA, MARYLAND

## FOREWORD

This volume of the *Biology Data Book* completes the second edition of a three-volume compilation of evaluated reference data in the life sciences. The preparation of the 281 groups of tables, graphs, and diagrams—constituting some 2100 pages—required four years, and the cooperative efforts of 712 eminent scientists. These experts from all over the world contributed and reviewed the data, and in addition provided more than 18,000 literature citations from which the information was derived.

Volume I of the *Biology Data Book* was published in 1972, and consists of five sections covering GENETICS AND CYTOLOGY; REPRODUCTION; DEVELOPMENT AND GROWTH; MATERIALS AND METHODS; and PROPERTIES OF BIOLOGICAL SUBSTANCES. Also included are nine appendixes of useful general information. Volume II, published in 1973, contains many new tables in its sections on BIOLOGICAL REGULATORS AND TOXINS; ENVIRONMENT AND SURVIVAL; and PARASITISM. The section on SENSORY AND NEURO- BIOLOGY is entirely new to the Biological Handbooks Series; its 35 tables cover neurophysiology, neurochemistry, neuroelectric properties, electroencephalograms, and the special senses. Each of the three volumes is indexed independently, and can be purchased separately by those interested only in data limited to particular fields.

This 2100-page "library" of biological reference data concludes a publication program begun a quarter of a century ago in the National Academy of Sciences—National Research Council (NAS—NRC). Ten handbooks, five in biology and five in toxicology, were produced by the time the project was transferred to the Federation of American Societies for Experimental Biology (FASEB) in 1959. Under FASEB auspices, six biological handbooks have been completed, in addition to the present three-volume *Biology Data Book*. Except for Volumes II and III of this last publication, all of the books were financed by agencies of the federal government. Two of these agencies must be acknowledged for their long-term generous support: the U.S. Air Force for 22 years of assistance, and the National Institutes of Health/National Library of Medicine for 15 years.

Gratitude must also be expressed to the biologists who served on the NAS—NRC and FASEB Handbooks Committees, and on the advisory committees for each book in the series. The former selected the fields to be covered, and the latter selected the tables to be included in each volume and recommended the scientists most eminently qualified to compile the data. Since 1959, more than 3000 prominent scientists have participated in the evaluation, contribution, and review of over 6000 pages of quantitative and descriptive data, including nearly 54,000 source

references. Without their expertise in providing the "best values" available, the Biological Handbooks Series could never have achieved its reputation for scientific excellence and accuracy. The unremunerated intellectual contributions of these dedicated authorities is sincerely appreciated.

Among those associated with the Handbooks Project since its inception are three distinguished biologists, who deserve special mention. One is Dr. J. W. Heim, who conceived the project, persuaded the NAS—NRC to assume responsibility for its establishment and operation, and provided Air Force funds to keep it solvent. Another is Dr. T. C. Byerly who was Chairman of the NAS—NRC Committee for the first 10 years of the project, and helped nurture it through its early days to maturity and eventual transfer to FASEB. The third member of this triumvirate is Dr. R. L. Zwemer, the only one of the original NAS—NRC Committee to serve the entire 25 years of the project's existence, including the last 15 years as Chairman of the FASEB Handbooks Committee. His efforts in enlisting the financial assistance of new sponsors through the years assured continuity of the undertaking; his unqualified support of, and interest in, the project merit a special salute. Drs. Zwemer, Byerly, and Heim were decisively instrumental in fostering, expediting, and maintaining the Biological Handbooks.

As a precaution against the introduction of errors in the volumes, all compilation, editing, indexing, and composition of copy have been performed within the confines of the Office of Biological Handbooks by a veteran staff. The product of their labors—the data books themselves—attest to the efficiency and devotion of this exceptional group of professionals. And no one better exemplifies the high standards of accuracy and meticulousness in the preparation of publication copy than the co-editor of the series for the past 20 years, Dorothy S. Dittmer.

