

**TESTS AND STUDIES
OF THE
OCULAR MUSCLES**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649203383

Tests and studies of the ocular muscles by Ernest E. Maddox

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

ERNEST E. MADDOX

**TESTS AND STUDIES
OF THE
OCULAR MUSCLES**

TESTS AND STUDIES

OF THE

OCULAR MUSCLES

BY

ERNEST E. MADDUX, M.D., F.R.C.S., Ed.

*Ophthalmic Surgeon to Royal Victoria Hospital, Bournemouth; formerly Syme
Surgical Fellow, Edinburgh University*

WITH 110 ILLUSTRATIONS

THIRD EDITION

Specially revised and enlarged by the author

PUBLISHED BY

THE KEYSTONE PUBLISHING CO.

BOURSE BLDG., PHILADELPHIA, U.S.A.

1907

PREFACE TO THE THIRD EDITION

That a second edition of this book should be asked for affords pleasant compensation for the time and thought it cost.

In the choice of terminology, I have carefully refrained from the dislodgment of ancient landmarks. Thus the words "adduction" and "abduction" will be found retained in their time-honored sense—a sense which is stamped on the very name of "abducens" muscle itself, and the dislocation of which would make the classics of Graefe and Donders, Helmholtz and Mauthner less intelligible.

The announcement, by one author and another, of supposed errors in the treatment of Listing's law by Donders and by Helmholtz have compelled me, even in these uncontroversial pages, to enter more fully into the laws of the parallel motions of the eyes than their clinical importance would perhaps otherwise warrant. The purely clinical reader can, if he prefer, pass over the section which shows these discoveries to be groundless.

My thanks are due to Dr. Asher, of Leipsig, for several suggestions from the German edition, one of which has led me to add a chapter on Nystagmus.

E. E. M.

CONTENTS

CHAPTER I		PAGE
THE GLOBE AND ITS SOCKET		15
The Ball of the Eye—Ocular Muscles—Normal Motions—Orbits—Tenon's Fascia—Check Ligaments—Their Functions—Internal Capsule—Tenon's Space—Bearing of Check Ligaments on Tenotomy.		
CHAPTER II		
THE OCULAR MOTIONS		34
Translations of the Globe—Listing's Plane—False Torsion—Donders's Law—Listing's Law—Helmholtz's Plane of Reference—Donders's Plane of Reference—Index of Torsion—Use of False Torsion—Azimuth and Altitude.		
CHAPTER III		
INDIVIDUAL OCULAR MUSCLES		52
Law of Innervation—Description of the Recti—Spiral of Insertions—Description of Obliques—Subsidiary Functions—Medial Origin of Muscles—Superductors and Subductors—Lines of Force—Muscular Planes—Axes of Rotation—Paralytic Equilibrium—Consecutive Deviation—Arc of Contact—Ophthalmotropes—Landolt's Ball—Tilted Axes.		
CHAPTER IV		
ASSOCIATED MUSCLES IN A SINGLE EYE		68
Isolated Contraction of some Muscles Unknown—Superducting Muscles for Example—Motion from Secondary Positions—Composition of Rotations—Dynamics—Moments—Resolution of Rotations—Co-ordination—Vertical Purchase of Recti and Obliques altered by Adduction and Abduction—Purchase of same Muscles about Vertical Axis—Paralytic Exophthalmos—Model with Tilted Axes—Paralytic Semi-orbits.		

CHAPTER V

PAGE

CONJUGATION OF THE TWO EYES 79

True Associates—Spasm of Single Muscles—Conjugate Innervations—Conjugate Paralysis—Convergence—Confirmation of Rules of Conjugation—Convergence and Accommodation—Effort and Work—Exophoria in Oblique Vision—Latent Deviations.

CHAPTER VI

MOTOR FACULTIES 98

Point of Fixation—Direct and Indirect Vision—Fixation-reflex—Persistent Fixation—Binocular Fixation—Projection—Corresponding Points—Physiological Diplopia—Suppression of Images—Origin of Projection—Fusion—Power of Overcoming Prisms—Breadth of Fusion Power—Monocular Perception of Distance—Stereoscopic Vision of Relief—Hering's Drop Test.

CHAPTER VII

STRABISMUS 115

Definition—Chief Division—Strabismus Convergens—Accommodative—Non-accommodative—Predisposing Causes—Congenital Amblyopia—Nervous Element of Strabismus—Imperfect Central Fixation—Strabismus Incongruus—Recovery of Lost Faculties—Extension of Partially Preserved Faculties—Strabismus Convergens Myopicus—Alternating Squint—Unilateral Squint—Operations—Strabismus Divergens—Refractive After-treatment for Squints—Javal's Course of Treatment—Natural Cure of Squint—Evidences of Squint—Secondary Deviation—Fallacy from Anisometropia—Apparent Squint—Intrinsic Aberrations of Eyeball—Linear Strabismometry—Hirschberg's Method—Perimeter Method—Charpentier's Method—The Tangent Strabismometer—Subjective Strabismometry—Paralytic Strabismus.

CHAPTER VIII

OCULAR PARALYSES 151

Symptoms—Order of Examination—Diplopia—Aphorisms, Incorrect and Correct—Complications—Diagnostic Procedure—Narrowing Circles—Dextral and Læval—Torsional Purchase and Vertical Purchase—Brief Summary—Confirmation of the Diagnosis—Measured Charts—To Read a Simple Chart—To Read a Multiple Chart—Independent Diplopia—Clinical Classification of Muscles.

