BETWEEN REPRODUCTION AND RECOVERY: NOTES ON EDITING CLASSICAL ARABIC MANUSCRIPTS ON ASTRONOMY

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I should like to start by saying that my experience in editing Arabic manuscripts of astronomy is limited. However, given the fact that the number of historians of Arabic science is modest, the small number of manuscripts I have already edited or have some familiarity with may qualify me to venture some remarks on the basis of my experience. Yet it is important to state at the outset that most of my remarks are meant to stir discussion rather than to make definitive assertions regarding the state of the art of editing manuscripts of Arabic astronomy.

It is perhaps appropriate to refer to the editing of Arabic scientific manuscripts as an art, rather than a science with definite rules and standard procedures. That it is not a science is abundantly clear from a review of any random selection of edited scientific texts. Different scholars use different methods of editing which, though not necessarily arbitrary, often differ considerably from each other. What complicates matters further is that there is no systematic forum where historians of Arabic science reflect on the issues and problems encountered in the process of editing Arabic scientific manuscripts, or where they attempt to establish some sort of professional consensus over the appropriate procedures of editing. To my knowledge, there are no books that discuss this subject; the only references which one can consult are either the introductions to various edited works, where the
method of editing used by a particular scholar may be outlined, or the reviews of such editions where reviewers may reflect on the merits or faults of certain editing procedures.

So, although I was asked to base my presentation today on my own experience in editing Arabic manuscripts of astronomy, I decided to also consult the general guidelines that could be culled from a few typical editions - or reviews of such editions - of Arabic scientific works. By comparing divergent approaches towards editing, I hope to make my remarks a bit more interesting and less dry, for the last thing that anyone would want to go through is to listen to a description of the critical apparatus of some edited work. In addition to being more interesting (or perhaps I should say less boring), a comparative examination of methods of editing would also shed light on some of the choices that an editor needs to make, and the theoretical implications of such choices.

The editing process involves both a text to be edited and an editor. The discussion, therefore, would have to focus on each of these two and the relationship between them. Let me start with the editor. Perhaps the most obvious of the desirable traits of an editor is experience; as in any other craft, the skill of an editor increases with increasing exposure to and experience with scientific manuscripts, and such a practical skill is indispensable. It is less obvious, however, what range of expertise an editor ought to cover. Already in my introductory remarks, I have referred to editors as historians of Arabic science. This identity between the editor and the historian is not necessarily self-evident and needs further justification. The issue here is to identify the skills that an editor of Arabic manuscripts on astronomy needs to cultivate in order to produce an acceptable edition of such manuscripts.

While scientific manuscripts are in a league of their own, some of the problems of editing are common to scientific as well as other kinds of Arabic manuscripts. Therefore, the first essential prerequisite in an editor is a good command of Arabic. However, since we are dealing here with scientific texts on astronomy, knowledge of Arabic alone is not sufficient. To be able to understand his or her text, the editor needs some command of the astronomy in question, or rather of the mathematical techniques and physical principles employed in the astronomical text he or she is editing. This is because the language employed in astronomical texts (and in scientific texts in general, each in its own way) is a specialised technical language that is different from other forms of literary expression. Moreover, the technical nature of the language is not only a factor of the science used, but also of a particular mode of expression which distinguishes medieval from modern usage. In other words, the technical idiom of medieval Arabic scientific manuscripts is quite different from that of modern scientific Arabic. Therefore, the editor of a medieval Arabic manuscript on astronomy plays the role of translator of a language twice removed from his or her contemporary usage: removed because of the gap between the medieval and the modern, and the gap between literary and scientific expression.

In addition to the command of Arabic and astronomy, the editor needs to be familiar with the historical context of the manuscript he is editing and the medieval technical linguistic conventions as opposed to the modern ones. Indeed, in the course of the tedious process of editing a manuscript, any manuscript, not only does the editor learn about the culture of origin of this manuscript, but he or she also employs certain assumptions about this culture which affect the strategy of editing. An editor of a manuscript on medieval Arabic astronomy must therefore cultivate linguistic, technical (or scientific) and historical skills in order to handle the task of multi-layered translation. One example will suffice to illustrate this point. Many astronomical manuscripts have tables where the letters of the alphabet are used to express numbers. In medieval usage, it is very common not to add the dots to letters. Thus, assuming a competent scribe who makes no
mistake, we would be faced at least with the problem of more than one possible reading of many of the letters which are written without the diacritical marks. For example, depending on what dots are added to the letters (yā’-ḥā’), we get either the number 18 (yā’-ḥā’), 13 (yā’-jīm), 58 (nūn-ḥā’), or 53 (nūn-jīm). The only way to restore tables meaningfully is to identify the formulas used to calculate their entries, as well as the approximate methods that may have been used in these calculations. The editor, therefore, must be prepared to solve the mathematical problems of a text in order to be able to edit it.

