

SALVO DE MEIS

ECLIPSES

AN ASTRONOMICAL INTRODUCTION FOR HUMANISTS

I s I A O

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FOREWORD

After the monumental work of Ginzel in 1899, the need of a guide for humanists to the study of historical eclipses was increasingly high. This book is unique, because not only has a clear introduction to the astronomical problems, but updates the number of texts, their interpretation and validity. The general part covers basic information on eclipses, rarely found in such a compact and complete way, hints on research, on calendrical and computing questions.

The reader is introduced into the details of how to consider a text with astronomical contents, precepts and caveats are given to warn the humanist, tables are included for quick evaluation of data such as length of day, epochs, names of months, calendars. The special treatment of solar and lunar eclipses is made in detailed files, in which each eclipse is mentioned in texts from known and new authorities, allowing comparison amongst the various interpretations. For all localities mentioned, the computation of the visibility of each eclipse has been made with the most recent astronomical theories, thus allowing a valuable improvement with respect to previous works, and a check for the truth of the statements in the texts. Translation of Greek texts is often made in Latin, a language in which humanists are supposed to be fully conversant, other texts are translated into English. Texts range from Babylonian to Chinese, Arabic, Medieval Latin or Greek.

It is therefore to appreciate this book, which is written especially for researchers in the historical and philological fields, and at the same time is a reference for studies and future research. For example, for each solar eclipse a geographical map has been computed to show the regions of visibility, thus giving hints to look for new records in places along the path of the eclipse. Useful tools are a chronological list of solar and lunar eclipses, with places and authorities, and a detailed bibliography, which updates former ones.

An idea of the work, which collects texts scattered in chronicles and documents is that it concerns about 400 eclipses from Babylonian to Renaissance times, with several authorities quoted for each eclipse, more than 360 titles are in the "Bibliographical Note", the index includes about 1200 items.

This research has been developed in the framework of an Is.I.A.O. Project concerning the History of Sciences and Pseudo-Sciences in Antiquity and in the Orient, a subject that needs a continuous collaboration among scholars specialists in different fields. Other supports to this work have been received from the MIUR (ex 40%) Project of National Interest, entitled "Interculturality, cultural, historico-religious Interaction between East and West from the Antiquity to Early Middle Ages". I would like to thank the Is.I.A.O. for the basic support given to this special field of research, which, because of its intercultural nature, represents a direct continuity to the seminal ideas of Prof. Giuseppe Tucci about the deep connections linking East and West. We could say that in very few fields this close relationship results to be so striking as in the history of sciences, and I must thank Salvo De Meis, for this new contribution to these studies in which he has given a so important improvement.

Antonio Panaino

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Salvo De Meis

CONTENTS

Foreword.....	V
Acknowledgements.....	VII
Contents.....	IX
1. Why a Book of Astronomy for Humanists?	1
2. Basic Astronomical Concepts: Time, Coordinates	3
Time.....	3
In the Case of Eclipses	4
Solar Longitude	5
Solar Longitudes at Entering the Signs.....	6
Saint of the Day.....	7
Local Time	8
Julian Day	9
Local Calendar Conventions.....	9
Day of the Week	10
Length of Day and Night	11
Equinoctial and Unequal (Seasonal) Hours	12
Rising Time of a Point of the Ecliptic (ἀναφοραί)	13
Passing by and Culmination of a Star	13
3. What is an Eclipse?.....	15
Solar and Lunar Eclipses: Mechanism of Formation.....	15
The Lunar Nodes and Their Motion.....	15
Solar Eclipses.....	16
Lunar Eclipses.....	16
Magnitudes.....	17
4. Birth, Life and Death of Eclipses.....	19
5. Precepts and Caveats	20
Solar Eclipses.....	20
Lunar Eclipses.....	23
The Lunar Eclipse of Alexander	25
6. Selected Solar and Lunar Eclipses and Related Files	27
7. List of Selected not Documented Solar and Lunar Eclipses.....	29
<i>ECLIPSE FILES Solar Eclipses.....</i>	<i>33</i>
<i>ECLIPSE FILES Lunar Eclipses.....</i>	<i>171</i>
<i>Appendix.....</i>	<i>255</i>
Geographical Coordinates of Places	255
Table of Daylight and Seasonal Hours	257
Unequal Hours at Rome	259
Hours of Day	259
Hours of Night	259
List of Selected Historical Solar Eclipses.....	260
List of Selected Historical Lunar Eclipses.....	265
Names of Zodiacal Signs	268
Months' Names by Number.....	269
Equation of Time in Minutes at 0 ^h UT, for the Year Zero.....	270
Semiarcus Diurnus for the Year Zero	270
Comparison of Eras and Calendars.....	271
Normalsterne MÚL SID	272
Roman Calendar of Julius Caesar, from 45 AC.....	273
Notes on the Eclipse Diagrams.....	274
Solar Eclipses	274

