Contents

1. Embryology and Anatomy 1

- Embryology of the Eyeball *1*
- The Eye at Birth *2*
- Development *2*

Gross Anatomy of the Eyeball 3

- The Globe *3*
- The Cornea *3*
- The Sclera *5*
- The Limbus *6*
- The Uvea *8*
- The Iris and the Pupil *8*
- The Ciliary Body *9*
- The Choroid *9*
- The Crystalline Lens *10*
- Chambers of the Eye *11*
- The Retina *12*
- The Conjunctiva *15*
- Tenon's Capsule *15*
- The Extraocular Muscles *16*
- The Eyelids *17*
- The Lacrimal Apparatus *20*
- The Orbit *20*

Blood Supply of the Eye 22

- Arteries *22*
- Veins *23*
- Nerves of the Eye *24*
- Lymphatic Drainage *25*

2. Physiology of the Eye 26

- Cornea *26*
- Lens *27*
- Tears *28*
- Aqueous Humor *30*

3. Physiology of Vision 32

- Effects of Light on the Eye *32*
- Electro-oculography *32*
- Electroretinography *34*
- Visual-Evoked Potential *34*
- Visual Perceptions (Sensations) *35*

4. Neurology of Vision 42

- The Visual Pathways *42*
- Pupillary Pathways and Reactions *42*
- Common Anomalies of Pupillary Reflexes *44*

5. Ocular Pharmacology..... 47

- Drug Delivery System *47*
- Astringents and Decongestant *48*
- Antibiotics *49*
- Antivirals *49*
- Antifungals *50*
- Autonomic Drugs *50*
- Local Anesthetics *52*
- Antiglaucoma Medications (Ocular Hypotensives) *52*
- Corticosteroids *53*
- Triamcinolone Acetonide *55*
- Nonsteroidal Anti-inflammatory Drugs *55*
- Viscoelastic Substances *56*
- Immunosuppressive Agents in Ophthalmology *56*
- Anti-Vascular Endothelial Growth Factor Agents *59*
- Systemic Reactions to Local Instillation of Medicines *60*
- Ocular Reactions to Systemic Medication *60*
- Ocular Preservatives *61*

6. Refraction of the Normal Eye..... 65

- The Optical System of the Eye *65*
- Schematic Eye *65*

- Reduced Eye *66*
- Physiological Optical Defects *66*
- Extraneous Imagery in Normal Eye *68*

7. Refractive Errors 70
- Definitions and Classifications *70*
- Hypermetropia (Long-Sightedness) *71*
- Myopia (Short-Sightedness) *73*
- Astigmatism *78*
- Aphakia *81*
- Anisometropia *85*

8. Accommodation and its Disturbances 86
- Accommodation *86*

9. Estimation and Correction of Refractive Errors 90

Objective Methods 90
- Retinoscopy *90*
- Refractometry (Objective Optometry) *91*
- Keratometry *91*

Subjective Methods 92
- Subjective Verification of Refraction *92*
- Examination of the Fundus *93*
- Methods of Ophthalmoscopy *94*

10. History-taking and Examination of an Eye Case 96

History-Taking 96
- Ocular Symptoms *97*

Examination of an Eye Case 102
- Method of Examination by Torch and Uniocular Loupe *102*
- Examination with a Slit Lamp *103*
- Clinical Examination of the Eye *108*

11. Diseases of the Eyelids 125
- Some Congenital Abnormalities *125*
- Abnormalities of Shape and Position *126*
- Important Lid Tumors *146*

12. Diseases of the Conjunctiva 149
- Conjunctival Diseases *149*
- Hyperemia of the Conjunctiva *149*
- Conjunctivitis *149*
- Acute Mucopurulent Conjunctivitis *153*
- Purulent Conjunctivitis *155*
- Membranous Conjunctivitis *156*
- Simple Chronic Conjunctivitis *157*
- Angular Conjunctivitis *158*
- Follicular Conjunctivitis *159*
- Allergic Conjunctivitis *164*
- Phlyctenular Conjunctivitis *164*
- Vernal Conjunctivitis *166*
- Conjunctival Degenerations *168*
- Conjunctival Cysts *171*
- Conjunctival Tumors *171*
- Symptomatic Conditions of the Conjunctiva *174*

