

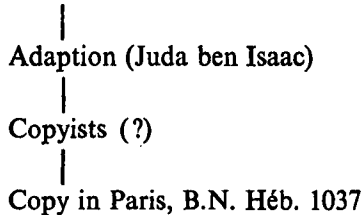
THE TREATISE ON MUSIC TRANSLATED INTO HEBREW BY
JUDA BEN ISAAC

(Paris, B.N. Héb. 1037, 22v-27v).

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In *Yuval* 1968 (pp. 1-47) Israel Adler published the Hebrew text of this treatise together with a French translation and a detailed commentary. From the musicological point of view this study is of excellent quality. Having now been invited by Adler to contribute my own view on the "how-when-and-where" of the genesis of this treatise, I hesitated for a long time, because I knew that the carrying-out of this request would be an exceedingly time-consuming task. What we have before us in the Paris manuscript, which is the only record of this treatise, is not the authentic text by Juda ben Isaac but a later version, in which we find traces of alterations, omissions and additions by copyists; furthermore, Juda himself carried out an adaptation of his Latin sources. One can formulate the provenance of the Parisian manuscript version as follows:

SOURCES



Between the "sources" on the one hand and the adaptations by Juda and the copyists on the other hand lies a century or two. It is clear, then, with what care one has to proceed and what painstaking and laborious work is demanded in order to reach a conclusion on the origins of this Hebrew treatise. The result of my study of the problem will be discussed in two parts: (A) A summary of the many separate data; (B) the historical argumentation based on these separate data.

A. A SUMMARY OF THE DATA ON THE HISTORY AND ORIGIN
OF THE TREATISE

Before beginning his treatise, Juda ben Isaac says that the *Ars Musica* is divided into *cinq portes* (chapters). He accordingly follows with a division into five chapters (“*portes*”) and adds (pp. 38–47) a *Porte sur la préparation des instruments de musique*. If we take a further look at the headings and *explicit*s of the five chapters, it should become obvious that one of the copyists has interfered with the order of the contents of Chapters IV and V.

Compare:

I. Porte première	I. No explicit
II. Porte seconde	II. No explicit
III. Porte troisième	III. No explicit
IV. Porte quatrième	IV. Fin de la quatrième porte. “Et à partir d’ici nous avons noté... Et moi, le scribe, je les ai omises car...”
V. No incipit	V. Fin de la cinquième porte
VI. Porte sur la préparation des instruments de musique	VI. Fin de la sixième porte

Regarding those *incipits* and *explicit*s, our attention is drawn in the first place to the fact that Chapter V does not have an *incipit*; this cannot have been the intention of the author. Then: Chapters I, II and III have no *explicit*, as against Chapters IV, V and VI. Besides, the authenticity of IV is open to suspicion: the Parisian manuscript first states that Chapter IV is finished, but then immediately continues with the beginning of a sequel: “et à partir d’ici nous avons noté...” It is of secondary importance that the copyist adds to this passage “Et moi, le scribe, je les ai omises...”; the main point is the contradiction between the announcement of the “Fin de la quatrième porte” and the immediate continuation — “Et à partir d’ici...” The section thus deals with (i) the mnemotechnical formulas for eight church modes (“des formes pouvant servir à l’apprentissage et à l’exercice dans les huit modes”); (ii) (most probably) the so-called *formulae tonorum*, i.e. the school examples for applying the theory of the modes in the practice of ecclesiastical chant (“et dans leurs [les huit modes] formes à entonner leur mélodie”); all this with music examples — unfortunately omitted by the copyist. Knowing that the discussion of the theory of the modes is the standard closing subject in

treatises on *musica plana* and that consequently the beginning of this discourse should be located at the end of Chapter V (V, 6–11)¹, there is reason to see the authentic order of Chapter IV and V as follows:

1. IV, 1–9.

“Porte quatrième... et de deux demi-tons”. No *explicit*.

2. V, 1–11.

“Porte cinquième... voici huit modes sur ces quatre clefs”. No *explicit*.

3. IV, 11.

Continuation of “Porte cinquième”, containing the (not transmitted) music examples for the theory of the modes.