With Volume III of the *Biology Data Book*, the publication program supervised by the Committee on Biological Handbooks and supported exclusively by government funds comes to an end, and a new series of data books begins. As in the past, the project will continue to be nonprofit. Future responsibility for policy and guidance has been assumed by the FASEB Publications Committee, and an Editorial Board has been formed to provide advice and recommendations in the preparation of new fascicles. Production time for future volumes will be cut in half, as a result of a new approach whereby the essential data for a discrete subject will be covered in approximately 300 pages. However, there will be no compromise in retrieving and disseminating the most useful, reliable, reference data available in the life sciences.

1 July 1974  
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# INTRODUCTION

The first edition of the *Biology Data Book*, published in 1964, was a 630-page compendium of "broad scope and limited coverage designed to serve as a basic reference in the field of biology." The scope of the second edition of the *Biology Data Book* is broader, and the coverage is not so limited. This newer edition should therefore be even more useful, than was the original publication, in providing information in subject areas outside the user's own field of competence.

Since it was impractical, as well as impossible, to include data for all species, contributors were instructed to restrict coverage to man and the more important laboratory, domestic, commercial, and field organisms. Despite this restriction, data for many more species—than the 400 covered in the 1964 volume—can now be found in the second edition.

As a result of the broadened scope and coverage, and the inclusion of data for additional species, the revised *Biology Data Book* appears as three volumes totaling more than 2100 pages. A brief description of the contents of Volumes I and II are given in the Foreword to this volume.

## Contents and Review

Volume III of the *Biology Data Book* is arranged in four sections, with the data organized in the form of 114 tables (quantitative and descriptive), graphs, and diagrams. In addition, two appendixes of animal and plant names are included. Contents of this volume were verified by 207 outstanding authorities in the fields of biology and medicine. The review process to which the data were subjected was designed to eliminate, insofar as possible, material of questionable validity and errors of transcription.

## Headnote

An explanatory headnote, serving as an introduction to the subject matter, may precede a table. More frequently, tables are prefaced by a short headnote containing such important information as units of measurement, abbreviations, definitions, and estimate of the range of variation. To interpret the data, it is essential to read the related headnote.

## Exceptions

Occasionally, differences in values for the same specifications, certain inconsistencies in nomenclature, and some overlapping of coverage may occur among tables. These result, not from oversight or failure to choose between alternatives, but from a deliberate intent to respect the judgment and preferences of the individual contributors.

## Conventions and Terminology

The main conventions used throughout this volume were adapted from the third edition of the *CBE Style Manual*, published in 1972 for the Council of Biology Editors by the American Institute of Biological Sciences. Terminology was checked against *Webster's Third New International Dictionary*, published in 1961 by G. & C. Merriam Company.

## Contributors and References

Appended to the tables are the names of the contributors, and a list of the literature citations arranged in alphabetical sequence. The reference abbreviations conform to those in *ACCESS: Key to the Source Literature of the Chemical Sciences*, published by the American Chemical Society in 1969.

## Animal and Plant Classification

Animal and plant taxa are arranged according to the classification outlines designated Appendixes III and IV at the back of Volume I of this *Biology Data Book*. The outlines were compiled from information provided by specialists at the Smithsonian Institution's National Museum of Natural History, the U.S. Department of Agriculture, and the American Type Culture Collection. The classifications reflect some of the recent agreements reached by the International Commissions on Nomenclature in the biological sciences.

## Scientific Names

In the tables, a synonym following the scientific name of an organism indicates that the synonym, although cited in the reference, is no longer the preferred name. No other attempt was made to provide taxonomic synonymy. All scientific names were either verified in standard taxonomic checklists and classification lists, or submitted for authentication to the appropriate authorities at the institutions listed above.

Upon the advice of these experts, some subspecies of plants appearing in Volume I have been changed to varieties in Volumes II and III.