13. Diseases of the Cornea and Sclera 178
- Evaluation of Corneal Diseases *178*
- Congenital Anomalies *179*
- Corneal Edema *180*
- Inflammation of the Cornea (Keratitis) *181*
- Bacterial Keratitis *181*
- Hypopyon Corneal Ulcer (Ulcus Serpens) *188*
- Mycotic Keratitis, Keratomycosis or Fungal Corneal Ulcer *189*
- *Acanthamoeba Keratitis* *191*
- Microsporidial Keratitis *192*
- Pythium Keratitis *193*
- Viral Keratitis *194*
- Recurrent HSV Keratitis *194*
- Herpes Zoster Ophthalmicus *196*
- Lagophthalmic Keratitis or Exposure Keratitis *198*

- Neurotrophic Keratitis *198*
- Atheromatous Ulcer *199*
- Peripheral Ulcerative Keratitis *199*
- Phlyctenular Keratitis *201*
- Interstitial Keratitis *202*

Corneal Degenerations and Dystrophies 204
- Degenerations *204*
- Dystrophies *207*
- Other Corneal Disorders *212*
- Contact Lenses *215*
- Diseases of the Sclera *218*
- Inflammation of the Sclera *218*
- Surgically-Induced Necrosis of Sclera (Sins) *221*

14. Diseases of the Uvea..... 223
- Uveal Diseases *223*
- Congenital Anomalies *223*
- Uveitis *228*
- Anterior Uveitis (Iridocyclitis) *229*
- Intermediate Uveitis (Pars Planitis) *235*
- Posterior Uveitis *236*
- Specific Uveitic Entities *237*
- Uveitis in Juvenile Rheumatoid Arthritis *238*
- Uveitis in Herpes Zoster *238*
- Tubercular Uveitis *239*
- Sarcoid Uveitis *239*
- Toxoplasmosis *240*
- Toxocariasis *241*
- Behçet's Disease *241*
- Vogt-Koyanagi-Harada Syndrome *241*
- Sympathetic Ophthalmitis *242*
- Glaucomatocyclitic Crisis (Posner-Schlossman Syndrome) *243*
- Cytomegalovirus Retinitis *243*
- Onchocerciasis (River Blindness) *244*
- Presumed Ocular Histoplasmosis Syndrome *244*
- Acute Retinal Necrosis *245*
- Acquired Immunodeficiency Syndrome *245*
- Endophthalmitis *246*
- Toxic Anterior Segment Syndrome *247*
- Panophthalmitis *248*
- Degenerations of Uveal Tract *249*
- Rubeosis Iridis *251*
- Choroidal Degenerations *251*
- Choroidal Detachment *253*
- Iris Cysts *254*
- Tumors of the Uveal Tract *255*

15. Diseases of the Lens 256
- Diseases of the Lens *256*
- Congenital Anomalies of the Lens *256*
- Ectopia Lentis *258*
- Lens-induced Ocular Diseases *259*
- Cataract *260*
- Congenital or Developmental Cataract *261*
- Senile Cataract *266*
- Management of Cataract *272*
- Specific Cataract Entities *279*
- Subluxation of the Lens *282*
- Dislocation of the Lens *284*

16. Glaucoma..... 286
- Intraocular Pressure *286*
- Corneal Thickness and Glaucoma *289*
- Definitions of Glaucoma *290*

Congenital or Infantile Glaucoma (Buphthalmos) 291
- Etiopathogenesis *291*
- Symptoms *291*
- Signs *292*
- Management *292*

Acquired Glaucoma 293
- Primary Angle-Closure Glaucoma *293*
- Primary Open-angle Glaucoma *302*
- Secondary Glaucoma *315*

17. Diseases of the Vitreous..... 323
- Vitreous Humor *323*
- Vitreous Detachment *324*

- Vitreous Opacities *324*
- Vitreous Hemorrhage *326*
- Prolapse (Loss) of the Vitreous *327*
- Vitrectomy *328*

