Over the last 15 years, J. L. Mancha has published a series of studies, mostly connected in one way or another with the work of Levi ben Gerson, in which he brings to bear his considerable skills in Romance philology and mathematics. Eleven of these have been collected in the volume under review, to which Mancha has added a preface and indices. Mancha was led to study Levi by way of his dissertation in which he wrote on Henry of Hesse’s *De reprobatione eccentricorum et epiciclorum*. Hesse’s criticisms of eccentrics and epicycles resonate in the work of Regiomontanus and Copernicus. The search for Hesse’s own sources led Mancha to Levi, who, as noted, has become the chief focus of his work. Only one of the essays reprinted here, ‘Ibn al-Haytham’s Homocentric Epicycles in Latin Astronomical Texts of the XIVth and XVth Centuries’, (to which I shall return below) is related to Hesse. By contrast, nearly all of the others, and certainly the longest and most important, are related directly or indirectly to Levi.

Research into Levi, in turn, led Mancha to other projects. The first two items in the volume are studies of Latin texts on pinhole images. Levi employed the pinhole camera for his measurement of the solar eccentricity; a study of the Latin version of the relevant chapter from Levi’s astronomy is appended to the second of the two essays on optics, ‘Pinhole Images in William of Saint-Cloud’s *Almanach*’. The last study in this volume, ‘Al-Biṭrūjī’s Theory of the Motion of the Fixed Stars’, confirms the suggestion of E. S. Kennedy, against the view of B. R. Goldstein, that al-Biṭrūjī did employ a pair of homocentric spheres (dubbed by Mancha a ‘Eudoxan couple’) in his reformed astronomy. The clue to this new interpretation, as Mancha tells us in his third footnote, was the discovery that Levi had used homocentric
spheres in dealing with the hippopede, a topic which Manchainvestigates in full in the seventh item in the volume, ‘Right Ascensions andHippopedes: Homocentric Models in Levi ben Gerson’s Astronomy I.First Anomaly’.

In the following I shall report upon some selected essays fromthis collection, in particular, those to which I wish to draw attentionor to which I feel that I may have something to add. I shall, however,jump directly to my conclusion now, and state that this a welcomeaddition to the Variorum series and a most useful work for historiansof medieval science.

Let me begin with a remark on the hippopede. Mancha ob-serves that the chief source for the technical features of the modelis Simplicius’ commentary to Aristotle’s De caelo. Although thattext is not known to have been translated into Arabic, somehow theprocedures became known, and even became ‘standard’. In this con-nection, I should draw attention to the very interesting Hebrew text, Meyashsher Aqov, which is likely to have been written by Abner ofBurgos (early 14th century), and which is a repository of some richHellenistic mathematics not known from other medieval sources aswell as other materials whose transmission history is unclear. Ab-nner was clearly drawing upon texts that may well have been at thedisposal of al-Bitruji and others.1

‘Heuristic Reasoning: Approximation Procedures in Levi benGerson’s Astronomy’, is the most thorough study I have seen of it-erative methods in pre-modern science. An iteration is a processfor solving algebraic (or transcendental) equations in which one firstmakes an educated guess as to the solution, then ‘plugs’ this solu-tion into an algorithm which will yield a better approximation. Thissecond solution is then ‘plugged’ into the same algorithm, yieldingan even better solution. After a number of successive iterations, the-differences between the results become insignificant, and one can be satisfied with the result.

Iterative procedures were employed not only by Ptolemy (as Mancha notes) but elsewhere in Hellenistic mathematics and in me-dieval Hebrew mathematics as well.2 However, as Mancha points out,

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1 I report much of this in Langermann 1996.
astronomers and mathematicians did not always explain exactly what
they were doing, nor did they attempt to justify the method on math-
ematical or logical grounds. Levi, however, did both at the begin-
ing of chapter 49 of the Latin version of his *Astronomy*. After translat-
ing and analyzing the relevant text, Mancha goes on to display six
examples of its application in a variety of astronomical problems.

By far the longest study (nearly 100 pages) is ‘The Provençal
Version of Levi ben Gerson’s Tables for Eclipses’. The text, whose dis-
covery is an important achievement in itself on Mancha’s part, sheds
new and stronger light on Levi’s relationships with Christian scholars.
In particular, Mancha demonstrates that the Provençal text, which is
earlier than the corresponding Hebrew version and contains materials
not found there, is due to Levi himself, who may have dictated it to a
Christian scholar, very likely Petrus of Alexandria, who is known to
have been associated with Levi in various capacities. Having now the
opportunity to study closely Levi’s work in all of the three languages
in which they circulated (Hebrew, Provençal, and Latin), Mancha
is led to the important conclusion that one ought not to speak of
‘originals’ and ‘translations’. Instead, each version, whatever the lan-
guage, presents Levi’s original research at whatever stage the text
was issued. Moreover, the Provençal and Latin versions are not mere
translations, but rather form part of a program undertaken in col-
laboration with Levi himself for making available the results of his
astronomical research to the aforementioned Christian circle.