The issues that arise in connection with the text to be edited are more complex but could be roughly classified under two general questions: which texts/manuscripts ought to be edited, and how to edit them. Given the small number of historians of Islamic science, the first of these questions is not as trivial as it may at first sound: it would certainly be preferable if all medieval scientific manuscripts were edited, but this is simply not possible. Choices, therefore, have to be made and, depending on what gets to be studied, we may end up with differing outlines for the history of Islamic science.

There are several very important examples to illustrate how crucial the choice of texts to study can be. To stay within the field of astronomy, I would just point out the qualitative advance in the field of the history of Islamic astronomy that resulted from the accidental discovery by E.S. Kennedy of a manuscript by Ibn al-Shāṭir on theoretical astronomy, and the subsequent search for and study of manuscripts on theoretical astronomy written in the thirteenth and fourteenth centuries. Kennedy was on his way from Beirut (where he taught mathematics) to Brown University in the United States (where he was preparing for a second PhD degree on the history of Islamic science.) He stopped in London, and went to the British Museum to obtain a copy of a zij by Ibn al-Shāṭir (a set of astronomical tables, usually with an introductory section providing formulae and explanations of the use of these tables). The librarian brought a different manuscript by the same author to Kennedy, and as he went to fetch the right one, Kennedy leafed through the first manuscript. He immediately noticed that it did not resemble what he had so far been accustomed to seeing. Later, together with Otto Neugebauer, he realised that this was a work on planetary models, and that it was surprisingly similar to the work of Copernicus. Without getting into too many details, my point here is that there was this very important aspect of the history of Islamic astronomy which was unknown to historians. Had it not been for Kennedy’s accidental discovery, the focus of research might have remained astronomical tables and applied astronomy. This is not to say that these fields are not important, but they do not represent the whole spectrum of medieval Arabic astronomical works and exclusive focus on them does not give a full and accurate picture of the field.

Although the number of students of Islamic science in general is much smaller than those who work on other aspects of Islamic culture, the field today is in a much better position than it was a few decades ago. Thanks to the efforts of a small number of committed scholars, I think that we are in a position today to suggest tentative outlines for the history of Islamic astronomy. Our search should, therefore, be less random, and our choice of works to edit should be guided by what we already know. This is not the place to make suggestions about directions of future research; some historians of Islamic astronomy have already made such suggestions. My point here is that the choice of manuscripts to edit should be guided not so much by habit as by merit; it is no doubt easier to work on familiar sets of mathematical problems, and also there is value in examining minute developments in methods and solutions in any particular sub-field of Islamic astronomy. Yet because the number of people working in this field is not so large, we cannot afford the luxury of over-
specialisation and should always keep the larger picture in mind. In my view, the primary focus at this point should be to fill in gaps in the overall picture rather than uncover one more treatise belonging to our particular specialisation or to the particular geographical area we happen to work on.

On this last point there is great merit in studying the scientific developments within specific geographical areas that had their distinct historical traditions, but one should also recognise the equally important transregional character of Islamic science. So to sum up my remarks on the question of which manuscripts we should choose to edit, I suggest that the task of editing should be performed in the context of the larger task of testing existing theories about the history of Islamic astronomy, its periodization schemes, development, relationship with other aspects of the culture, and so on.

With regard to the methods of editing astronomical texts, it is useful to start with a clear statement of the purpose of editing manuscripts: to make one or more copies of a text suitable for publication by means of comparing, selecting, emending, and revising one or more available copies of this text. In other words, the purpose of the edition is to produce a corrected version of what approximates, in the judgement of the editor, to the original text, with as little distortion as possible. The edited version must reproduce the original for use by the reader in such a way that this reader can assess the judgements made by the editor and also reconstruct from the edited text the manuscripts used in the edition.