As a sixth chapter then followed a *Porte sur la préparation...*, being an added chapter to the *Musica plana* (in the strict sense). The *Fin de la sixième porte* may have been added by the copyist who modified the incipits and *explicit*s of Chapters IV and V.

We should consider carefully the authentic order of the text in Juda ben Isaac’s treatise, because its arrangement will be a starting point for an inquiry into the Latin sources at his disposal. This also includes the determination of what the adapter — and here we are thinking in the first place of Juda ben Isaac — omitted from his Latin *Vorlage*. This can be done by first locating these passages in which Juda ben Isaac becomes incomprehensible to a layman, and then comparing them with the traditional theory, which reproduces the contents of such passages in a properly intelligible way.

This inquiry has led us to the following conclusions:

Chapter I is to be considered complete, with the exception perhaps of I, 12–13. The passage I, 12–13 is a traditional (but shortened) presentation of the practical application of the Guidonian Hand. To the question why Juda ben Isaac (or the copyist) shortened this passage, I have no answer. One can put it thus: Chapter I is almost complete. The passage I, 14–15 belongs to the summary table of the intervals (Adler, p. 21).

Chapter II is incomplete, particularly II, 1–6. Here the gist of the theory of the *Proprietates* and *Deductiones* is given, but this theory is curtailed to such an extent that it is not, or not sufficiently, intelligible to a layman.

Chapter III is complete.

Chapter IV is incomplete (VI, 1–9). In the tradition the “species” of the

¹ In the following, the page numbers in Arabic numerals refer to the article by I. Adler (*Yuval*, Jerusalem 1968, pp. 1–47); the combinations of Roman and Arabic numerals refer to the V(VI) *Portes* of Juda’s treatise as published by Adler in this article, and the editorial subdivisions there.

intervals are accompanied by music examples, which are lacking here. The illogical explanation in IV, 7–8 of the difference between the *consonantiae simplices* and *compositae* can be traced back to the Latin sources. Chapter V seen as V, 2–12 (without IV, 11, which was not transmitted to us), is not clear at the beginning (V, 2–5) and is probably abbreviated. Chapter VI which is, as we have said, an addition to the *Musica plana* (in the strict sense) is to be considered complete, perhaps with the exception of VI, 20 (see below).

The question is how far Juda ben Isaac or his copyists are the source of these omissions. For IV, 11, which, as we see it, is meant to stand after V, 11 (introduced with: “Voici huit modes sur ces quatre clefs”) the copyist admits his omission explicitly. Regardless of who may have been responsible for the other omissions, we have no choice but to proceed from the text as it has reached us. With this text before us, knowing where the gaps are, we now put the question: What were the Latin sources of Juda ben Isaac, what is their date, and where were they written?

This problem is always a difficult one when, as in this case, no direct source can be indicated, and especially in this case where no music example has reached us. Especially the music examples announced for the *formulae tonorum* (IV, 11) might have furnished a clear indication of provenance. The Parisian version, which in addition to all its faults also shows a number of scribal errors, renders our task far from easy.

One issue must be raised immediately: as regards the provenance, we should consider the last chapter (VI) separately from the preceding ones (I–V). We shall therefore restrict ourselves at present to the *Musica plana* in the strict sense, as treated in I–V.

I. Chapters I–V of the Treatise by Juda ben Isaac

The first question is whether there are indications in these chapters which force us to assume the existence of more than one Latin source. To support such an assumption one may, in my opinion, point to the fact that (1) certain parts differ in style, (2) the terminology is not throughout of the same idiom, and (3), the contents of some passages are repeated in different chapters, sometimes with a different terminology.

It is remarkable that in Chapters II, IV and V (and these are precisely the “incomplete chapters”) the dialogue question-and-answer style is used (II, 1 and 7; IV, 1 and 5) and that here the reader’s attention is attracted in a special manner — “Et sache que...” (compare: “Et sciendum...”, “Et nota...”); thus in II, 6, IV, 2 and V, 2². Even so we must be cautious in concluding

² To the “deviating style” also belongs the gloss in III, 4–6: “Rappelle-toi...”.

from this peculiarity that Chapters II, IV and V had a different Latin source than Chapters I and III. However, such a conclusion is not necessarily inevitable, since similar changes of style not infrequently appear in mediaeval treatises for didactic considerations. They also appear in re-workings of a standard subject matter; and we, for our part, see in Juda ben Isaac not exclusively a translator but an adapter.