CHAPTER IX

OCULAR PARALYSES (*Continued*) 169

Optical Illusion—How to transfer Charts to Opposite Eyes—Paralysis of Right External Rectus—Paralysis of Left External Rectus—

Qualifications in Paralysis of the External Recti—Paralysis of Right Internal Rectus—Paralysis of Left Internal Rectus—Qualifications in Paralysis of the Internal Recti—Paralysis of Right Superior Rectus—Paralysis of Left Superior Rectus—Paralysis of Right Inferior Rectus—Paralysis of Left Inferior Rectus—Paralysis of Right Superior Oblique—Paralysis of Left Superior Oblique—Paralysis of Right Inferior Oblique—Paralysis of Left Inferior Oblique—Paralysis of the Third Nerve—Test for Fourth Nerve—Measurement of Ocular Paralysis—Conjugate Paralysis—Tests for them—Tropometer—Precise Tests for Convergence—Mnemonics for Ocular Paralysis—Dangers of Mnemonics—Werner's Mnemonic.

CHAPTER X

NYSTAGMUS 192

Definition—Rapidities—Apparent Motion—Examination of—Etiology—Nature of the Excursions—Treatment of Nystagmus—Curiosities.

CHAPTER XI

OPHTHALMOSCOPIC CORNEAL IMAGES 198

Precautions—Fixation Position of the Corneal Reflection—Apparent Squint—Refraction Surmisable—The Reflection in Cataract and Iridectomy—Tests for Monocular Blindness—Alternation—Concomitancy—Test for Binocular Fixation—Hirschberg's Rule for Squint—Priestley Smith's Mode of Strabismometry—Different Points of View—Error of Approximation—Photography of Muscular Anomalies—Author's Camera—Recording Reflections.

CHAPTER XII

HETEROPHORIA 213

Chief Divisions—Dissociation of the Eyes—Physiological Heterophoria—Direction of Deviation—Hyperphoria—Objective and Subjective Tests—Prism Tests—Glass Rod Test and its Allies—Two Species of Cylinder—Manufacture—Mode of Use—Measurement of Latent Deviations—Rare Anomaly—Previous Tangent Scales—Advantages of the Tangent Scale—Which Eye Fixes?—Other Uses of the Scale—Test for Concomitancy—Trial Test for Reliability—Heterophoria in Near Vision—Mode of Use—Its Meaning—Physiological Exophoria—Prism Diopters in Near-Vision Tests—Intermediate Scales—Tests for Breadth of Fusion—Correction of Hyperphoria—Relative Importance of Correction—Concomitancy vs. Paresis—Horizontal Breadth of Fusion—Orthoptic Training—Simple Rules for Heterophoria—Rules for Decentering—Prism Diopters—Direction of Decentering—Example—Prism Diopters—Operative Interference—Graduated Tenotomy—Marginal Tenotomy.

CHAPTER XIII

PAGE

CYCLOPHORIA	236
-----------------------	-----

Its Detection and Clinical Measurement—Its Exact Measurement—Paretic Cyclophoria—Non-paretic Cyclophoria—Explanation of Leaning Image—Rule for Rod Test—Cyclophoria in Near Vision—Oblique Astigmatism—Cyclophorometers—Optomyometer—Clinoscope—Volkmann's Apparatus—Meissner's Test—Depression of the Visual Plane—True Primary Position in Distant and in Near Vision—Le Conte's Confirmation—Savage's Test Compared—Eaton's Apparatus—Formula for Meissner's Test.

CHAPTER XIV

THE EYE IN DARKNESS	250
-------------------------------	-----

The Visual Camera—Deviation in Near Vision—Sense of Projection—Effect of Attention on the Desire for Fusion—Speed of the Exophoria—Laws of Conjugation Illustrated—False Fusion—Diluted Fusion.

LIST OF ILLUSTRATIONS

FIGS.	PAGE
1-2—Axes, Poles and Equator	17
3-4—Tenon's Fascia	19, 21
5-7—Check Ligaments	22, 23
8—Horizontal Section of the Globe and its Membranes	24
9-10—Diagrams showing effect of Tenotomy	26, 27
11—Check Ligaments	29
12—Vertical longitudinal section of Eyeball and its adnexa	30
13—View of under-surface of the Eyeball	31
14—Author's Torsion Calculator	43
15—Author's Design for solving False Torsion	47
16—Diagram showing how the Eye reaches a new position by the shortest route	48
17-21—Diagrams illustrating Torsion	49, 50
22—Muscular Planes and Axes	59
23—Landolt's Ophthalmotrope	63
24—Anderson Stuart's Model of Ocular Muscles	64
25—Landolt's Ball	65
26—Tilting of the Axes	66
27—Helmholtz's Diagram for motion from one secondary position to another	69
28—Composition of Rotations	71
29—Composition of Muscular Forces	72
30—Planes of Corneal Orbits	73
31—Model with Tilted Axes	76
32—Diagram illustrating Conjugation	87
33-36—Diagrams illustrating Convergence and Accommodation	88, 92
37-38—Figures for the Field of Fixation	101
39—Diagram illustrating Mis-projection	106
40—Proximal and Distal Diplopia	111
41-43—Stereoscopes	111, 112, 113
44—Home-made form of Hering's Drop Test	114
45—Ophthalmoscopic Corneal Reflections in Normal Eyes	137
46-47—Diagrams illustrating Perimetric Methods of Measuring Squint	140
48—Diagram to illustrate "Spherical Aberration"	141
49-51—First and Second Steps in Tangent Strabismometry	142, 143, 144
52—Landolt's Dynamometer	154
53—Schweigger's Hand Perimeter	155
54—Dextral and Laeval Muscles	162
55—Mnemonic Attitude for Muscular Planes	162