Before I discuss some of the differences in the strategies of editing, let me first give a few examples of the kinds of textual problems that the editor deals with and attempts to resolve. To start with, the editor recognises that any manuscript has an author and one or more copier or scribe. As such, the errors in the received manuscripts could be either substantive mistakes made by the author, or scribal errors. The latter could be mechanical errors of copying, or could result from the scribe’s lack of knowledge of scientific terminology. In addition to these different kinds of errors, there are also ambiguities in the manuscripts that result from lack of vowels or diacritical marks; differences between correct but unfamiliar medieval grammatical conventions and standard modern ones; the differences between medieval spelling conventions and modern ones (for example, the use of a yā’ instead of a hamza, or the use of dagger alif; the use of abbreviations (for example, the use of dh for dhāhir, or mj for maṭlūh), and so on.

Another common difficulty in editing astronomical manuscripts is the reconstruction of diagrams. Because in most cases editors use black and white microfilm copies to prepare their editions, and because in many originals red ink is used to draw diagrams, parts or all of these diagrams often do not appear in the microfilm copies. Even when such diagrams do appear, they are often hopelessly distorted and need to be reconstructed, almost from scratch. In short, the editor faces errors as well as ambiguities resulting from the unfamiliarity of the medieval grammatical and orthographic conventions.

In almost all the problems I have mentioned, there are different choices that editors make - choices that result in significantly different products and that have implications beyond the mechanics of the editorial process itself. To start with, there is the question of whether to attribute errors to the scribe or the author of a scientific manuscript, and what to do in either case. The author, of course, is a scientist who knows (one hopes) the subject he is writing about. The scribe, on the other hand, is not necessarily a scientist, and may in fact have no idea what the manuscript he is copying means. No wonder, then, that there are more scribal errors in scientific manuscripts than in other literary manuscripts. However, this basic distinction between author and scribe often leads modern editors to adopt editing policies which, in my view, are not always justifiable. Basing themselves on this
distinction, editors often refrain from making any changes in what they judge to be the author's 'original' error, while they take great liberties in adding or eliminating freely from the text when they suspect that the scribe has altered the original either deliberately or by mistake.

While it is reasonable to assume that scribes are often not proficient in the subjects of the treatises they copy, there is little reason to doubt that as a general rule they had high standards of accuracy. Such high standards were common not just in the sciences but in other fields as well. As such, one would expect errors in, for example, copying alphabetical representations of numbers or the omission by mistake of a word or even a sentence. It is quite unlikely, however, that a scribe would deliberately interpolate or interpret the text, and add to or omit from it accordingly. In fact, many of the copied manuscripts that have been examined have been compared to the original precisely to make sure that no words have been added or dropped by mistake; the manuscript would usually end with the expression qūbūla ālā al-asl (compared to the original) by either the copyist or some other person. Corrections are usually inserted in the margin with a mark in the body of the text to indicate where these corrections belong, and with such symbols next to them as sahh (correct). Additions to the text for the purpose of commentary, explanation, or criticism are usually inserted in the margin in a different hand, often with the name or initials of the person making the addition or some other indication that this is not part of the original text.

For similar reasons, one should not necessarily attribute inconsistencies in the use of technical terminology, grammar, spelling, and so on to the scribe rather than the author. Though this may occasionally be the case, no absolute assertions can be made without further examination. This brings us to the second important choice that editors make with regard to assumptions about the consistency and readability of a text. Editors often argue that it is not their job to correct the author's mistakes. This,

in effect, means that the editor reproduces the grammatical and other mistakes of the Arabic manuscript while the task of producing a readable corrected text is achieved in the translation of the original Arabic to some European language. The Arabic editions may thus be full of mistakes, as well as medieval usage and conventions of spelling which do not conform to modern standard conventions. An implicit assumption here is that an edition need not be readable by an Arab reader since it needs interpretation anyway; the original thus is reproduced to satisfy the curiosity of the philologist, while substantive issues are dealt with in the translated version. To be sure, no matter what the editor chooses to do, the edition ought to be a transparent text through which the reader can reconstruct the original text as it appears in the received manuscripts. This, however, can be adequately achieved by reference to the critical apparatus, and there is no justification for producing an edition which is identical to the manuscript only in print.