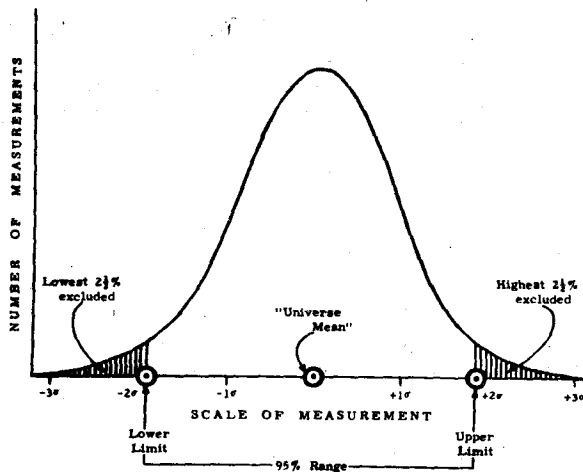
To aid the user in identifying an organism, the index includes the taxonomic orders for animals, and the families for plants. Two appendixes provide cross-reference to scientific and equivalent common names occurring in this volume.

## Range of Variation

Values are generally presented as either the mean, plus and

*continued*

minus the standard deviation, or the mean and the lower and upper limit of the range of individual values about the mean. The several methods used to estimate the range—depending on the information available—are designated by the letters “a, b, c, or d” to identify the type of range in descending order of accuracy.



“a”—When the group of values is relatively large, a 95% range is derived by curve fitting. A recognized type of normal frequency curve is fitted to a group of measured values, and the extreme 2.5% of the area under the curve at each end is excluded (see illustration).

“b”—When the group of values is too small for curve fitting, as is usually the case, a 95% range is estimated by a simple statistical calculation. Assuming a normal symmetrical distribution, the standard deviation is multiplied by a factor of 2, then subtracted from and added to the mean to give the lower and upper range limits.

“c”—A less dependable, but commonly applied, procedure takes as range limits the lowest value and the highest value of the reported sample group of measurements. It underestimates the 95% range for small samples and overestimates for larger sample sizes, but where there is marked asymmetry in the position of the mean within the sample range, this method may be used in preference to the preceding one.

“d”—Another estimate of the lower and upper limits of the range of variation is based on the judgment of an individual experienced in measuring the quantity in question. The trustworthiness of such limits should not be underestimated.

## ABBREVIATIONS AND SYMBOLS

Only those abbreviations and symbols not generally defined in the headnote, body, or footnotes of a table are included in this list.

