

# The Interactions of Ancient Astral Science by David Brown with contributions by Jonathan Ben-Dov, Harry Falk, Geoffrey Lloyd, Raymond Mercier, Antonio Panaino, Joachim Quack, Alexandra von Lieven, and Michio Yano

Teije de Jong

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*The Interactions of Ancient Astral Science* by David Brown with contributions by Jonathan Ben-Dov, Harry Falk, Geoffrey Lloyd, Raymond Mercier, Antonio Panaino, Joachim Quack, Alexandra von Lieven, and Michio Yano

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*Reviewed by*  
Teije de Jong\*  
University of Amsterdam  
[T.deJong@uva.nl](mailto:T.deJong@uva.nl)

This book is an admirable attempt by its author, assisted by eight reputed colleagues, to present an overview of our present knowledge of astrology and astronomy as practiced in ancient Mesopotamia, Greece, Egypt, Rome, India, China, and Japan, and of the possible interactions leading to borrowing and/or transmission of astral science between these cultures from ancient times onwards up to about AD 600. Yet it is also a somewhat impossible task because it requires a working knowledge of at least several of the scripts and languages of these ancient cultures, of the astrological and astronomical techniques employed by the practitioners of ancient astral science, and of the historical and cultural context within which these practitioners were functioning.

This created an almost unsurmountable obstacle not only to the authors of this book, and potentially to its readers as well, but also to its reviewer. David Brown himself remarks,

It was mentioned above how difficult it is to master both the ancient languages and the technicalities of astral science, and there will be some who will glance through this book and wonder if there are more than five people in the world who can understand and evaluate it in its entirety. There are probably not. At times I felt that the book was being written for the deceased, namely Neugebauer and Pingree. [7]

This is why the incubation time for this review has been long and it is the reason—at least in part—for some of its shortcomings. Nevertheless, I have

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\* TEIJE DE JONG is professor emeritus of astrophysics at the Astronomical Institute “Anton Pannekoek” of the University of Amsterdam, the Netherlands. His research on the history of astronomy includes the study of ancient solar eclipses, Greek horoscopes, Babylonian observations of heliacal risings and settings of stars and planets, the origin and development of Babylonian lunar and planetary theories, and Mesopotamian chronology.

read Brown's book with great pleasure and not seldom with excitement; the subject matter is close to my heart and the author has both a pleasant, personal style of writing, and strong opinions. Moreover, he makes a serious and, in my opinion, successful effort to approach the problem of the possible transmission between ancient systems of astral science afresh and with an open mind by introducing the more general concepts of "resonance" and "interaction" to replace "borrowing", "transmission", or "adoption". The advantage of his choice of terms is that it leaves the direction and intensity of the process initially unspecified, to be determined later by further study and analysis.

The book is thick, covering almost 900 pages, with Brown responsible for about 75% of the text and the other eight contributors for the remaining 25%. Rather than summarize the contents in words, I give here a condensed version of the table of contents from which the main topics treated and the emphasis they receive in the book can be directly derived:

1. Introduction (30 pages)
2. Mesopotamian Astral Science (31 pages)
3. Egyptian Astral Science (9 pages)
  - a. Egypt as Astronomical-Astrological Centre between Mesopotamia, and India (Joachim Quack) (56 pages)
  - b. From Crocodile to Dragon – History and Transformations of the *Dodekaoros* (Alexandra von Lieven) (15 pages)
4. West Semitic Astral Science (with Jonathan Ben-Dov) (24 pages)
  - a. Babylonian Astral Sciences in West Semitic Sources: The Case of Qumran (Jonathan Ben Dov) (32 pages)
5. Astral Science in Greek and Latin (122 pages)
  - a. Transmission Successes and Failures. Methodological Issues and the Case of 4th Century BCE Greek Astronomy: A Preliminary Sketch (G. E. R. Lloyd) (12 pages)
6. Astral Science in the Hellenistic Period (133 pages)
7. Iranian Astral Science (27 pages)
  - a. On Iran's Role in the Transmission of Ancient Astral Sciences and the Ramifications Thereof (Antonio Panaino) (34 pages)
8. Indian Astral Science (13 pages)
  - a. The Early Use of Naksatras (Harry Falk) (7 pages)
  - b. Alleged Mesopotamian Astrology in India (116 pages)
  - c. Alleged Mesopotamian Astronomy in India (65 pages)
  - d. The Earliest Greek Astral Science in India (23 pages)