In my view, the editor should seek a balance between the need to reproduce the original mechanically and the need to eliminate its ambiguities. This includes correcting errors in spelling and grammar, standardising the spelling and grammatical usage, punctuating the text, and so on. Punctuation, in particular, seems to be avoided by many editors of Arabic scientific manuscripts. This is partly because medieval Arabic has no punctuation. However, the decision of an editor becomes specially objectionable when the Arabic edition has no punctuation while the translation is fully punctuated. Moreover, such translations are usually based on a corrected reading of the Arabic, and they often employ algebraic notation instead of the word description of numerals and mathematical operations which are employed in the Arabic edition. Again, the problematic implication of such a choice is that the Arabic is a mere philological curiosity while the translation is where substance and meaning are to be found.
Ideally, an editor can substantially reduce the ambiguities of astronomical texts while interfering minimally with the text itself. The editor can also ensure that the format of the manuscript is accurately preserved by providing the reader with a critical apparatus which includes all the variants, corrections, unconventional spellings, and so on. This apparatus should also preserve material found in the margins of the manuscripts such as notes by readers and owners, and marginal revisions by authors, readers or scribes. All of these tasks are to be included in the editing process and should not have to wait until a translation of the text is produced. This is not to underestimate the value of translation, however, but simply to think of it as a tool which, in addition to making the text available to historians of science who do not read Arabic, enhances the understanding of the original Arabic rather than relegating the Arabic text to the status of a relic.2

Editing, as I have already suggested, can be seen as a translation of sorts. Editing can also be facilitated if at the same time a text is edited it is translated into another language. It is more difficult to translate a scientific work without a reasonable understanding of the text than it is to edit it without such an understanding. Translation, however, is more transformative than editing, a point which brings us to another set of problems related to the editing of Arabic texts originally translated from Greek. Not only does the editing of such texts require knowledge of the scientific and discursive culture in which these texts were produced, but we also stand to learn much about this culture in the process of editing itself. In astronomy in particular, the most influential text translated from Greek was Ptolemy’s Almagest. Two Arabic translations of this text are extant, and there is reference in the bibliographical sources to at least one other lost translation. The first extant translation is by al-Ḥajjāj ibn Maṭar and it was prepared during the days of al-Ma’mūn (c. 830 AD); a later translation was prepared by Ishāq ibn Hunayn and Thābit ibn Qurra, towards the end of the ninth century. Neither of these texts has been edited, presumably on the assumption that the Greek original is available thus making the Arabic redundant. Some parts of the extant translations have, however, been compared by George Saliba in his study of Kitāb al-Hay’a by Mu’ayyad al-Dīn al-ʿUrǧī. Saliba demonstrated how al-ʿUrǧī, who was writing in the thirteenth century, had access to and used for both translations; these translations were not mere revisions of each other, but fresh translations of the original Greek text. Further study of these texts may explain the need for many translations of the same text and may also shed light on the cultural history of the early period of translation. Needless to say, such a study starts with editing the two translations and then comparing their structure, syntax, technical terminology, and so on.

One of the issues that arises in connection with this kind of text is the consistency of technical terminology. The terminology available to the early translators steadily developed, and the language of astronomical texts became more consistent and clear with the passage of time. An editor of early texts, therefore, should not smooth away the roughness of such texts by eliminating inconsistent usage of the technical terminology. Moreover, despite the general move over time towards more clarity and consistency, editors should allow for a development in the opposite direction: as knowledge of astronomy and other mathematical disciplines spread into wider sectors of Muslim society, some educated non-specialists composed general scientific works. Such works are of interest not only on account of what they tell us about the culture that produced them but also because of their possible scientific merit. However, as in the case of most scholars who venture outside their fields, the uneasiness of the authors of such works often results in some lack of consistency and smoothness in the texts. Here too the editor should be attuned to the cultural
background and should try to preserve the tone and structure of
the text which reflects this culture.

