Prolegomena to the Study of Hellenistic Astronomy

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1 Introduction

If it is prudent at any time to reflect on the assumptions underlying a question, it is surely prudent at the outset of this volume to set forth our presuppositions in asking the question What is Hellenistic astronomy? The aim of such preliminary reflection is not, of course, to answer the question but to clarify the terms on which we expect it to be answered. So, let us start with a definition and an observation.

The definition is a lexical stipulation: in what follows, the term “astronomy” will cover knowledge of the heavens no matter whether it is used for describing the heavens, for predicting celestial and meteorological phenomena or, astrologically, for understanding and prognosticating human lives and events in them. In making this stipulation, we step aside from modern concerns about science and pseudo-science. Our justification is that, while the ancients did indeed ponder how astronomy differed from astrology, they regarded both as real sciences and even as aspects of the same science in spite of their different epistemic reach.

The observation is that no idea is born or lives in the abstract, that ideas are conceived in specific contexts by people living in given places at given times in determinate communities in diverse cultures, and that they are preserved in media that are ultimately material using the languages and scripts of those communities and cultures. For us, this observation gains particular interest when the ideas concern the world about us and the question becomes Under what circumstances do groups unified by some project or shared understanding change their ideas when confronted with new ones arising either from within the group as consequences of what was held before or from without?

To bring this last question to the history of astronomy, we elaborate the observation as follows:

- (1) Science as a body of knowledge and practices is entirely embedded within the historical and cultural framework of those who know and practice it. It is in no way separable from such frameworks. Thus, while we continue to learn from the work of Otto Neugebauer and his students—without it, we would not have our current understanding of Ptolemy’s debt to the

Babylonians or of the ways in which he either transformed and made it Greek or was prominent in this process—we will not limit our study of ancient astronomy in any culture to considering its mathematical methods and parameters, an approach exemplified in Neugebauer's monumental *A History of Ancient Mathematical Astronomy* [1975].

- (2) Understanding a culture's science and appropriating or interpreting it in one's own framework is made possible to the extent that science is about, or concerns, a shared world and that the cultures involved and individuals within them share some commonalities.
- (3) Change in science does not arise only in response to the solution of technical problems within the science; it may also be brought about proximately by ideas that come from outside the boundaries of the science as conceived and practiced at the time.
- (4) Since any such change in ideas is, however, mediated by the individuals and groups that have them, the acceptance of new ideas may ultimately depend on interests and concerns that are far from scientific themselves.
- (5) Accordingly, such acceptance can bring about radical change not only in the scientific ideas that a community or culture has, it may also bring about new scientific practices and even professions as well as broad challenges to previous norms of belief and behavior.
- (6) Finally, when communities and cultures interact and share knowledge in part, it makes sense not only to speak of the science of one group in distinction from that of another but also to view the science embedded in both together as a single transcultural phenomenon, that is, as a locus where questions of what is and is not admitted in each gain real meaning.

It is true, we admit, that adopting premises of this sort is self-fulfilling: to look at the history of a particular science under these terms is pretty much to guarantee that they will be found to be the case. Yet, this is not a fault but a feature of most inquiries: in intellectual history especially, the findings tend to confirm the terms under which they were found. Indeed, the real test for such an inquiry once completed is whether it encompasses all and only what should be encompassed. With this in mind, then, let us spell out what we take to be the guiding principles of the kind of answer that we expect in asking the question What is Hellenistic astronomy?

Since Hellenistic astronomy has been an object of modern scholarship for close to 300 years, we begin with the adjective "Hellenistic" because its use in classical scholarship bears the weight of established tradition.

2 Why “Hellenistic”?

There are many ways in which historians divide their subject into periods. It is important to keep in mind that, when such periodization is done properly, it is with an eye to the subject itself and its internal structure. Like Plato's butcher [cf. *Phaedrus* 265e1–3], one must carve the animal at its joints. To introduce periods that belong to another subject or class of questions is a misstep that will separate what ought to be grasped at once and keep together what should be separated. Thus, for example, periodizing the history of ancient Greek mathematics by reference to the Archons of Athens would not be a particularly good idea. So let us turn to the history of ancient astronomy by itself.

When one considers ancient astronomy in the Near East and Mediterranean as a transcultural phenomenon, that is, as a set of diverse but interacting astronomies,¹ it becomes readily evident, nowadays at least, that Babylonian mathematical astronomy and astrology were the original instigators of a great change in other cultures that demarcates one period of astronomical theorizing in the history of Western thought from the next. (This is not to deny that older forms of theorizing persisted.) Scholars will, of course, set the timing of this change differently in different cultures. For the Greeks and Romans, it started in the late fourth century BCE. This is important because the Greco-Roman transformation² of the earlier native science, a process involving the appropriation of Babylonian astronomy that was effectively completed in the works of Claudius Ptolemy, became itself an instigator of change in other cultures, primarily as recorded in Greek. Moreover, it persisted even with the emergence of Christianity as a political power and it is not until the mid-eighth century CE, when the Arabs took Greco-Roman science in new directions, that we see the end of the era that began roughly a millennium earlier. For this reason, then, we maintain that the period from the late fourth century BCE to the mid-eighth century CE is a discrete era in the history of Western astronomy and that it is rightly called Hellenistic.

1 In speaking of astronomies, it is important not to burden the term “astronomy” with Greco-Roman and later connotations. For the various ways in which knowledge of the heavens was spoken of during the Hellenistic Period, see Glossary, p. 633.