<b>Measurements</b>	<b>Q<sub>10</sub></b>	= logarithmic relation of increasing rate of reactions per 10°C increase in temperature	<b>IU</b>	= international unit
yr = year			munits = milliunits	
mo = month			μunits = microunits	
wk = week			i.p. = intraperitoneal	
da = day			i.v. = intravenous	
hr = hour	atm = atmosphere		pH = hydrogen ion concentration (negative log)	
min = minute; minimum	mm Hg = millimeters of mercury			
s = second	mosmole = milliosmole		D = dextro (configuration)	
ms = millisecond	μosmole = microosmole		L = levo (configuration)	
	PO <sub>2</sub> = oxygen pressure		m = meta	
m = meter	PCO <sub>2</sub> = carbon dioxide pressure		o = ortho	
km = kilometer	BTPS = body temperature & ambient pressure, saturated with water vapor		p = para	
cm = centimeter	STPD = standard temperature & pressure, dry		n = normal	
mm = millimeter			N = normal; nitro	
μ = micron	V = volt		M = molar	
mμ = millimicron	mV = millivolt		mM = millimolar	
nm = nanometer	μF = microfarad		μM = micromolar	
Å = Angstrom			H = hydro; hydrogen bond	
ft = foot	no. = number		O = oxy	
	avg = average		S = sulf; sulfo	
wt = weight	max = maximum		mol = molecular	
g = gram	± = plus or minus			
kg = kilogram	SD = standard deviation		Ala = alanine	
mg = milligram	SE = standard error		Arg = arginine	
μg = microgram	log = logarithm		Asn = asparagine	
ng = nanogram	Δ = change or difference		Asp = aspartic acid	
pg = picogram	d = derivative of		Cys = cysteine	
mmole = millimole	< = less than		CyS = cystine	
μmole = micromole	> = more than		Gln = glutamine	
μμmole = micromicromole	≧ = not less than		Glu = glutamic acid	
nmole = nanomole	≦ = not more than		Gly = glycine	
matom = milliatom	↑ = yields		His = histidine	
μatom = microatom	° = degree (angular)		Ile = isoleucine	
meq = milliequivalent	X = times; by; crossed with		Leu = leucine	
μeq = microequivalent	~ = proportional to; high-energy bond		Lys = lysine	
neq = nanoequivalent	≈ = approximately		Met = methionine	
mgEq = milligram equivalent	approx. = approximately		Orn = ornithine	
lb = pound			Phe = phenylalanine	
oz = ounce			Pro = proline	
			Ser = serine	
vol = volume			Thr = threonine	
ml = milliliter			Trp = tryptophan	
μl = microliter			Tyr = tyrosine	
% = parts per hundred			Val = valine	
‰ = parts per thousand				
temp = temperature				
T = temperature				
°C = degrees Celsius				
°K = degrees Kelvin				
cal = calorie				
kcal = kilocalorie				
Mcal = megacalorie				
	<b>Biological and Chemical Specifications</b>			
	♂ = male			
	♀ = female			
	♂♀ = male & female			
	sp. = species (singular)			
	spp. = species (plural)			
	Hb = hemoglobin			
	RBC = red blood cells			
	WBC = white blood cells			
	DNA = deoxyribonucleic acid			
	RNA = ribonucleic acid			
	tRNA = transfer ribonucleic acid			
	CMP = cytidine 5'-monophosphate			
	FSH = follicle-stimulating hormone			
			<b>Miscellaneous</b>	
			Fn = footnote	
			ad lib = <i>ad libitum</i> (as desired)	
			cf. = <i>confer</i> (compare)	
			c.g. = <i>exempli gratia</i> (for example)	
			i.e. = <i>id est</i> (that is)	

# CONTENTS

## X. NUTRITION, DIGESTION, AND EXCRETION

168. Nutrients: Chemical Elements . . . . .	1433
169. Nutrients: Lipids . . . . .	1435
170. Nutrients: Proteins, Peptides, and Amino Acids . . . . .	1437
171. Nutrients: Purines and Pyrimidines . . . . .	1439
172. Nutrients: Vitamins and Related Compounds . . . . .	1441
173. Nutrients: Miscellaneous Growth Factors . . . . .	1444
174. Nutritional Standards: Man . . . . .	1446
Part I. United States: Children and Adults . . . . .	1446
Part II. Canada and United Kingdom: Children and Adults . . . . .	1447
Part III. Other Countries and United Nations Agency: Adults . . . . .	1449
175. Nutritional Standards: Domestic Animals . . . . .	1450
Part I. General Requirements . . . . .	1450
Part II. Minerals . . . . .	1458
Part III. Vitamins . . . . .	1465
176. Amino Acid Requirements: Vertebrates . . . . .	1473
177. Properties of Proteolytic Enzymes and Their Precursors . . . . .	1476
Part I. Physical Properties . . . . .	1476
Part II. Kinetic Properties . . . . .	1477
178. Catalytic Action of Digestive Enzymes . . . . .	1479
179. Digestive Enzymes: Vertebrate Tissues and Secretions . . . . .	1481
180. Pathways of Carbohydrate Digestion: Man and Laboratory Mammals [ <i>diagram</i> ] . . . . .	1485
181. Pathways of Protein Digestion: Man and Laboratory Mammals [ <i>diagram</i> ] . . . . .	1487
182. Pathways of Lipid Digestion: Man and Laboratory Mammals [ <i>diagram</i> ] . . . . .	1488
183. Excretion Products in Feces: Man . . . . .	1489
Part I. Compounds Other Than Steroids . . . . .	1489
Part II. Steroids . . . . .	1491
184. Excretion Products in Sweat: Man . . . . .	1493
185. Excretion Products in Urine: Man . . . . .	1496
Part I. Compounds Other Than Steroids . . . . .	1496
Part II. Steroids . . . . .	1507
186. Properties of and Excretion Products in Urine: Mammals Other Than Man . . . . .	1512
187. Properties of and Excretion Products in Urine: Chicken . . . . .	1524

