

Astronomy as a Cultural System

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Editorial Note. This paper was first published as Iwaniszewski, Stanislaw, ‘Astronomy as a Cultural System’, *Interdisciplinary Research*, Archaeological Institute and Museum of the Bulgarian Academy of Sciences, 1991, Vol. XVIII, pp. 282-289. The paper was read at the First National Symposium on Archaeoastronomy held in November, 22-24, 1988 in Tolbukhin (present day name is Dobrich). This paper was translated into Russian by M.M. Kalishenko and published as “Astronomiya kak kul'turnaya Sistema”. *Na rubezhakh poznaniya vselennoy. Istoriko-astronomicheskiye issledovaniya*, 22: pp.67–73 (1990). [Russkaya Akademia Nauk, Moskva], edited by Alexander Gurshtein.

Introduction

About twenty years after its emergence, archaeoastronomy is still treated with scepticism by anthropologists and anthropologists. The new idea that past societies had developed relatively advanced calendar and astronomical systems of knowledge and recorded it in unwritten evidence attracted some astronomers, mathematicians, engineers, and other scientists on the one hand, and a lot of enthusiasts for ley lines or ancient extra-terrestrial visitors on the other. Anthropologists and archaeologists remained more sceptical. However, time has elapsed, the followers of the new paradigm have gathered a large body of new data, and archaeoastronomy should now be recognised as a normal field of study, thus following the well-known process of the adoption of new paradigms described by Thomas Kuhn.¹ The sceptical attitude, however, has remained.

This state of affairs results, in my opinion, from the fact that no theoretical advances of major importance followed the avalanche of new

¹ Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd edn (Chicago, IL: University of Chicago Press, 1970).

Stanislaw Iwaniszewski, ‘Astrology as a Cultural System’, *Culture and Cosmos*, Vol. 23, no. 2, Autumn and Winter 2019, pp.3-9.

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<https://doi.org/10.46472/CC.0223.0203>

4 Astrology as a Cultural System

data. I argue that our study of calendar and astronomical activities and systems of knowledge should now be viewed as a two-stage operation: first, as at present, the gathering of data both through desk-based and field research, employing methodologies and techniques developed in mathematics, astronomy and other exact sciences in order to demonstrate the existence of astronomical relationships to the built environment ; and second, as a new innovation, the relating of these activities and systems to cultural processes. Scientists have contributed much to the establishment of the methodology of the first stage, yet the absence of a body of anthropologists, archaeologists, and ethnologists from the very beginning of the study of archaeoastronomy has been reflected in the lack of any theoretical approach. If archaeoastronomy is to be considered as a field of study where both the exact sciences and social sciences meet, then the second stage of our investigation must be developed. Considering that both anthropologists and archaeologists are dissatisfied with contemporary archaeoastronomical work, I have started to build an anthropological foundation for archaeoastronomy on the grounds that anthropology deals with cultures. This essay is my next step towards better understanding of the place of astronomy in society.²

Astronomy and Culture

To start with an analysis, let us begin with a comparison of an anthropological study of astronomy and calendrics with the science of chronobiology (or chronoanthropology). It can be stated that astronomy studies the nature of the universe, i.e., the nature of astronomical bodies and phenomena that occur outside the Earth and its atmosphere, and are of extra-terrestrial origin. On the other hand, chronobiology investigates the nature of different rhythms and cycles on the Earth and, eventually, their relation to astronomical rhythms and cycles. Neither archaeoastronomy nor ethnoastronomy are concerned with the nature of events occurring outside the earth, nor are they interested in their possible influences on biological life. They study the astronomical knowledge and behaviour of human beings as a part of a cultural process.

This cultural context may briefly be explained as follows. Owing to their biological constitution, humans can perceive astronomical

² Stanislaw Iwaniszewski, 'El papel de la astronomía en el desarrollo cultural en Mesoamérica' (PhD thesis, National Autonomous University at Mexico City, 1988); Stanislaw Iwaniszewski, 'Exploring Some Anthropological Theoretical Foundations for Archeoastronomy', in Anthony F. Aveni, ed., *World Archaeoastronomy* (Cambridge: Cambridge University Press, 1989), pp.27-37.

phenomena occurring outside the Earth. However, human models of the universe, calendar systems, astronomical tools and techniques, and so on, vary from one society to another. It is people who create these differences when they process the astronomical phenomena they perceive. If we study the following set of problems then we can easily discover that various needs for certain types of astronomical knowledge and distinct causes for a certain type of astronomical activities are responsible for those differences:

- (a) how people can get the information about astronomical objects and phenomena
- (b) how human concepts of the universe evolve
- (c) how this type of knowledge can modify human behaviour

In other words, the perception of an astronomical object or phenomenon is followed by the conscious work of human beings who, acting in conformity with their needs and reasons, utilise that object's or phenomenon's value for their own needs, reasons and purposes. These needs, reasons and purposes depend on the individual's interactions with their environment, taking place within different cultural processes.

