

**ELEMENTS OF ASTRONOMY  
WITH  
NUMEROUS EXAMPLES  
AND EXAMINATION PAPERS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649570997

Elements of Astronomy with Numerous Examples and Examination Papers by George W. Parker

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](http://www.triestepublishing.com)

**GEORGE W. PARKER**

**ELEMENTS OF ASTRONOMY  
WITH  
NUMEROUS EXAMPLES  
AND EXAMINATION PAPERS**



*page 14  
for the  
p. 142*

**ELEMENTS**  
**OF**  
**ASTRONOMY.**

**WITH**  
**Numerous Examples and Examination Papers**

**BY**  
**GEORGE W. PARKER, M.A.**

**OF TRINITY COLLEGE, DUBLIN**



**FOURTH EDITION**

**LONGMANS, GREEN, AND CO.**  
**39, PATERNOSTER ROW, LONDON**  
**NEW YORK AND BOMBAY**

**1902**

## PREFACE.

THE present volume is intended to meet the wants of those Students whose knowledge of Mathematics is limited to an acquaintance with the Elements of Euclid, Algebra, and Plane Trigonometry. In a few cases easy formulæ in Dynamics are introduced, but the articles containing these may, if necessary, be omitted without a breach in the continuity of the work.

Many of the examples have been selected from papers set to third and fourth year Students of Trinity College, Dublin; while a considerable number have been chosen with a view to assist those reading for Degrees in the London and Royal Universities.

The book forms, to some extent, a connecting link between the many popular works on Astronomy and more advanced treatises on the subject. The author, therefore, hopes that it may be found useful, not only by those for whom it has been specially

written, but also by many others among the general public.

The author is much indebted to MR. PIERS WARD, M.A., LL.B., for his kind assistance in reading the proof-sheets.

18, TRINITY COLLEGE, DUBLIN.

*July 19th, 1894.*

---

## PREFACE

TO THE SECOND EDITION.

IN this Second Edition the work has been carefully revised and some new matter added. The number of the examples has also been increased. The Author desires to express his thanks to several friends who have suggested many of the additions, and more especially to MR. RAYMOND WALTER A. SMITH (Sch.), B.A., to whom most of the corrections are due.

18, TRINITY COLLEGE, DUBLIN,

*March 13th, 1900.*

# CONTENTS.

## CHAPTER I.

### PROPERTIES OF THE SPHERE. DEFINITIONS.

	PAGE
Fundamental Definitions. Apparent diurnal Motion of the Heavens. The Ptolemaic and Copernican Systems. Changes in the Sun's Declination,	1

## CHAPTER II.

### THE EARTH.

Altitude of the Celestial Pole. Length of a Degree of Latitude. Magnitude of the Earth. Proofs of the Earth's Rotation. Foucault's Experiment,	1
--	---

## CHAPTER III.

### THE OBSERVATORY.

The Transit Instrument. Various Errors and Adjustments. The Meridian Circle. Regulation of the Clock. Equatorial and Micrometer. Alt-Azimuth Instrument, . . . . .	33
--	----

## CHAPTER IV.

### ATMOSPHERIC REFRACTION.

Effect on the Apparent Position of a Heavenly Body. Law of Refraction. The Constant Coefficient determined by various methods. Oval appearances of Sun and Moon, . . . . .	53
--	----



## CHAPTER V.

## THE SUN.

	PAGE
The Sun's apparent Annual Path. Proofs of the Earth's Annual Motion.	
The Seasons. Heat from the Sun. Sun Spots. Rotation of Sun.	
Twilight. Its duration determined, . . . . .	62

## CHAPTER VI.

## THE MOTIONS OF THE PLANETS. THE SOLAR SYSTEM.

Definitions. Phases and Brightness of the Planets. Periodic Times determined. Kepler's Laws. Direct and Retrograde Motions. Rotations of Planets. Transits of Venus and Mercury. Comets and Meteoric Showers. Lengths of the Seasons. Eccentricity of Ellipse, . . . . .	78
--	----

## CHAPTER VII.

## PARALLAX.

Law of Diurnal Parallax. Effect on the apparent position of a body. Horizontal Parallax of the Moon or a Planet determined. Finding the Sun's Parallax. Magnitudes of Moon, Sun, and Planets. Annual Parallax—Bessel's Method. Annual Parallax of Jupiter, . . . . .	114
--	-----

## CHAPTER VIII.

DETERMINATION OF THE FIRST POINT OF ARDES. PRECESSION, NUTATION,  
AND ABERRATION.

Flamsteed's Method for finding the Right Ascension of a Star. Precession of the Equinoxes—its Period and Physical Cause. Nutation. Velocity of Light. Law of Aberration. General Effect of Aberration, . . . . .	134
--	-----

## CHAPTER IX.

## THE MOON.

The Moon's Phases. Determination of her Synodic Time and Sidereal Period. Metonic Cycle. The Moon Rotates round an axis. Librations. Harvest Moon explained geometrically. Revolution of the Moon's Nodes. Height of a Lunar Mountain. Physical State of the Moon, . . . . .	149
--	-----

## CHAPTER X.

## ECLIPSES.

	PAGE
Causes of Lunar Eclipses. Breadth of the Earth's Shadow at the Moon.	
Solar Eclipses. Conditions for Eclipses. Ecliptic Limits. Saros of the Chaldeans, . . . . .	169

## CHAPTER XI.

## TIME.

The Equation of Time. Its Causes. Unequal Lengths of Morning and Afternoon. Local Time. Mean and Sidereal Time. Reduction of Time. The Julian and Gregorian Calendars. The Sun-Dial, . . . . .	184
--	-----

## CHAPTER XII.

## APPLICATION TO NAVIGATION.

Hadley's Sextant. Latitude determined by various Methods. Mean Local Time calculated. Longitude by Chronometers. Lunar Method of determining the Longitude, . . . . .	202
---	-----

## CHAPTER XIII.

## THE FIXED STARS. SPECTRUM ANALYSIS.

Star Magnitudes. Clusters and Nebulae. Proper Motions. Double, Binary, and Variable Stars. The Solar Spectrum. Surface of the Sun and Solar Prominences. Spectra of Stars and Nebulae, . . . . .	214
--	-----

## CHAPTER XIV.

## MASSES OF THE HEAVENLY BODIES.

The Mass of the Earth—Maskelyne's Method and the Cavendish Experiment. Masses of the Sun and Planets. Masses of Binary Stars. Note on the Celestial Globe, . . . . .	227
--	-----

---

EXAMINATION PAPERS AND MISCELLANEOUS QUESTIONS, . . . . .	[1]
INDEX, . . . . .	[17]