## XI. METABOLISM

188. Energy Metabolism at Various Weights: Man . . . . .	1527
Part I. Basal: Infants and Children . . . . .	1527
Part II. Resting: Adults . . . . .	1527
189. Basal Energy Metabolism at Various Ages: Man . . . . .	1528
Part I. Children . . . . .	1528
Part II. Adults . . . . .	1528
Part III. Summary of Values per Surface Area . . . . .	1529
Part IV. Effect of Age on Body Potassium and Metabolic Levels . . . . .	1530
190. Pathways of Mineral Metabolism: Laboratory Mammals . . . . .	1530
191. Pathways of Lipid Metabolism: Mammals [ <i>diagrams</i> ] . . . . .	1538
192. Pathways of Carbohydrate Metabolism [ <i>diagram</i> ] . . . . .	1542
193. Pathways of Amino Acid Metabolism . . . . .	1544

194. Metabolic Interrelationships: Lipids, Carbohydrates, and Proteins [diagram]	1551
195. Pathways of Nucleoprotein Catabolism [diagram]	1552
196. Citric Acid Cycle [diagram]	1554
197. Respiratory Chain [diagram]	1556
198. Pathways of Energy Metabolism in Muscle [diagram]	1557
199. Pathways of Photosynthesis: Plants [diagrams]	1558
Part I. Carbon Reduction Cycle	1558
Part II. The C-4 Cycle	1560
200. Pathways of Sucrose and Starch Synthesis in Plants: Intermediates [diagram]	1561
201. Pathways of Biosynthesis: Natural Products [diagram]	1562
202. Protein Biosynthesis	1564
Part I. Pathways [diagram]	1564
Part II. The Genetic Code	1566
203. Pathways of Polynucleotide Biosynthesis [diagrams]	1566
Part I. Purines	1566
Part II. Pyrimidines	1568
204. Nitrogen Cycle in Nature [diagram]	1569

## XII. RESPIRATION AND CIRCULATION

205. Principles Governing Behavior of Gases	1571
206. Principles Governing Flow in Vessels	1573
Part I. Quantitative Relations Pertaining to Steady Flow [diagrams]	1574
Part II. Quantitative Relations Pertaining to Pulsatile Flow [graphs]	1576
Part III. Qualitative Effects Associated with Changes in Geometry [diagrams]	1578
207. Respiratory Media	1580
208. Respiratory Frequency, Tidal Volume, and Minute Volume: Vertebrates	1581
209. Nervous Control of Ventilation: Mammals	1584
210. Dimensions of Lung Respiratory Zones: Mammals	1586
Part I. Morphometric Parameters	1586
Part II. Lung Volume and Body Weight [graph]	1587
Part III. Alveolar Surface Area and Whole Body Oxygen Consumption [graph]	1587
211. Properties of Cytochromes: Animals	1588
212. In Vivo and In Vitro Carbon Dioxide Dissociation	1591
Part I. Carbon Dioxide Dissociation Curves: Mammals	1591
Part II. Dissociation Curve Slopes: Vertebrates	1594
213. Data for Constructing Blood Oxygen Dissociation Curves: Vertebrates	1598
Part I. Man	1598
Part II. Mammals Other Than Man	1601
Part III. Birds	1606
Part IV. Reptiles	1607
Part V. Amphibians	1609
Part VI. Fishes	1610
214. Oxygen Consumption: Vertebrates	1613
Part I. Mammals	1613
Part II. Birds	1617
Part III. Reptiles	1619
Part IV. Amphibians	1623
Part V. Fishes	1624
215. Data for Constructing Oxygen Dissociation Curves: Invertebrates	1630
216. Oxygen Consumption: Invertebrates	1633
Part I. Effect of Age, Sex, Size, and Stage of Development	1633
Part II. Effect of Removal and Replacement of Neuroendocrine Tissues	1637
Part III. Effect of Variation in Temperature	1639
Part IV. Effect of Salinity Variation in External Medium	1642
217. Properties of Cytochromes: Higher Plants	1645