One historian of Islamic science who has contributed
significantly to enhancing our understanding of the complex
relationship between translation and research is Roshdi Rashed.
Rashed has shown how translators - who were also experienced
mathematicians - often used in their translations technical terms
which derived from contemporary mathematical operations not
known to the Greeks. In other words, the translators interpreted
the texts they were translating in light of the research of their
own time: the *Arithmetica* of Diophantus, for example, was
translated after the new field of algebra was established, and it
thus acquired an algebraic interpretation which is alien to the
Greek original. Here too we have an illustration of how important
it is for an editor to preserve and illuminate the varying linguistic
structures of texts and to relate these structures to manifold
scientific and cultural developments.

There are numerous other instances where the sharp
sensitivity of the editor is of the greatest import. Let me give one
more example: in astronomical manuscripts one often comes upon
quotes from and citations of earlier sources. Needless to say, one
of the tasks of an editor is to try to identify these sources, even if
the authors or cited texts are not named. In the more fortunate
cases, when these sources are identified, editors often discover
that their authors do not quote their sources word for word. Such
variations, however, cannot be automatically explained as either
errors or paraphrasing of the original source. Although these are
real possibilities, the editor should also consider the possibility
that the author of his text is introducing a deliberately subtle
change to the source which he quotes, reflecting a difference in
his approach to or perception of a particular scientific problem.
The text of `Urdj's *Kitab al-Hay'a* illustrates this point: `Urdj, as
I noted earlier, selectively quotes from two different translations
of the same text by Ptolemy. This, as Saliba shows, is not a

matter of simple stylistic preference, but also reflects `Urdj's
conceptual thinking about theoretical astronomy and physics. The
appreciation of the significance of subtle changes in quoted texts
is particularly central to the editing and study of astronomical
texts which are written as commentaries on earlier ones.
Commentaries are often wrongly considered as explanatory texts
with little originality of their own. Again, there are numerous
commentaries, practically none of which has been edited. Recently,
however, it has been illustrated that some of the most original
contributions of Arabic astronomy were introduced in
commentaries. For example, Saliba has shown that the first instance
in which the thirteenth-century astronomer Nasir al-Din al-Tusi
attempted to reform Ptolemaic astronomy was in his *Ta'hir al-
Majisti* (Commentary on the *Almagest*). This and other examples
illustrate the need to rethink some of the presuppositions that
affect choices of texts to edit, and the things to be considered
should such editions be undertaken.

Another problem arises when there is more than one version
of a work, that is, when the author revises the work and produces
two versions (or even more) of it. This is notably the case in two
important astronomical texts of the thirteenth century that have
already been studied, namely the *Tadhkira* of Nasir al-Din al-Tusi,
and the *Kitab al-Hay'a* of Mu'ayyad al-Din al-'Urdj. The existence
of more than one version, and perhaps copies which mix or pick
and choose from these versions, considerably complicates the job
of the editor. Yet it is extremely important to fully document all
variants because they shed much light on the actual process of
thinking, through which the astronomer arrived at his discoveries
and formulations. These revised works convey an image of
astronomical knowledge as a process rather than a momentary
occurrence - as knowledge always in the making. An editor who
is not aware of the possibility of having more than one version of
a work may assume that there is only one original; in which case,
the variants would be treated as errors and would be dismissed. An editor's choice, therefore, could inadvertently obscure rather than illuminate the process of scientific thinking, and suppress sources that are most useful for understanding the dynamics of this process.

A final technical point that arises in connection with editing manuscripts of Arabic astronomy is the number of manuscripts to use. An editor is most fortunate when only one or two good copies of the work he is editing are extant. In actual practice, however, the number of copies used by editors varies from a single extant manuscript to what may seem like an endless number of manuscripts. In the latter case, editors often try to identify families of manuscripts and assess the quality and reliability of each of these 'families'. In many cases, it is futile to try to collate all the available copies; the editor needs to choose a manageable number of manuscripts to work with. Of course, one of the tasks for an editor is to establish the criteria by which he or she selects from what is available. Here too, appearances can be deceptive. Nicely written texts which appear suitable for facsimile reproduction are not necessarily the most accurate copies of the manuscripts in question: neat copies often contain more errors than those that seem scrambled and hard to read. As always, the editor has to make a judicious choice, not just as a mechanical reproducer of a text, but as an historian of a scientific culture who aims to uncover the linguistic, scientific, and cultural context of this text, and recover in the process of editing a sense of the text's culture of origin.

Selected Bibliography


