

**THE PLANETARIUM, AND
ASTRONOMICAL CALCULATOR.
FOR THE USE OF SCHOOLS,
ACADEMIES, AND PRIVATE
LEARNERS**

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The Planetarium, and Astronomical Calculator. For the Use of Schools, Academies, and Private Learners by Tobias Ostrander

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TOBIAS OSTRANDER

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THE

PLANETARIUM,

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ASTRONOMICAL CALCULATOR,

CONTAINING

The Distances, Diameters, Periodical and Diurnal Revolutions of all the Planets in the Solar System, with the Diameters of their Satellites, their distances from, and the periods of their Revolutions around, their respective Primaries; together with the method of calculating those Distances, Diameters and Revolutions. Also, the method of calculating Solar and Lunar Eclipses; being a compilation from various celebrated authors, with Notes, Examples and Interrogations; prepared

FOR THE USE OF
SCHOOLS, ACADEMIES, AND PRIVATE LEARNERS.

BY TOBIAS OSTRANDER,

TEACHER OF MATHEMATICS,

AND AUTHOR OF "A COMPLETE SYSTEM OF MENSURATION," "THE ELEMENTS OF NUMBERS," "EASY INSTRUCTOR," "MATHEMATICAL EXPOSITION," &c.

"Consult with reason, reason will reply,
"Each fixed point, which glows in yonder sky,
"Informs a system in the boundless space,
"And fills with glory its appointed place;
"With beams unnumber'd brightens other skies,
"And worlds, to thee unknown, with heat and life supplies."

THIRD EDITION.

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STEREOTYPED BY J. S. KNEFIELD.

1834.

PREFACE.

In presenting the following pages to the public, I will briefly remark, that the people generally are grossly ignorant in the important and engaging science of Astronomy. Scarcely one in a county is found capable of calculating with exactness and accuracy the time of an eclipse, or conjunction and opposition of the Sun and Moon. Is it for lack of abilities? No.—There are no people in the world who possess better natural faculties for acquiring knowledge of every description, than those who inhabit the United States of America. In this land of liberty, much has been done, and much still remains to be done, for the benefit of the rising generation. Schools, Academies, and Colleges have been erected, for the purpose of facilitating and extending information and instruction among the youth. Gentlemen possessing the most profound abilities and acquirements, have engaged in the truly laudable employment of disseminating a knowledge of the sciences, both of the useful and ornamental description. Still, this branch of the Mathematical science, called Astronomy, has been almost totally neglected, especially among the common people. From what source has this originated? I answer, from a scarcity of books, well calculated to give the necessary instruction. Though there be many productions possessing merit, which are of importance to the rising generation, yet they are deficient in the tables necessary for the calculation and protraction of eclipses. The works of Ferguson, Enfield and others, from which this is principally compiled, contain all that is necessary; but the expense renders them beyond the means of many, who perhaps possess the best abilities in our land. Extensive volumes are not well calculated for the use of Schools; for a student is under the necessity of reading so much unessential, and uninteresting matter, that the essence is lost in the multiplicity of words; and for these reasons, many of the teachers have neglected this useful and important branch of the

Mathematical science. I have long impatiently beheld the evil, without an opportunity of providing a remedy, until the present period.

I now present to this enlightened community, a volume within the means of almost every person; containing all the essential parts of Astronomy, adapted to the use of Schools and Academies; made so plain and easy to be understood, that a lad of twelve years of age, whose knowledge of Arithmetic extends to the single rule of proportion, can, in the short space of one or two weeks, be taught to calculate an eclipse: and many possessing riper years, from the precepts and examples given in the work, will be found capable of accomplishing it, without the aid of any other teacher.

The Tables, (with the exception of two,) I have wholly calculated, and then duly compared them with those of Ferguson. Great care has also been taken, to present the work to the public, free from errors.

Should the following pages meet the approbation of a generous and enlightened community, and be the means of extending the knowledge of this important branch of Education, not only to the rising generation but to those of maturer years, the Compiler, whose best abilities have hitherto been employed in endeavouring to meliorate the condition of man, by improving the mind and enlightening the understanding, will have the pleasing reflection, that he has removed some of the shackles of ignorance, and supplied a fund of useful and interesting knowledge.

THE COMPILER.

CONTENTS.