18. Diseases of the Retina 330

- Symptoms and Signs *330*
- Ophthalmoscopic Findings *330*
- Examination of the Fundus *331*
- Methods of Ophthalmoscopy *331*
- Congenital and Developmental Abnormalities *332*
- Retinopathy of Prematurity *334*
- Retinal Vascular Disorders *335*
- Retinal Vein Occlusion *337*
- Central Retinal Venous Occlusion *337*
- Branch Retinal Venous Occlusion *338*
- Central Serous Retinopathy *339*
- Fundus Fluorescein Angiography *340*
- Cystoid Macular Edema *341*
- Age-related Macular Degeneration *342*
- Retinitis Pigmentosa *345*
- Retinal Detachment *347*
- Rhegmatogenous Retinal Detachment *348*
- Tractional Retinal Detachment *352*
- Exudative Retinal Detachment *352*
- Hypertensive Retinopathy *353*
- Diabetic Retinopathy *355*
- Other Ocular Signs in Diabetes Mellitus *360*
- Retinoblastoma *360*

19. Diseases of the Optic Nerve 361

- Optic Nerve *361*
- Optic Nerve Diseases *361*
- Developmental Abnormalities *362*
- Optic Neuritis *364*
- Toxic Amblyopias (Toxic Optic Neuropathies) *366*
- Anterior Ischemic Optic Neuropathies *367*
- Papilledema *368*
- Optic Atrophy *371*
- Optic Nerve Tumors *373*

20. Intraocular Tumors..... 375

- Iris Tumors *375*
- Ciliary Body Tumors *375*
- Choroidal Tumors *376*
- Malignant Melanoma of the Choroid *377*
- Metastatic Carcinoma of the Choroid *379*
- Choroidal Hemangioma *380*
- Retinoblastoma *380*
- Differential Diagnosis of Leukocoria in Children *384*

21. Diseases of the Orbit 387

- Developmental Anomalies *388*
- Proptosis and its Investigations *389*
- Orbital Inflammations *394*
- Thyroid Ophthalmopathy *397*
- Rhabdomyosarcoma *400*
- Optic Nerve Tumors *400*
- Cavernous Sinus Thrombosis *402*
- Carotico-Cavernous Fistula *402*
- Fractures of the Orbit *403*

22. Diseases of the Lacrimal Apparatus 404

- Symptoms and Signs *404*
- Diseases of the Lacrimal Gland *404*
- Dry Eye Syndrome *405*
- Watering from the Eye *411*
- Diseases of the Lacrimal Passage *414*
- Tumors of the Lacrimal Sac *418*

23. Ocular Motility: Squint..... 420

- Ocular Movements *420*
- Visual Development *422*
- Diplopia *424*
- Amblyopia *425*
- Squint (Strabismus) *427*
- Concomitant Squint *429*
- Paralytic Squint *435*
- Duane's Retraction Syndrome *440*
- Nystagmus *441*

24. Ocular Injuries 444

- Classification of Mechanical Injuries *444*
- Contusions (Blunt Injury) *444*
- Blow-out Fracture *451*
- Open Globe (Penetrating/ Perforating) Injury *452*
- Foreign Bodies *453*
- Chemical Injuries (Burns) *459*
- Thermal Burns *463*
- Radiational Injuries *463*

25. Common Eye Surgeries..... 465

- General Principles *465*
- Preoperative Preparation *465*
- Postoperative Care and Treatment *466*
- Anesthesia and Akinesia *467*
- Conventional ECCE With PCIOL Implantation *471*
- Manual Small Incision Cataract Surgery *473*
- Phacoemulsification *475*
- Femtosecond Laser Cataract Surgery *476*
- Intracapsular Cataract Extraction *477*
- Intraocular Lens Implantation *478*
- Glaucoma Operations *484*
- Cyclocryotherapy *486*
- Cyclophotocoagulation *487*
- Operations Upon the Iris *487*
- Operations of the Cornea *488*
- Eye Bank and Donor Cornea *494*
- Tarsorrhaphy *496*
- Pterygium Operation *497*
- Chalazion Operation *498*
- Dacryocystectomy *499*
- Dacryocystorhinostomy *499*
- Evisceration *500*
- Enucleation *501*
- Amniotic Membrane Transplantation *502*
- Incision and Drainage of Lacrimal Abscess *502*
- Incision and Drainage of Lid Abscess *503*

26. Blindness and its Prevention 504

- Blindness *504*
- National Programme for the Control of Blindness *508*
- Nutritional Blindness Vitamin A Deficiency *513*
- Vision *2020*: The Right to Sight *518*
- Vision *2030* Insight: Ending Avoidable Sight Loss (IAPB) *520*