218. Respiration Rates: Plants . . . . .	1648
Part I. Bacteria . . . . .	1648
Part II. Slime Molds and Fungi . . . . .	1650
Part III. Algae, Lichens, and Bryophytes . . . . .	1655
Part IV. Vascular Plants . . . . .	1660
219. Comparative Anatomy of the Heart: Vertebrates . . . . .	1676
220. Comparative Anatomy of the Vascular System: Vertebrates . . . . .	1678
Part I. Blood Vessels . . . . .	1678
Part II. Lymphatics . . . . .	1684
221. Basal and Nonbasal Heart Rate: Man . . . . .	1686
222. Heart Rate: Vertebrates . . . . .	1688
Part I. Mammals . . . . .	1688
Part II. Birds . . . . .	1692
Part III. Reptiles and Amphibians . . . . .	1693
Part IV. Fishes . . . . .	1694
223. Heart Rate and Cardiac Output During Exercise: Man . . . . .	1695
Part I. Submaximal Exercise . . . . .	1695
Part II. Maximal Exercise . . . . .	1696
224. Pulmonary Blood Flow: Mammals . . . . .	1697
Part I. Man . . . . .	1697
Part II. Mammals Other Than Man . . . . .	1699
225. Cerebral Blood Flow: Man and Baboon . . . . .	1700
226. Renal Blood Flow: Mammals . . . . .	1701
Part I. Man . . . . .	1701
Part II. Mammals Other Than Man . . . . .	1702
227. Hepatic Blood Flow: Mammals . . . . .	1703
Part I. Man . . . . .	1703
Part II. Mammals Other Than Man . . . . .	1704
228. Skin Blood Flow: Man . . . . .	1706
229. Limb Blood Flow: Man . . . . .	1710
230. Digital Blood Flow and Arterial Blood Pressure: Man . . . . .	1711
231. Arterial Blood Pressure: Man . . . . .	1713
Part I. At Various Ages [ <i>graphs</i> ] . . . . .	1713
Part II. By Geographic Location and Nationality . . . . .	1715
232. Arterial Blood Pressure: Vertebrates Other Than Man . . . . .	1718
233. Venous Blood Pressure: Man . . . . .	1727
234. Capillary Blood Pressure: Vertebrates . . . . .	1727
235. Nervous Control of the Cardiovascular System: Vertebrates . . . . .	1728
236. Electrical Properties of Cardiac Tissue: Vertebrates . . . . .	1730
Part I. Action Potentials of Single Fibers . . . . .	1730
Part II. Electrical Constants of Fiber Tissue . . . . .	1735
237. Events During Cardiac Cycle: Man and Dog . . . . .	1735
238. Relation of Heart Sounds to Cardiac Cycle: Man . . . . .	1738
239. Effect of Hypothermia on Circulation: Vertebrates . . . . .	1740
Part I. Physiological Variables . . . . .	1740
Part II. Stroke Volume and Cardiac Output . . . . .	1742
Part III. Heart Rate . . . . .	1744