In archaeology and anthropology, culture may be defined in many different ways. In view of my own professional trajectory, I am inclined to consider culture as a product of human beings' adaption to their environments. Culture, as a by-product of biological evolution, mediates between human beings and their environment. Using culture, humans can impose their will upon nature, establish the rules of social behaviour, and understand their position in the world. In other words, culture, or a cultural system, is a tool that establishes and maintains relations between people and their natural, social and psychological environments. Consequently, any study of astronomical and calendar behaviour and/or systems of knowledge should be aware of these cultural relations.

Culture, being a product of human beings' adaption to their environment, may then be viewed as a two-sided entity, since the process of adaption consists of two fundamental aspects: behavioural and cognitive.³ Consequently, archaeologists and ethnologists developed two

³ Roger M. Keesing, 'Theories of Culture', *Annual Review of Anthropology* 3 (1974): pp.73–97; Alexander Alland, 'Adaption', *Annual Review of Anthropology* 4 (1975), pp. 59–73; Robert C. Dunnell, 'Style and Function: A Fundamental Dichotomy', *American Antiquity* 43, no. 2 (1978): pp.192–201; Patrick Kirch, 'The Archaeological Study of Adaption: Theoretical and Methodological Issues',

6 Astrology as a Cultural System

distinct concepts of culture systems: behavioural-ecological and ideational-symbolic.⁴

Since people establish and maintain a relationship with three kinds of environment – natural, social, and psychological – and because any cultural system is considered as a two-sided entity, we can build a paradigm of four different levels of cultural interactions:

culture – natural environment
society – natural environment
society – human psychodynamics
culture – individual psychodynamics.

As I have said, these are also the levels in which astronomical or calendar activities and systems of knowledge interact and play different roles.⁵ In our research, we must analyse those aspects of cultural – natural, social and psychological – interactions in which astronomy and calendrics play a significant role. In my opinion, the working framework of possible cultural functions of astronomy can be extended as follows:

- I. Level one – astronomical practices and natural environment:
 - (1) the importance of astronomical activities for ecological adaption
 - (2) “cosmovision” as a device for ecological balance
- II. Level two – astronomical practices and society:
 - (1) astronomy, calendars, and socio-rhythms
 - (2) ‘cosmovision’ as an element of basic social norms
 - (3) ‘cosmovision’ and social integration
 - (4) the place of the concept of astrobiology in ideology: the legitimisation and justification of the existing social order
 - (5) astronomy and social evolution
 - (a) astronomical and calendrical knowledge as a social endogenous synchroniser which offers to the social

in M.B. Schiffer, ed., *Advances in Archaeological Method and Theory* Vol. 3 (New York: Academic Press, 1980), pp.101–56.

⁴ See in M. Kearney, ‘World View Theory and Study’, *Annual Review of Anthropology* 4 (1975): pp.247–70.

⁵ Stanislaw Iwaniszewski, ‘Exploring Some Anthropological Theoretical Foundations for Archeoastronomy’, *Archeoastronomy*: p.27.

- system a higher level of autonomy in relation to natural environment
- (b) astronomy and the development of social stratification
- (c) astronomy and the general evolution of sociocultural systems
- III. Level three – astronomical practices and ideational-symbolic culture:
 - (1) astronomy and the formation of culturally recognized conceptual models for and of the world (world view)
 - (2) the evolution of ideo-symbolic elements in astronomical subsystems
 - (3) mathematical and astronomical tools and concepts
- IV. Level four – astronomical practices and the psychodynamic development of man:
 - (1) the perception of astronomical phenomena and the evolution of human visual perception, symbolisation and attribution of meaning of significance
 - (2) astronomical images as vehicles of mental processes
 - (3) astronomical images as mnemotechnic systems of the cultural classifications of phenomena

This scheme suggests that astronomical and calendar activities can play different functions on different levels of culture interactions. For example, we can discover that a given alignment links a sun-on-the-horizon event to a certain date in the calendar. In our analysis we can establish that this date is to be associated with specific vegetation cycles, important for the basic subsistence economy of the society under consideration. The same date could generate some other social and economic rhythms which may be linked with magico-religious world views, thus contributing to the formation of religious ceremonials. Those associations may refer to the sacred status of a certain social strata, and on a different level, to the psychology of the individual.