27. Surgical Instruments 522

- Eye Speculums *522*
- Silcock's Needle Holder *523*
- Arruga's Needle Holder *523*
- Artery Forceps (Hemostat) *524*
- Fixation Forceps (Eyeball Fixation Forceps) *524*
- Von Graefe's Cataract Knife *524*
- Scalpel Handle (Bard-Parker Handle) *525*
- Blade Breaker *526*
- Thermocautery (Heat Cautery) *526*
- Conjunctival Scissors *527*
- Plain Dissecting Forceps *527*
- Corneal Spring Scissors (Universal) *528*
- Iris Forceps *528*
- De-Wecker's Iris Scissors *530*
- Intracapsular Forceps *530*
- Lens Expressor (Lens Hook) *531*
- McNamara's Spoon (Lens Spatula) *531*
- Vectis (Wire Vectis) *532*
- Iris Repositor *532*
- Needle Holder (Barraquer's and Castroviejo's) *533*
- Colibri Forceps *533*
- St. Martin's Forceps *533*
- Superior Rectus Holding Forceps *534*
- Suture Tier Forceps *534*
- Bowman's Discission Needle *534*
- Zeigler's Knife *534*
- Laser Treatment for Posterior Capsule Opacification *535*
- Capsulotomy Forceps *535*

- Capsulorhexis Forceps (Utrata Forceps) *535*
- Irrigating Vectis *536*
- Irrigation-Aspiration Two-Way Cannula (Simcoe Cannula) *536*
- McPherson's Forceps *537*
- Vannas' Scissors *537*
- Intraocular Lens Dialer (Sinsky's Hook) *537*
- Sclerocorneal Splitter (Crescent Knife) *538*
- Angular Keratome *538*
- Side-Port Blade *538*
- Epilation Forceps (Cilia Forceps) *539*
- Strabismus Hook (Muscle Hook or Squint Hook) *539*
- Lid Retractor (Desmarre's) *540*
- Foreign Body Spud and Needle *540*
- Tooke's Knife (Scleracorneal Splitter) *541*
- Elliot's Scleracorneal Trephine Identification *541*
- Disc-Holding Forceps *542*
- Chalazion Forceps (Clamp) *542*
- Beer's Knife *542*
- Chalazion Scoop (Curette) *543*
- Punctum Dilator (Nettleship's) *543*
- Lacrimal Cannula *544*
- Lacrimal Dissector with Scoop (Lang's) *544*
- Rougine *545*
- Muller's (Self-retaining Adjustable Hemostatic) Retractor *545*
- Cat's Paw Retractor *546*
- Bone Punch *546*
- Hammer, Chiesel and Bone Gouge *546*
- Evisceration Spoon or Scoop *546*
- Enucleation *547*
- Keratome *548*
- Lacrimal Probe (Bowman's) *548*
- Lid Plate (Spatula) *549*
- Entropion *549*
- Caliper (Castroveijo's) *549*
- Corneal Trephine (Castroviejo's) *550*
- Pin-Hole *550*
- Stenopeic Slit *551*
- Ophthalmic Lenses *551*
- Red-Green Goggles *553*
- Placido's Disc *553*
- Prism *554*
- Retinoscope *555*
- Magnifying Loupe *556*
- Jackson's Cross Cylinder *557*
- Maddox Rod *557*
- Methods of Sterilization *557*

28. Miscellaneous 560

- Laser in Ophthalmology *560*
- Cryotherapy in Ophthalmology *562*
- Fluorescein Dye in Ophthalmology *563*
- Ultrasonography in Ophthalmology *569*
- Ultrasound Biomicroscopy *571*
- Radiology In Ophthalmology *572*
- Ocular Emergencies *573*
- Subconjunctival Injection *574*
- Sub-Tenon Injection *574*
- Intravitreal Injections *575*
- Laboratory Diagnosis of Ocular Infections *575*
- Corneal Topography *576*
- Corneal Tomography *577*
- Specular Microscopy 578
- Scanning Laser Polarimetry (GDxVCC) *579*
- Optical Coherence Tomography *580*
- Headache in Ophthalmology *582*
- Computer Vision Syndrome *584*
- Migraine *585*
- Smoking and Eye Diseases *586*
- Ocular Changes in Pregnancy *587*
- Ocular Manifestations of COVID-19 *587*

Index *589*