- e. On the Originality of Indian Mathematical Astronomy (Raymond Mercier) (44 pages)
9. Astral Science in China (15 pages)
10. The Japanese Iconography of the Decans (Michio Yano) (16 pages)
11. Final Reflections (12 pages)
12. Bibliography of Resonances (49 pages)
13. Index (29 pages)

Brown describes the composition of the book in his introduction:

The alert reader will soon notice that the external contributions and my text are not always coherent. It was ambitious to experiment with the tried and tested formats that are either a book written by a single author or a collection of contributions with an introduction by the editor that attempts an overview. This is a book that is meant to be read from start to finish, and the connecting chapters are meant to concentrate the focus on the questions at hand—what interactions took place and why, and can we produce a convincing and coherent description of the development of the astral sciences in the Old World that takes into full consideration their interactions? While this means that I can eschew the usual convention of summarizing the external contributions in this introduction, I cannot pretend that the format works flawlessly. The placing of von Lieven’s article was most difficult, for example, since it deals with a supposed connection between Egypt and China. It is also less minimalist in its assumption of influence than my parts, or those of Falk, Quack, Mercier, or Ben-Dov. Panaino is also rather more maximalist in approach than I might be. The first part of Lloyd’s contribution would sit better in this introduction, and Yano’s contribution in part goes beyond the temporal limits of the project. In this regard, it is fair to say that while all contributions are valuable works of scholarship, some are more apposite to the express aim of this book than others. [5]

One of the main theses proposed in the Brown bible, as I have called it among colleagues, is that astrology is the driving force behind all astronomy carried out in antiquity. His views are summarized in the introduction:

We may be tempted to think that Hipparchus availed himself of Babylonian observational data and astronomical parameters because of an “academic” interest in astronomy, but a different motivation is suggested in ch.5. The spread of zodiacal astrology was affected by historical circumstance, by the transmissibility of the astronomy that accompanied it, and by the presence of existing astrological techniques in the adopting cultures, but can we deny that the private, commercial exploitation of the heavens was not the dominant factor in the transmission of astrology and astronomy first from Babylonia to Egypt, Iran, the West Semitic areas, Greece, and Rome, and thence from Roman Egypt to Iran and India?

We may have an aversion to thinking that private astral divination was the driving force behind these two great spreads of astral science in the pre-Muslim period. The ground may have been prepared by those with agendas other than the exploitation of a market based on human fascination with the heavens and the future, but it was those who saw a way to make a living out of personal astrology and who made the effort to familiarize themselves with the complexities of cuneiform arithmetic astronomy and the rules of astrological interpretation who drove the spread. Let us not ignore the fact that theirs was a great effort. It was far more than the adopting of a few easy-to remember parameters, as with the 19-year calendrical cycle, say, or some ancient wisdom vis a vis the malefic quality of a planet. It required *translation*. It was these entrepreneurs, largely unknown, who happily elaborated on the astrological techniques used in Mesopotamia, while making next to no contribution to the quality of the accompanying arithmetic astronomy, save altering the predicted dates to the local calendar and adapting the methods to suit their needs better. This seems typical of commercialization. No program of making and recording observations akin to that which had existed in Babylonia was available in those areas that then made free use of those hard won parameters and techniques, that is until we turn to that strand of Graeco-Roman thought which continued to adhere to a view that astronomy should be formulated in a way that was coherent with philosophical teachings.