	Page
PREFACE	3
SECTION I.	
Of Astronomy in general	7
SECTION II.	
Of the Solar System	14
Transits of Mercury	18
Transits of Venus	20
Of Vesta	23
Of Juno	25
On Ceres	26
On Pallas	26
On Jupiter	27
On Saturn	30
On Herschel, or Uranus	32
On Comets	34
SECTION III.	
On Gravity	42
SECTION IV.	
Phenomena of the Heavens, as seen from the Earth	47
SECTION V.	
Physical causes of the motions of Planets	54
SECTION VI.	
On Light and Air	61
SECTION VII.	
To find the diameter of the Earth, and the distances of Planets from the Sun, &c.	67
SECTION VIII.	
Of the Equation of Time, and precession of the Equinoxes	73
SECTION IX.	
Of the Moon's Phases	78
Of the Phenomena of the Harvest Moon	81

6	CONTENTS.	Page.
	SECTION X.	
On Tides		90
	SECTION XI.	
Astronomical Problems		97
	SECTION XII.	
On Eclipses		106
	SECTION XIII.	
On the Construction of Astronomical Tables		118
	SECTION XIV.	
Directions for the Calculation of Eclipses		122
Astronomical Tables		136
Equation of Time		159
	SECTION XV.	
Examples for the calculation of Eclipses		167
To find the Sun's true place		179
Concerning Eclipses of the Sun and Moon		180
	SECTION XVI.	
To project an Eclipse of the Sun		189
	SECTION XVII.	
Projection of Lunar Eclipses		192
	SECTION XVIII.	
On the Fixed Stars		200
On Groups of Stars		203
On Clusters of Stars		203
	SECTION XIX.	
An account of the Gregorian or New Style		206
Chronological Problems		207
Perpetual Almanack		211
Tabular View of the Solar System		219
	SECTION XX.	
Problems for the Terrestrial Globe		214
Problems for the Celestial Globe		222
Dictionary of Astronomical Terms		226

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"Astronomy, Parent of Devotion! engage my midnight vigils,
Elevate my thoughts to contemplate thy vast realities;
Warm my soul with adoration, pure and fervent praise,
To Him, whose finger fashioned yon revolving worlds!"

SECTION FIRST.

OF ASTRONOMY IN GENERAL.

Of all the sciences cultivated by mankind, Astronomy is acknowledged to be, and undoubtedly is, the most sublime, the most interesting, and the most useful. By the knowledge derived from this science, not only the magnitude of the earth is discovered, the situation and extent of the Countries and Kingdoms ascertained, trade and commerce carried on to the remotest parts of the world, and the various products of several countries distributed, for the health, comfort, and conveniency of its inhabitants; but our very faculties are enlarged, with the grandeur of the ideas it conveys, our minds exalted above the low contracted prejudices of the vulgar, and our understandings clearly convinced, and affected with the conviction, of the existence, wisdom, power, goodness, immutability, and superintendency of the Supreme Being. So that without any hyperbole, every man acquainted with this science, must exclaim with the immortal Dr. Young: "An undevout Astronomer is mad." From this branch of Mathematical knowledge, we also learn by what means, or laws, the Almighty Power and

Wisdom of the Supreme Architect of the Universe, are administered in continuing the wonderful harmony, order and connexion, observable throughout the planetary system; and are led by very powerful arguments, to form this pleasing and cheering sentiment, that minds capable of such deep researches, not only derive their origin from that Adorable Being, but are also incited to aspire after a more perfect knowledge of his nature, and a more strict conformity to his will.

By Astronomy we discover, that the earth is at so great a distance from the sun, that if seen from thence, it would appear no larger than a point; although its diameter is known to be nearly 8,000 miles: yet that distance is so small, compared with the earth's distance from the fixed stars, that if the orbit, in which the earth moves round the Sun, were solid, and seen from the nearest star, it would likewise appear no larger than a point; although it is at least 190 millions of miles in diameter; for the earth in going round the sun, is 190 millions of miles nearer to some of the stars, at one time of the year than at another; and yet their apparent magnitudes, situations, and distances, still remain the same; and a telescope which magnifies above 200 times, does not sensibly magnify them; which proves them to be at least, one hundred thousand times further from us, than we are from the sun.

It is not to be imagined that all the stars are placed in one concave surface, so as to be equally distant from us; but that they are placed at immense distances from one another, through unlimited space, so that there may be as great a distance between any two neighbouring stars, as between the sun from which we receive our light, and those which are nearest to him. Therefore, an observer who is nearest any fixed star, will look upon it alone as a real sun; and consider the rest as so many shining points, placed at equal distances from him in the firmament.

By the help of telescopes, we discover thousands of stars which are entirely invisible, without the aid of such instruments, and the better our glasses are, the more become visible. We therefore can set no limits to their