SALVO DE MEIS

Lunar Eclipses	274
Index	275
Figures	288
Abbreviations.....	289
Bibliographical Note.....	291

INTRODUCTION

1. WHY A BOOK OF ASTRONOMY FOR HUMANISTS?

Humanists, as we shall generally call here historians, philologists, scholars of classical antiquities, are often interested in knowing the details of eclipses mentioned in the documents they study.

The document can be a clay tablet, a papyrus, a text, a building, a stela, that is everything containing information on astronomical phenomena, eclipses in this case.

This study has many applications, but the humanist is mainly interested in chronological questions such as the dating of specific texts or the finding of eclipses related to a given event or person.

There are many papers and books, which deal with the eclipses from an astronomical point of view, but less which are concerned with the historical or philological aspects connected with this phenomenon.

The astronomical texts are normally too specialised for the humanist, who is a specialist too of his own work, and does not need to run into the details of astronomy or mathematics.

The historical or philological papers and books are often quite old ones and not always available.

In the past, the works of J.B.J. Delambre, F.K.Ginzl, F. Boll, P.V. Neugebauer, O. Neugebauer, just to mention some of the most known authors, have been widely used for reference, and still now they are most useful; they however require quite a knowledge of general astronomy and of mathematics, besides care in their use, as we shall see.

The Canons of eclipses are available, with their lists of data, but they too require the knowledge from which the humanist refrains; moreover they must be modern and contain information, which really can be of use to the humanist, as it will be explained later.

Therefore, it is the purpose of this book to give guidance on how to investigate Solar and Lunar eclipses for historical research, and to supply an astronomical background to fully take advantage of the information available.

The reader is supposed to be familiar with basic astronomy and have knowledge of elementary trigonometry only, no calculus or higher mathematics being needed.

Besides eclipses, other questions will be dealt with, such as ancient and modern terms, measure of time, accuracy of results; examples from ancient documents will be given and reasons explained, to clarify what makes the modern approach (and conclusions) different from the ones in use until a few decades ago.

Files of selected historical Solar and Lunar eclipses complete this work, to help in a first research or to stimulate new ones.

If the humanist wants or needs more details on a particular eclipse not included here, he will get anyway the basic information of those technical items to ask to the specialist. In fact the complete calculation of an eclipse, such as the drawing of maps, or the calculations of the event for a given site, should not take the humanist's time, but rather be the care of the historian-astronomer with whom to cooperate.

Also this one is a specialist: astronomy is so expanded now, that it is easy to find astronomers who know very little about calculations of eclipses, especially ancient ones, although they know everything about barred spiral galaxies or neutron stars.

This introduction is the preliminary, but rigorous, study for humanists of the most interesting astronomical phenomenon which from Antiquity to now has produced and produces documents of historical value.

Formulae are limited to the essential ones, maps are provided for all Solar eclipses studied here, and diagrams of Lunar eclipses are given. Details of their use are explained and numerical examples from ancient documents are carried on to clarify the explanations. Maps will help in finding other places, where other records of eclipses probably are extant or refer to.

The methods given are those used at present. For the procedures of ancient authors, the reader should consult the books in the bibliographical summary, mainly those by O. Neugebauer.

While the eclipses examined concern generally those from Babylonian to Medieval times, the general background and data are obviously valid for other epochs and cultures.

Precepts and caveats will be indicated to correctly analyse eclipses and to avoid errors, which are due to hidden meanings or definitions, often found in documents. Occasional comments will give hints for research and will indicate the difficulties of the "Art de vérifier les dates".

The humanist will realise that astronomy is easier than declensions and conjugations in ancient languages, or that formulae are not more difficult than palaeography.

SALVO DE MEIS

Babylonian eclipses are studied here, but a much deeper analysis of the extant tablets will appear in a volume by P.J. Huber and S. De Meis, *Babylonian Eclipse Observations 750 BC to 1 BC*, which will be published by IsIAO.

As a preliminary short outline of the development of observation and calculation of ancient eclipses, a few pages are dedicated to this subject, although some questions are dealt with more detail in the specific cases studied.