

ASTRONOMY FOR HUMANISTIC STUDIES

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ABSTRACT

Astronomy has frequently been considered as an interdisciplinary science. This curriculum has been elaborated for secondary school, where a close collaboration between the seminars of Mathematics, Physics-Chemistry and Biology is recommended.

Moreover we should not forget that Philosophy, Religion or Art had already had some common subjects with Astronomy before Modern Physics, Geology or Biology had something to share with it.

Precisely due to the fact that Homer's Universe is not the same as Beckett's, some astronomic knowledge for humanistic studies must be recovered, especially for the History of Art and Culture and for Literature.

I. INTRODUCTION

When Garcilaso de la Vega (16th c) wrote in a poem that after his lover's death he wanted to meet her at the third wheel, he was not facing his contemporaries with any obscure riddle. People perfectly understood its meaning, even though they were no more than standard readers, or no wiser readers than three hundred years before. In the same way, Dante's astronomical allusions in the Divina Commedia were not written for exceptional humanists: "certain passages... today considered as indication of an astronomical culture, were then understood by most people" (Burckhardt, 1860). Thus, it seems clear that some knowledge of celestial things and their movement was held at the time. A modern reader, finding himself in a similar situation, will consult the footnote. If it exists, that is all right, but if it does not, then he will pass on to the next paragraph.

Although we shall mention some examples below, now we must recognize that in a lot of literary, philosophical or religious texts there are some references to star positions or to the Zodiac. Students interested in these subjects will need a minimum of this specific knowledge. Nevertheless, classical astronomy is not enough. In order to penetrate into the spirit of a period it is necessary to know which image of the world and the universe their people was sharing: How they think the sky is ordered, which interpretation they assume, the role given to man within this order? Thus, a person interested in humanities must have a general view of the different conceptions of the universe along History.

We think that students of human sciences need two kinds of astronomical knowledge: a) Information about the history of astronomy before the scientific revolution of the 17th century, generally ignored by sciences students and b) some classical astronomy for the comprehension and interpretation of non-scientific texts.

II. EARLY COSMOLOGY

We will refer to some historical aspects of Astronomy before it belonged to the scientific domain. The first interesting period might be located in from 3000 BC to 600 BC, during the Egyptian, Babylonian, Assyrian and Persian empires. Astronomy belonged to the conglomerate Religion-Philosophy-Science before they came apart. Students will discover the foundations of an astronomic conception that pervived some centuries and which was support for texts, buildings, etc.: the sky must be known in order to be identified on the earth. At the time, man was understood as a reduced-scale universe (microcosm) and every territory, temple or city had to be a reflection of some celestial archetype: the constellations of Cancer, Bootes and Ursa Major were associated with the Babylonian cities of Sippar, Assur and Nineveh respectively (Eliade, 1951). Mesopotamian temples, with seven levels consecrated to the seven visible planets, show that sky observation was not a profane activity: it had some theological meaning. We find another example in the Greco-roman mythology, where celestial bodies were gods and mythical creatures that lived in the universe: Jupiter hanged the Pleyads from the sky in order to protect them from Orion the Giant, who had pursued them on the Earth, but Venus did the same with the Giant. Thus, Orion goes on pursuing the Pleyads for ever and ever.

Some naturalistic criteria were introduced in cosmic interpretation during the Hellenic Age (Farrington, 1953), from years about 600 BC (the Miletus School) to 200 AD (the Greco-roman Age). We want to point out two periods:

a) Pythagoras (530 BC) expanded the theory of the seven spheres where the seven visible planets move on. Pythagorean cosmology became more complex until Ptolomeus (150 AD), whose geocentric system was generally accepted up to the publication of the Copernican system (1543). Let us see some references to it: In the following text, Fray Luís de León writes about the spheres and the music that they produce (by combination of the seven pythagorean notes):

"Traspasa el aire todo/ hasta llegar a la más alta esfera/ y oye allí otro modo/ de no precedera/ música, que es la fuente y la primera" (Oda a Francisco de Salinas).

Also to the first sphere, where the Moon is placed, and to the third, where Venus is:

"...la luna cómo mueve/ la plateada rueda, y va en pos della/ la luz do el saber llueve,/ y la graciosa estrella/ de amor la sigue reluciente y bella..." (Noche Serena).

The Renaissance is full of allusions to this theory: Dante, León Hebreo, Marsilio Ficino, etc.

b) The cosmic conceptions of Plato (400 BC) and Aristotle (350 BC) introduced the independence of planetary movements in Pythagorean cosmology and pointed out the theories of the Miletus School: the four essential elements composing the universe. They had inherited a tendency to deify what they saw in the sky and to establish dependences between terrestrial things and celestial ones. This tendency had an

important influence during the Middle Ages: We have seven holes on our face because of the seven planets; under this influence (Vernet, 1951) Ramón Llull writes in his *Llibre de meravelles* (Del cel),

"Demana Félix al pastor si en los dotze signes que en les set planetes és calor, humilitat, fredor e secor. Respòs lo pastor que los estronomians han apropiades les quatre calitats damunt dites als dotze signes e a les set planetes per ço car són ocasió a muntiplicar les quatre calitats dels elements, pus fortment en un temps que en altre; e açò és per raon de la influència que los corses terrenals reseben dels celestials."