The establishment of different functions of astronomy at different levels of cultural interactions enables us to study its evolution, to develop taxonomies, and to define cultural correlates. At least two contributions of the scholars whose concepts are still not fully acknowledged by archaeoastronomers seem to me as starting points for any evolutionary, taxonomic, or cultural-contextual analysis. I refer here to the astrobiological theory of René Berthelot and the taxonomy of three

different astronomical competences and complexities of Asgar Aaboe.⁶ However, being static rather than dynamic, these systems of classifications are only starting points and now we must try to move beyond them, placing them in a much broader cultural context. We must also revise the concepts of Karl Marx and Karl Wittfogel, who stated that astronomical knowledge and calendar making were instrumental in the development of social stratification, contributing to control of the means of production, and hence of social-political systems.⁷ All these hypotheses were developed before the emergence of archaeoastronomy and now should be considered on the grounds that they may serve as further starting points for the anthropological analysis of astronomy and calendrics.

A New Paradigm: Cultural Astronomy

Taking into account the cultural context of astronomical and calendar behaviour changes the perspective of the whole analysis. If we consider past cultural contexts on the basis of the evidence obtained through archaeological research, we deal with archaeoastronomy. Ethnoastronomy is the study of calendrics and astronomy in native and rural societies that are roughly contemporary to us. Socioastronomy will examine calendrics and astronomy in the context of contemporary urban societies and eventually the history of astronomy will limit itself to the study of ideational-symbolic aspects of astronomy and calendrics in literate societies. All of these disciplines study astronomical behaviour in different cultural contexts. However, the general discipline that treats astronomy as a part of a cultural system may be coined as cultural astronomy. Then cultural astronomy would consist of the following four disciplines:

- a. archaeoastronomy – referring to past societies
- b. ethnoastronomy – referring to contemporary native and peasant societies
- c. socioastronomy – referring to contemporary urban societies

⁶ René Berthelot, *La pensée de l'Asie et l'astrobiologie* (Paris: Payot, 1949); Asgar Aaboe, 'Scientific astronomy in antiquity', in F.R. Hudson, ed., *The Place of Astronomy in Ancient World. Philosophical Transactions of the Royal Society of London Series A, Mathematical and Physical Sciences* 276 (1974): pp.21–42.

⁷ Karl Marx, *Capital: a Critique of Political Economy*, Eden and Cedar Paul, trans (London: George Allen and Unwin, 1933); Karl A. Wittfogel, *Oriental Despotism. A Comparative Study of Total Power* (New Haven, CT: Yale University Press, 1957).

d. history of astronomy – referring to ideational-symbolic cultural subsystems

Cultural astronomy consists of the study of human-astronomical relations carried out in a cultural context. In this way this field of investigation differs from that of astronomy (considered as a knowledge of the nature of astronomical objects and phenomena) and of biological astronomy (cosmobiology and chronobiology). It provides a parallel to disciplines that study human interrelations with the geographical setting and ecological environment, such as cultural geography and cultural ecology, which study human interrelations with the geographical setting and ecological environment, respectively.

It is necessary to stress that each of the four subdisciplines deals with distinct kinds of evidence. Their methods of interpretations are different. While archaeoastronomy borrows much from archaeology, ethnoastronomy should utilise strategies and concepts from ethnology and cultural anthropology, and socioastronomy should adopt sociology and social psychology. However, as astronomical behaviour may be investigated at different levels of cultural interaction, we should use some methods borrowed from other sciences, including psychology, the history of religions, art history and the history of science. Combining these different fields of study, cultural astronomy may be viewed as an interdisciplinary. Yet it may also be considered a single discipline combining all theories which relate astronomy to culture. In my opinion, we must develop cultural astronomy as such a broad field if we want it to be considered an academic discipline.

Conclusions

In sum, cultural astronomy is the broad name of a proposed discipline that studies human relations in the context of observed astronomical phenomena and objects. It may be divided into four subdisciplines, each of which should develop its own method and theory of investigation while sharing the techniques of mathematical and astronomical measurement. It also stands somewhere between astronomy and biological astronomy. I introduce the concept of cultural astronomy in order to stabilise the body of new scientific approaches called archaeoastronomy and ethnoastronomy. I hope that it will move existing approaches towards a more mature phase of scholarly and academic development and thus the scepticism of archaeoastronomy on the part of anthropologists and archaeologists will diminish.

10 Astrology as a Cultural System

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