### XIII. BLOOD AND OTHER BODY FLUIDS

240. Blood Electrolytes: Primates . . . . .	1751
Part I. Man . . . . .	1751
Part II. Primates Other Than Man . . . . .	1754
241. Blood Electrolytes: Mammals Other Than Primates . . . . .	1771
242. Blood Electrolytes: Birds . . . . .	1794
243. Plasma Electrolytes: Reptiles . . . . .	1799
244. Plasma Electrolytes: Amphibians . . . . .	1802
245. Blood Electrolytes: Fishes . . . . .	1803

246. Blood Non-protein Nitrogenous Substances: Man . . . . .	1805
247. Blood Non-protein Nitrogenous Substances: Vertebrates Other Than Man . . . . .	1808
248. Blood Lipids: Man . . . . .	1815
249. Blood Lipids: Vertebrates Other Than Man . . . . .	1816
250. Blood Carbohydrates: Man . . . . .	1819
251. Blood Carbohydrates: Vertebrates Other Than Man . . . . .	1821
252. Acid-Base Balance of Blood and Plasma: Man . . . . .	1830
Part I. Acid-Base and Blood Gas Values for Various Ages . . . . .	1830
Part II. Acid-Base Values for Normal Human Plasma and Erythrocyte Fluid . . . . .	1833
Part III. Siggaard-Andersen Alignment Nomogram . . . . .	1834
Part IV. Singer-Hastings Nomogram . . . . .	1836
Part V. Normal Ionic Patterns in Arterial Blood [ <i>graphs</i> ] . . . . .	1837
Part VI. Temperature Variation of Some Acid-Base Quantities . . . . .	1838
253. Acid-Base Balance of Blood and Plasma: Domestic and Laboratory Animals . . . . .	1838
Part I. Blood . . . . .	1838
Part II. Plasma . . . . .	1839
254. Blood Volumes: Vertebrates . . . . .	1841
Part I. Man . . . . .	1841
Part II. Vertebrates Other Than Man . . . . .	1846
255. Erythrocyte and Hemoglobin Values: Vertebrates . . . . .	1849
256. Blood Platelet Counts: Mammals . . . . .	1853
257. Leukocyte Counts: Man . . . . .	1854
Part I. Full-Term and Premature Infants . . . . .	1854
Part II. All Ages . . . . .	1856
258. Leukocyte Counts: Vertebrates Other Than Man . . . . .	1858
Part I. Mammals, Birds, Reptiles, and Amphibians . . . . .	1858
Part II. Fishes . . . . .	1859
259. Bone Marrow Differential Cell Counts . . . . .	1860
Part I. Rib: Dog . . . . .	1860
Part II. Sternum: Man . . . . .	1861
Normal Blood and Marrow Cells: Man [ <i>color plate</i> ] . . . . .	Facing page 1862
260. Blood Oxygen Dissociation Curves: Mammals . . . . .	1863
Part I. Adult . . . . .	1863
Part II. Maternal, Fetal, and Postnatal . . . . .	1867
261. Blood Oxygen Dissociation Line Charts: Man . . . . .	1871
262. Effect of Temperature Change on Blood Oxygen and Carbon Dioxide Pressures: Man and Dog . . . . .	1873
Part I. Use of Kelman and Nunn Temperature Correction Chart . . . . .	1873
Part II. Use of Single-Line Nomograms . . . . .	1875
263. Carbon Dioxide Solubility and First Dissociation Constant ( $pK'$ ) of Carbonic Acid in Plasma and Cerebro-spinal Fluid: Man . . . . .	1876
264. Effects of Altitude on Blood Values: Man . . . . .	1876
Part I. Residents. Long-Term Effects . . . . .	1876
Part II. Transients: Short-Term Effects . . . . .	1880
265. Effects of Altitude on Blood Values: Vertebrates Other Than Man . . . . .	1883
266. Effects of Altitude on Arterial Blood Gases: Man . . . . .	1890
Part I. Simulated Altitude . . . . .	1890
Part II. Incomplete Acclimation . . . . .	1893
Part III. Complete Acclimation . . . . .	1894
267. Blood Coagulation Tests: Man . . . . .	1897
Part I. Skin Bleeding Time . . . . .	1897
Part II. Clotting Time . . . . .	1898
Part III. One-Stage Prothrombin Time . . . . .	1900
Part IV. Fibrinogen Levels . . . . .	1902
Part V. Clot Retraction Volume and Time . . . . .	1903
Part VI. Summary of Normal Values . . . . .	1903
268. Physical Properties of Hemolymph: Arthropods . . . . .	1906
Part I. Volume: Arachnids, Crustaceans, and Insects . . . . .	1906
Part II. pH: Insects . . . . .	1910