Alfonso X (13th c) considered the study of these correspondences as one of the seven liberal arts. Under his protection, the *Escuela de Traductores de Toledo* published *Libros del Saber de Astronomia*. His nephew, the writer Juan Manuel (*Libro del Caballero et del Escudero*, 14th c) and, later, poets like Francisco Imperial or Diego de Valencia wrote frequent references to the influence of the celestial order. Also we find in the *Arcipreste de Hita's Libro de Buen Amor*,

"Esto diz' Tholomeo e dizelo Platón,/ otros muchos maestros en este acuerdo son:/ qual es el ascendente e la constellación/ del que naçe, tal es su fado e su don."

If we take into account the great influence of Arabic culture, also in the astronomy field, a deep comprehension of these writings is only possible with the close collaboration of astronomers and philologists, as in the case of several works published by professors Catalá, Orús, Millàs and Vernet.

This historical study may finish with Ptolomeus' system and its cultural implications.

III. CLASSICAL ASTRONOMY

The astronomy concerning star positions may be of great interest for future historians and philologists. Humanists admit that it is impossible to translate Plato without some astronomical knowledge, but in our specialized world it is difficult to meet a hellenist who masters sciences or a scientist who understands Greek.

Below we show some examples about how a simple programme of classical astronomy may be applied adequately to humanities students. The programme might be composed of the following items:

1. The Celestial Sphere. Earth rotation. Horizon and hour coordinates.
2. Earth translation. The zodiac. Equatorial and ecliptic coordinates.
3. Time estimation. Calendars.
4. The solar system.
5. Stars and constellations. Observation instruments.

First, let us see some applications in order to describe places and periods. We must point out that all the following references may be interpreted by using a simple planisphere:

Hesiod, in *Works and Days* describes some periods of the year using two astronomical concepts (Dicks, 1970): first rising of a star and first setting of a star at sunrise. He places the mowing in the first fortnight of May, at the same time as the first rising of the Pleyads at sunrise; and the tillage in the first fortnight of November, with the first setting of the Pleyades at sunrise: "Al surgir las Pléyades... empieza la siega; y la labranza, cuando se oculten (384)". In the same way he refers to the end of autumn: "En ese momento el lucero Sirio remonta un poco de día sobre las cabezas de los hombres... y se toma la mayor parte de la noche (418)"; to the end of June: "Manda a tus criados aventar el sagrado grano de Deméter cuando por primera vez aparezca el forzado Orión (598)" and, to the end of the summer, with the first rising of Arcturus at sunrise: "Cuando Orión y Sirio llegen a la mitad del cielo y la Aurora de rosados dedos pueda ver a Arturo... corta y lleva a casa todos los racimos (609)".

On the other hand Homer, in his *Odyssey*, allows us to rebuild some Odysseus' journeys (Pillot, 1969) by means of fragments like this: "Les Plèiades mirant, i el Bover, que tarda a colgar-se,/ i l'Ossa, que també li diuen el Carro, i que gira/ sense moures de lloc i contra Orió fa parada,/ i no té part en els banys de l'Oceà ella sola;/ i aquest estel, va manar-li Calipso.../ que tota la travessia l'anés tenint a mà esquerra (V.262)".

Now, let us see more examples, perhaps more literary than others, which show a high knowledge of astronomy at the time (more than is usual for a secondary-school student):

A reference to some circumpolar stars from Fray Luís de León: "Por qué están las dos Osas/ de bañarse en la mar siempre medrosas (A Felipe Ruíz)".

Dante, with his *Divina Commedia*, is also an exhaustive example. He refers to spring in the following words: "El bell planeta que en l'amor conforta/ omplia de riulla l'orient,/ velant els Peixos que li fan escorta (Purgatorio, I)". Venus, always near the Sun, was in Piscis constellation; hence, taking into account the phenomenon equinoxes' precession, Venus sets under the sign of Aries.

Other interesting astronomical references in Dante are: Reference to the Polar star: "Aquell corn,/ en la punta del qual brilla l'estel/ que la primera roda té a l'entorn (Paradisso, XIII)"; to Saturn: "Hem pujat a la sèptima esplendor,/ que ara sota el pit del Lleó ardent/ irradia (Paradisso, XXI)"; to winter: "Un altre llum lluïa;/ si a Càncer resplandís un tal cristall/ l'hivern tindria un mes tot fet de dia (Paradisso, XXV)".

Góngora, as other baroque writers, is not an exception. "Salamandria del Sol, vestido estrellas,/ latiendo el Can del cielo estaba... (Fábula de Polifemo y Galatea)" places us in the month of July; and these beautiful verses: "Era del año la estación florida/ en que el mentido robador de Europa/ (medialuna las armas de su frente,/ y el sol todos los rayos de su pelo).../ en campos de zafiro pace estrellas (Soledad primera)" refer to spring.

In September 1983, the new curriculum "(EATP) Curs d'iniciació a l'Astronomia" was accepted by the "Direcció General de Batxillerat". It was pointed out as an interdisciplinary subject within the area of sciences, forgetting its usefulness for humanistic studies. We should like to make a contribution to filling this void.

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