The *Syntaxis* records for us the traces of another observational program, one which had begun long before the second century CE, but seemingly without much success when it came to generating predictions comparably accurate to those made using arithmetic techniques. The *Syntaxis* also records for us a polemic in favor of spherical-trigonometric astronomy, and critical of arithmetic astronomy. At the same time, it avails itself of the parameters of arithmetic astronomy. Ptolemy presents his work as exemplary of a “method”, a “scientific method” if we may use the terms anachronistically, leading from qualitative hypotheses to observations of what we might term “boundary condition” situations, to the mathematical determination of parameters, which in turn fill out the hypotheses and make the model quantitative. It is all very convincingly presented, but closer analysis reveals some fundamental flaws in both hypotheses and methodology. The flaws are passed over in silence, the adjustment of results disguised.

Why? Is this no more than sloppiness on Ptolemy’s part? He was, indeed, remarkably prolific, but his exactness when it comes to the mathematical calculations speaks against this. Who was his audience? Who was he trying to convince? It seems to me we must look to his work on astrology, the *Tetrabiblos*, and his simplification of sphericaltrigonometric [*sic*]astronomical procedures for everyday use by astrologers in the *Handy Tables*, and the ultimate success of both compositions in the ancient world, to understand Ptolemy’s agenda. He too, I argue, was trying to exploit the market in personal zodiacal astrology, and

he was competing with the dominant market leader, arithmetic astronomy, in doing this. The universality of trigonometric astronomy, its greater accuracy, and its alleged basis in careful observations, as well as its adherence to circular motion were all means by which to attract followers. His aims were doubtless far wider, and it is not clear that his works brought him substantial reward in his lifetime. His works drew on the achievements of earlier mathematicians and trigonometric astronomers and must be understood in this light, too. His was not the only form of trigonometric astronomy available either.

Astrologers were slow to embrace the new astronomy, but eventually embrace it they did. One of Ptolemy's aims, albeit delayed, was realized. By around CE 400 the new astronomy had such a large part of the market that astrologers in India, who had since familiarized themselves with astrology and arithmetic astronomical techniques from the West, made the supreme effort to learn the trigonometric ones too. Some of the greatest amongst them were able to make substantial and meaningful adaptations to the Graeco-Roman-Egyptian (and perhaps Sasanian, see ch.7) versions, and their agendas, too, may have exceeded the requirements of the mere commercial exploitation of the heavens by means of facilitating the writing of horoscopes. However, the rapid adaptation to the Indian context of zodiacal astrology and its further elaboration there, shows that India had become another market for this form of human psychological comfort.

The identification of the need was made in Babylonia, as was the creation of a great product. The size of the market there is still hard to assess, but it must have been substantial (Brown, 2008). Similar markets opened up in Egypt, Greece and Rome, the Levant, Iran, India, and finally around the world, though not without setbacks in the form of the opposition posed by organized religion, for example. The fact that trigonometric astronomy could portray itself as more convincingly coherent with some of the more popular ideas of the Roman world, was potentially more accurate, and worked at all locations, no doubt further assisted the spread of the personal astrology it came to underpin. More crucial, though, was the ease with which Babylonian zodiacal astrology was able to have Aristotelian, Stoic, Epicurean, native Egyptian, Iranian, native Indian and many other ideas grafted on to it, so much so, in fact, that it became in each of these cultures an almost "indigenous" tradition. In particular, such was the extent to which this Babylonian discipline was Egyptianized, that Egypt became known as the home of astrology for many Greeks. For the Indians, in turn, astrology is a *Yavana* science. In all these cases, the very ignorance of the adopting culture as to the true origin reflects on the nature of the transmissions. This is not transmission driven by interested academics, but business people, for whom the truth is what sells. Strabo, for example, is well aware of Babylon and Uruk's role in the development of astrology (ch. 2, here).