‘Levi ben Gerson’s Astronomical Work: Chronology and Christ-
ian Context’, deals as well with Levi’s relations with Christians. It is,
however, a departure from Mancha’s usual work in that neither math-
ematical astronomy nor Romance philology play a major role here.
It is, nevertheless, one of the most interesting and revealing contribu-
tions to Levi’s biography that I have seen. Making use in particular
of the many dated observations in Levi’s writings, Mancha points
to peaks in astronomical research that correspond to requests from
Christians, as well as to low points that came about when Levi was
stymied. Levi’s writings in other fields, especially biblical exegesis,
fit in nicely to those years when astronomical activity is not attested.

‘Ibn al-Haytham’s Homocentric Epicycles in Latin Astronomical
Texts of the XIVth and XVth Centuries’ tries to draw a connection
between a physical model proposed by Ibn al-Haytham to account
for the complex motions in latitude of the planets, and some models
that are found in Latin texts. Ptolemaic astronomy analyzed motion
in latitude as the product of an oscillatory motion on the part of
one, or, in the case of the inferior planets, two diameters of the epicy-
cle. Yet how is one to explain this physically in accordance with the
principle that only one motion can be attributed any single body in
the heavens? Ibn al-Haytham (965–ca 1040) devised a system of con-
centric spheres rotating on different poles to account for it. Mancha
has found in works by Henry of Hesse, a certain magister Julman,
and Albert of Brudzewo (author of a gloss to Peurbach’s Theorica),
‘physical arrangements of two concentric spheres enclosing the epicy-
cle (or the eccentric) identical to that of Ibn al-Haytham... although
without parameters’.

So far so good. The problem—and Mancha is certainly aware of
it (see his first note)—is that the particular monograph in question,
Treatise on the Movement of Iltifāf, is not extant even in Arabic;
and there is no reason at all to suppose that it, or the reply of Ibn
al-Haytham to a critic of his solution, which does survive, would
have been available to readers in the West. Ibn al-Haytham’s On
the Configuration of the World, by contrast, was widely read and
translated more than once into Latin. In that book, however, Ibn
al-Haytham does not offer a solution to the problem at hand, though
the oscillations are mentioned, and the Latin terms (reflectio, incli-
natio) are the same as those that appear in the texts studied in this
article. Mancha observes that the authors whom he studies did not
themselves design the system, since they speak of it as the theory
of others. However, the models are not complex, and involve little
more than the assumption of spheres that will be responsible for the
execution of the motions that are described in On the Configuration
and other writings.

I have some criticisms concerning Mancha’s translations and
transcriptions. Mancha’s command of English is excellent, and his
expositions and translations read well. However, he has a tendency
to translate some terms much too literally. For example, in the first
study, ‘Egidius of Baisiu’s Theory of Pinhole Images’, he consistently
renders ‘pyramis’ by ‘pyramid’, instead of ‘cone’, the correct and
precise translation. Mancha chooses ‘diaphaneity’ for ‘diaphanitas’, instead of the perfectly good ‘transparency’ [passage 13]. He uses ‘experience’ too often, inconsistently, and not always correctly. At the beginning of passage 19, ‘Etiam est contra sensum’ is rendered ‘It is also contradicts (!) experience’; and at the beginning of passage 20, ‘Ad quod experimentum quidam falso nituntur respondere’ is given in English as ‘This is an experience against which some try in vain to argue’. ‘Sensum’ should be rendered ‘senses’, or, if one insists, ‘sense experience’; and ‘experimentum’ in this context really means ‘observation’, or, if that seems inappropriate, ‘empirical datum’. (The same applies to Mancha’s use of ‘experience’ on page 15 of the fifth item in the collection).

Passage 18 in the first study presents a more difficult challenge. The Latin has ‘virtus curvaretus et fortificaretur’, which Mancha translates, ‘their virtuality would curve and increase in strength’. ‘Virtuality’ is of course out of place here; ‘virtus’ must mean here ‘power, strength’, and so one would accordingly translate ‘fortificaretur’ by something like ‘would intensify’. I admit, though, that the full intent of the passage is beyond me. Finally, a word on transcriptions from the Greek. In the eighth study, Mancha consistently writes ‘egklisis’. This may be a precise letter for letter transcription; but gamma before kappa is a palatal nasal stop, and so the correct and standard transcription is ‘enclisis’.

BIBLIOGRAPHY


3 See, e.g., Kheirandeish 1999, 2.154 for the employment of this technical term in the Latin version of Euclid’s Optics.