2 We will use “Greek” and “Latin” to indicate the *languages* in which texts were written and not the *ethnicity* of their authors, which can be different. The question of the cultural context in which these texts were written is complicated. We will use “Greco-Roman” to indicate one of the cultural contexts in which these texts were written and understood.

3 Hellenistic Astronomy as a Subject

For students of astronomy in Greco-Roman intellectual culture, what makes this view of Hellenistic astronomy especially interesting is that astronomy in this period was actually contested, that Greek and Latin writers urged divergent views of what astronomy is and should be without there being clear winners, Ptolemy's great synthesis notwithstanding [Bowen 2007, 2018; Jones 1990c]. Indeed, one defining question for authors writing in Greek and Latin was whether to include Babylonian astronomy in the traditional astronomy that went back to Plato and Aristotle, and, if so, how much of it, all or some [Bowen 2013b].

Such concern about what to appropriate from Babylonian astronomy is not limited to Greco-Roman culture; it is reflected in other cultures too and points to the more basic fact that the process of appropriation is a complicated one of interpretation, rejection, and transformative acceptance.³ Moreover, this process was often bi-directional: while Babylonian astronomy left its mark on other cultures (and not always by the mediation of work in Greek and Latin) without signs of changing much itself, there are indications that these other cultures, Egyptian for example, likewise impacted astronomy in Greco-Roman culture even as they were in turn influenced by it. The upshot for inquiry into Hellenistic astronomy as we propose is two-fold:

- First is that to understand how and why the various Hellenistic astronomies took the form that they did will require exploring the intellectual and social contexts of each in its culture. This entails that we must reject any personification or essentializing of culture or civilization—Greco-Roman or whatever—as though it were an agent and had impermeable boundaries. To the contrary, the history of Hellenistic astronomy shows exactly how permeable these supposed boundaries of language and culture can really be.
- But second is that this will make sense only if we distinguish Hellenistic astronomy from Hellenistic astronomies without reifying the former as a body of knowledge and making it anything more than a meta-historical category. In other words, on our terms, while it is useful and necessary to speak of Hellenistic astronomy, it was not a body of knowledge held by any one community or culture in Antiquity. Further, there was no single, authoritative way of understanding the heavens that merited the title “astronomy” before all others or was universally valued as such.

3 On the role of expertise in the process, see Misiewicz 2018.

Consequently, in asking What is Hellenistic astronomy?, we rule out any assertion that Hellenistic Greco-Roman astronomy was the authoritative paradigm for knowledge of the heavens, since this would impede our understanding the very processes by which this particular astronomy or any of the others was formed and transformed. As we see it, then, Greco-Roman astronomy has nothing to do with any modern hierarchy of value attached to ancient sources for science and will have no more centrality or epistemic authority than Babylonian or Egyptian astronomy, for example, in our discussions.

4 The Geo-cultural Reach of Hellenistic Astronomy

Once Hellenistic astronomy is viewed as a corpus of interacting astronomies, the question becomes Whose astronomies does it include? In our view, it should include the astronomical science of each of the geo-cultural regions that was engulfed by the Alexandrian conquest in the late fourth century BCE. Well, almost all. In this volume, however, we do not address Indian astronomy because it makes better sense to us to present it as a subject while considering astronomy in the Arab world as it impacted the Latin West and Byzantine East.

5 The Challenge of Contextualization

Such contextualization of Hellenistic astronomy as we propose raises a problem that may be cast as a dilemma: while ignoring the contexts of a science by abstracting its ideas is to miss the *history* of that science, to focus on these contexts and to ignore the ideas and their role in bodies of knowledge is to miss the history of the *science*. The challenge to be faced in our asking What is Hellenistic astronomy? is to pass between the horns of this dilemma which is at once historiographic and philosophical.

So far as the two opposed schools in the historiography of science in evidence today are concerned, this is easy enough. To internalists who restrict their study of astronomy to its technical content, that is, to its observations, the use of these observations to quantify models, and the parameters of these models, we propose by virtue of our concern with context an answer to the Why?-questions that they broach only on the most restricted terms, if at all. That is, we propose a course that will allow much fuller explanations of changes in the technical theorizing of Hellenistic astronomy. To those historians who focus on scientists and scientific institutions, we are proposing here a case

study of astronomy that connects the socio-cultural environment of a body of scientific learning to its technical apparatus and structures.

As for those in either school who advocate histories of *longue durée*,⁴ we here set out a theme by which to study more than a millennium of thought. Granted, this theme comes with no hope for a narrative—and this not just because the evidentiary materials for such are lacking but because in focusing on Hellenistic astronomy understood as a number of interacting astronomies each with its own cultural context, we embrace the adventitious character of human history and, thus, its resistance to overarching storylines and narratives of continuous progress.

6 Conclusion

Thus, our understanding of what is involved in asking What is Hellenistic astronomy? is that, while it is a body of knowledge to be acquired by historians, it has no historical standing, no meaning in Antiquity. To ask about and study Hellenistic astronomy is, in our view, to ask about and study a set of numerous, interacting astronomies held in the interval from 300 BCE to 750 CE, say, by the cultures of the various regions brought into contact by Alexander the Great in the late fourth century BCE.

4 For the most recent call to this kind of historiography as part of a largely misguided effort to influence policy-makers, see Guldi and Armitage 2015.