It is a coherent story that I am attempting to tell here, with the help of the team of invited experts. In answer to the self-evident critique, why not deal in the ancient categories themselves, I would answer that such an approach has failed

in the past to produce clarity when it comes to the question of transmission and interaction. Scholars immersed in their respective fields do indeed have the best chance of producing the most robust account of the development of “astral science” within those cultures, if we accept for the moment that the category “astral science” can be, at least roughly, defined in each. Where that development, though, is dependent on outside influence the specialist scholar is confronted by specific difficulties emerging from their non-nuanced understanding of the other cultures. It is all too easy to try and fit the astral science of the other culture into the ancient categories of the culture one knows best and detect all kinds of parallels that do not really exist. The solution, of course, is to have experts in differing fields collaborate, which is what is attempted here, but first they must have a series of terms with which they can communicate that can more or less be imposed on their data without too much damage being done to the native categories. It is with this in mind that a reductive approach has been adopted, and astral science broken down into the categories listed above. [22–25]

Brown questions the opinions of previous generations of scholars who saw too often transmission where there was none (Pingree) or who denied transmission where later research has shown its undeniable existence (Neugebauer). To illustrate the latter, he writes,

Equally, as regards Mesopotamian influence on Graeco-Roman astral science, Neugebauer’s views of 1975 were falsifiable, and I argue, have been falsified, in particular as a result of the papyrus material from Egypt. Neugebauer’s view in 1975 was that the influence was minimal, but he had altered his view on that by the late 80s. So radical is the revision since then that as this book will argue, Hellenistic Astral Science is a term that should now be understood to mean “Babylonian Astral Science in the Hellenistic Period”, albeit often written in Greek and other cursive scripts. The discipline had been taken up by the Hellenes, and they made important contributions to its various manifestations, but despite its being attributed to the *Yavanas*, “Ionians”, or Greeks by the Indians, even in India the core of the discipline after c. CE 300 remained Mesopotamian. [5]

Brown introduces his new concepts of “resonances” and “interactions”:

The casual use of terms such as “adopting”, “borrowing”, “transmission”, and so forth characterizes many works that attempt to compare and contrast ancient systems of astral science. It is all too easy to spot what appears to be a case of a parallel approach to a problem and suggest “transmission” and leave it at that. Indeed, one can show off one’s breadth of knowledge and fill pages with copious notes in various ancient languages of “possible parallels” and prove almost nothing. In order to avoid this, a strategy has been developed which will now be outlined.

Examples of alleged “parallel approaches”, of identical or similar parameters or names, in two or more languages written in different geographical areas are termed *resonances*. Thus termed, no assumption is made as to whether

the resonance in question does or does not attest to the use in one culture of a method, system, parameter, or name devised in an earlier. The term “interaction” rather than “transmission” will be commonly used so as not to prejudice the interpretation as to what reasons lay behind the use in one culture of astral science developed in another. Was it driven by the recipient or the creator of the work? Most of the resonances studied here have long since been noted by various authorities. Not all, however, for the reader will see that this author has not been immune to proposing some cases of interaction of intellectual ideas based on resonances he has seen and which have not yet been noted by others. Theoretically, I would have liked to have assessed every resonance noted in material dating to the period up to c. 650 CE, from Rome to China, but this was not feasible when it came to the wealth of astrological material, in particular. In this case, I decided that a detailed assessment of the Indo-Babylonian resonances in astral omens would be made, and of the few Sino-Babylonian ones. A detailed, but by no means comprehensive, study of Graeco-Roman-Babylonian resonances in zodiacal astrology is offered, but the study of resonances in classical texts of Babylonian omens has only been made cursorily. Similarly, only the broad outline of the Indian debt to Hellenistic astrology will be made on the basis of the long-known resonances there. As to the calendar, and its varied manifestations, it is not our central concern here, though where it plays a part in a wider astronomical scheme it will be considered. No attempt at comprehensiveness has been attempted when it comes to astral religion, cosmography, cosmology, time-keeping, astral magic, geography, and mathematics in astral science, and instrumentation has been all but ignored. It is hoped that so far as the astronomical systems and the evidence for astral mapping are concerned the following chapters have missed but few of the resonances noted by other scholars. Each “resonance” will be treated on its own merits, based on the sources surviving, and also, importantly, the agenda of the scholar noting the resonance. We cannot escape the fact that some scholars see more resonances in a text than do others, and evaluation at this subjective level is extremely hard. Pingree, for example, saw resonances with Babylonian omens and arithmetic techniques in early Indian compositions that I do not see at all. Other times, I accept that there is a resonance, but see no reason to attribute it to cultural influence rather than to independent discovery. A third variant is one where it has been asserted that the resonances indicate that a transmission of written material from Babylon made its way to India, say, perhaps via Iran and perhaps in translation, but I have argued instead that the resonance, though it exists, attests at most to an informal passing of astral lore by word of mouth, probably from layman to layman along a trade route. [27–28]