Part III. Specific Gravity: Insects . . . . .	1911
Part IV. Freezing-Point Depression: Insects . . . . .	1912
Part V. Hemocytes: Insects . . . . .	1913
269. Inorganic Ions and Amino Acids in Hemolymph: Insects . . . . .	1917
270. Free Nitrogenous Compounds in Hemolymph or Blood: Invertebrates . . . . .	1919
Part I. Common Amino Acids: Insects . . . . .	1919
Part II. Common Amino Acids: Invertebrates Other Than Insects . . . . .	1927
Part III. Unusual Amino Acids and Other Nitrogenous Compounds: Insects . . . . .	1930
Part IV. Unusual Amino Acids and Other Nitrogenous Compounds: Invertebrates Other Than Insects . . . . .	1933
271. Carbohydrates in Hemolymph or Blood: Invertebrates . . . . .	1936
272. Chemical Composition and Physical Properties of Lymph: Mammals . . . . .	1942
Part I. Man . . . . .	1942
Part II. Dog . . . . .	1948
Part III. Domestic and Laboratory Mammals Other Than Dog . . . . .	1955
273. Physical Properties and Chemical Composition of Cerebrospinal Fluid: Mammals . . . . .	1976
Part I. Man . . . . .	1976
Part II. Mammals Other Than Man . . . . .	1978
274. Physical Properties and Chemical Composition of Serous Fluids: Vertebrates . . . . .	1980
Part I. Man . . . . .	1980
Part II. Vertebrates Other Than Man . . . . .	1983
275. Total Body Water: Man . . . . .	1986
Part I. Antipyrine Determination . . . . .	1986
Part II. Deuterium Oxide and Tritium Oxide Determinations . . . . .	1987
Part III. Desiccation and Specific Gravity Determinations . . . . .	1988
276. Total Body Water: Mammals Other Than Man . . . . .	1989
277. Renal Function Tests: Vertebrates . . . . .	1992
Part I. Man . . . . .	1992
Part II. Homoiothermic Animals Other Than Man . . . . .	1999
Part III. Poikilothermic Animals . . . . .	2008
278. Chemical Composition and Physical Properties of Aqueous Humor: Vertebrates . . . . .	2009
Part I. Man . . . . .	2009
Part II. Mammals Other Than Man . . . . .	2011
Part III. Birds, Amphibians, and Fishes . . . . .	2020
279. Chemical Composition and Physical Properties of Vitreous Humor: Vertebrates . . . . .	2022
Part I. Man . . . . .	2022
Part II. Mammals Other Than Man . . . . .	2024
Part III. Vertebrates Other Than Mammals . . . . .	2031
280. Physical Properties and Chemical Composition of Tears: Man . . . . .	2032
281. Body Composition with Increasing Weight and Age: Man . . . . .	2041

## APPENDIXES

Appendix I. Scientific Names and Corresponding Common Names . . . . .	2043
Part I. Animals . . . . .	2043
Part II. Plants . . . . .	2050
Appendix II. Common Names and Corresponding Scientific Names . . . . .	2052
Part I. Animals . . . . .	2052
Part II. Plants . . . . .	2059
INDEX . . . . .	2061

