

**FIRST OBSERVATIONS IN  
ASTRONOMY: A  
HANDBOOK FOR  
SCHOOLS AND COLLEGES**

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First Observations in Astronomy: A Handbook for Schools and Colleges by Mary E. Byrd

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**MARY E. BYRD**

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**FIRST OBSERVATIONS**  
**IN**  
**ASTRONOMY**

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*A HANDBOOK FOR SCHOOLS AND COLLEGES*

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**BY**  
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By MARY E. BYRD

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## PREFACE

REAL knowledge in science depends upon direct study of objects and phenomena. Astronomy is no exception. Literally to look up, to see with our own eyes and to find out by seeing,— these things are the beginnings of astronomy.

As a guide to first observations, this handbook has been written. With few exceptions, the mechanical appliances required can be made by a carpenter or by the students themselves. Simple tools are best at first. It needs but slight experience with protractors, plumb lines, gnomons, and sun-dials to realize how aptly they can be used in scientific training, and how much meaning they put into different subjects. Not a little light will reach some of the dark places of geography and arithmetic, when teachers are accustomed to make simple observations, and know how to interest boys and girls in finding the latitude of the school building with the window gnomon, and the error of the clock from the horizontal sun-dial. At present, we sometimes have so-called courses of nature study with the sun in heaven left out!

A few topics of advanced character, dealing mainly with time and longitude, have been included in the final chapter; but, as a rule, simplicity of treatment has been carefully guarded, and mathematical knowledge beyond elementary branches is not required.

No effort has been made to deal even in a cursory manner with descriptive astronomy. It must, of course, receive its due meed of attention, and when the sky is cloudy, or the weather very cold, emphasis is naturally placed on that part of the subject.

To add vividness to the illustrations, many observations have been prepared, under the writer's direction, in different parts of the country, by different students, and are marked with their initials.

Grateful acknowledgement is made to those who have read the book wholly or partly in manuscript and given help in other

ways, especially to Professor Harriet W. Bigelow of Smith College and Mary M. Hopkins, Instructor there, to Professor Anne S. Young of Mount Holyoke and Professor Ellen Hayes of Wellesley. Mention should also be made of Louise Barber, and Jane T. Vermilye, former assistants at Smith, who have contributed some of the more difficult observations, and to another Smith alumna, Lucy Stoddard, who has aided in preparing the index.

Professor William F. Rigge has kindly allowed the use of two diagrams, illustrating a solar eclipse, which accompanied an article of his in *Popular Astronomy*. In this permission the editor of the journal, Doctor Herbert C. Wilson, courteously joins, and also gives leave to make use here of articles by the writer which first appeared in the same journal.

Freedom of access to the library and the use of some of the astronomical instruments of the State University of Kansas are privileges that have been highly appreciated; and no small debt is owed to A. Marks, a jeweler of Lawrence, Kansas, whose kindness and courtesy in sending accurate time by telephone rendered it possible to test a home-made transit instrument, and to determine longitude from local observations.

References to descriptive astronomy are made to "Young's Elements of Astronomy," and are designated by "Young." Those to "Byrd" refer to the writer's "Laboratory Manual in Astronomy."

MARY E. BYRD.

NEW YORK, N. Y.  
November, 1913.



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## INTRODUCTION.

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1. **Equipment.**—The unaided eye is no mean astronomical instrument, and when the sky is clear, the main objects of astronomical study are ready at hand. There is, however, little value in haphazard star-gazing. A definite scheme of work, under competent instruction, should be carried on regularly, in the day-time and in the evening. Mechanical appliances at first may be few and simple, as for example:

1. Meridian stone and carpenter's level.
2. Altazimuth for measuring angles.
3. Plumb lines and sun-dial for finding time.
4. Gnomon for determining latitude and time.
5. Celestial globe and good watch or clock.
6. Opera-glasses or small telescope.\*

This, in the main, is the equipment assumed in giving instructions for a large number of observations. Details regarding it are to be found in the first chapter, and there also other apparatus is described.

The suggestion may seem premature, but it is certain that a small building devoted to astronomy is an advantage in many ways. It affords the needed shelter for plumb lines, and gives opportunity for mounting permanently instruments like the sun-dial and home-made transit which must be critically adjusted in the meridian. A good view of the heavens should be insured from its roof, and if a section of that is removable, work with small telescopes is facilitated. Wear and tear is also saved by

\*With the exception of a good time-piece and the celestial globe which many schools possess, the cost of these appliances will probably amount to about fifty dollars.