He discusses some recent results in the transmission of ancient astral science in terms of these new concepts:



It is an opportune moment to reconsider the interactions of ancient astral science in that geographically connected landmass from China to Europe. Developments *within* the fields of cuneiform, Greek, Demotic, Coptic, and West Semitic astral science over the last few years have meant that the assumptions of the previous generation of scholars needed to be overhauled. Some of these have been mentioned already. A significant contribution to the history of Indian astral science was made by Falk (2001) with his careful redating [*sic*] of the *Yavanajataka*, and this and our joint re-reading of the last chapter of that composition have now permitted a radical reevaluation of early Graeco-Indian interactions in the astral sciences (see ch. 8.c). A careful reanalysis of the contexts of both Indian and Mesopotamian astral science has led me to conclude that there is no Mesopotamian influence on India in this area in the period prior to c. 300 BCE, and thereafter none that is not mediated by other cultures (chs. 8.b and 8.c). The reevaluation of the early history of Greek astronomy fits well with this new model of early Hellenistic contacts with India. We know a little more about the earliest astral science in Iran, and a great deal more about early West Semitic astronomy-astrology and calendrics, thanks in part to the discoveries at Qumran. In ch. 4.a, Ben-Dov has provided a snapshot of the spread of Babylonian astral science to the West Semitic areas in the period prior to c. 150 BCE, and both his and Panaino's description of the situation in Iran fit well with the picture pieced together from the cuneiform and Greek sources of that period of astral science in and around Mesopotamia.

The recent surge in interest amongst Egyptologists in the astral sciences preserved in the late papyri, and in a reassessment of earlier data, has forced us to rethink the extent of the debt Hellenistic and Roman astrology and astronomy owe to the ancient Egyptians, and both Quack and von Lieven are at the forefront of this new movement. Quack's contribution here (ch. 3.a) is a major summary of the new state of the field.

We have learned a great deal more in recent years about the extent to which arithmetic astronomy played a dominant role in the first three to four centuries CE in Egypt, and more about the way that astronomy both borrowed and adapted Babylonian methods preserved on cuneiform tablets. We are also better able, on the basis of this work, to recognize that Ptolemy's works were not of central importance precisely at the time when sophisticated arithmetic astronomy began to be taken up in India and Iran. We know more about the background to Ptolemy's achievements, suggesting at once that he was typical of his era, but also that his era produced a great leap forward when it came to trigonometric, predictive astronomy. All of this fits well with the description of and explanation for the development of astral science in India in the first few centuries CE. Mercier's contribution (ch. 8.e) conclusively solves a debate that has raged since the early 1970s as to the extent to which the early Indian trigonometric *siddhāntas* made use of parameters perfected on the basis of

locally made observations. This has profound implications as to our understanding of the nature and purpose of the most sophisticated of Indian astronomy in the pre-Muslim period, and the nature of astronomical interaction at this time. It emphasizes India's paramount significance in the astral sciences just as our period of concern comes to an end, and helps explain India's role in the transmission of astral science thereafter, an area which in recent years has been most successfully explored by Michio Yano. [26–27]

Once again, while some of Brown's opinions are strong and some of his arguments controversial, I find his book worth reading and often stimulating. It is an erudite collection of knowledge of ancient astral science and of ideas about its transmission between different cultures in the Old World. I recommend it for purchase to all libraries of learned institutions of the history of science and to those interested individuals and scholars who can afford it.

It seems appropriate to end this review by quoting Brown for the last time:

Historians of astronomy or science may criticize our approach or suggest a better way to piece together the evidence we have presented, and all will find reading the whole book somewhat of a challenge. As Tony Wilkinson put it "by covering such a broad canvas, there should be something in this book to annoy everyone". [8]