Thus, when the definition of a concept appears in a source, for instance that of the *mutatio vocum*, an adapter will prefer for didactic reasons to introduce this definition with: "Quid est mutatio vocum?" (compare II, 7: "Et qu'est-ce que la mutation...?"). I see in these passages "in a variant style" the touch of the Hebrew adapter: in most cases, Juda ben Isaac himself.

More difficult is the evaluation of the changes of terminology. These appear in the terms for the tone letters — *claves*, *litterae*, *puncta* (the last as tone signs or notes) and those for the *solmization-mutation-syllables* = "voces", *notae*. Juda ben Isaac uses *lettre* in I, 4; II, 6; (VI, 30); *Lettres clefs* in III, 4; *Point(s)* in V, 1–4; *clefs* in V, 6–7 (VI, 25). For the solmization syllables he also uses *neginôt* in I, 14–15 and VI, 2, 13 (translated by Adler as *notes*, see also I, 2 and his annotation to the passage *Préface*, 9, p. 17); *qôl (ôl)* in II, 7–8, *passim* (translated: *note[s]*, and in II, 1 (translated: *voces*). What can be deduced from this?

The question can only be answered after placing the terms in their context and comparing this context with the construction of the chapter and of the chapters in their relation to one another.

But through this we reach the third point: the contents of some of the passages reappear in different chapters, sometimes with a different nomenclature. A typical example of this is the subject of the placing of the tones between the lines (or *spatia*) or on the lines (*lineae*). This theory is incidentally mentioned in I, 14–15 with *notes (neginôt)*; it recurs in II, 6 with *lettre*, and, in the gloss III, 4–7, with *lettres-clefs*, *la notation du point*, *les points* and *les voces (qôlôl)*.

After an intensive study and comparison of these texts in their context I have come to the following conclusion: The principal reason for the inconsequent use of more than one term for tone-letter or for solmization-syllable, as well as for the reappearance of one and the same subject is: (i) in the one case literal copying (translation), in the other case the adaptation and abbreviation of the fundamental Latin text; (ii) the subject matter itself, which induces the change of terms. In Chapter I the line is taken that *lettre* stands for tone-letter and *neginôt (notes)* for solmization-syllables. Chapter II keeps to *lettre* and uses *qôl (note)* for the solmization-syllable; see the Introduction where the adapter asks, concerning the syllables: "Combien de (genres de) voces y-a-t-il dans la main?". However, this (II, 1–5) is an abbreviated rendition

of a subject which in the Latin source may have been introduced by a disquisition (as in similar treatises) on the "voices *vel* notae". Chapter III is consistent with its use of *qôl(ôt)* (*notae*), and (III, 4) the *lettres-clefs*. In Chapter IV the equivalents for tone-letters and solmization-syllables do not appear. In Chapter V another matter is dealt with, namely the square notation in the *Cantus planus*, from which the text passes to a reference (V, 5) to the *discantus* in two voices. In any case this part (V, 2-5) is one of the adapted passages, but then it was most probably adapted from a statement or a discussion of the subject in the Latin *Vorlage*. Precisely here the problem of the determination of the authentic sequence of the parts IV, 11-V, 2-5-V, 6-11 arises; we shall return to this point.

The inference is that nothing compels us to suppose that Juda ben Isaac had more than one main Latin source at his disposal for Chapters I-V. This does not negate the assumption that this main Latin source was itself a compilation from several older and more recent sources; neither does it negate the assumption that Juda adapted that Latin source in his own way, as the copyist(s) also did in their own fashion.

But here too: even if we have to search for this Latin source in France, and then (on account of *déchant*) in the first place in the cultural centre, Paris, the possibility has still to be taken into account that Juda ben Isaac could have found his *Vorlage* somewhere outside Paris.

Are there other authors who adapted the same source?

While proposing this question, we must state, before everything, that the source has not come down to us in its authentic version. This statement is based not only on the conspectus of the published material, but also on that of a considerable number of manuscript treatises not yet published.

There is ONE treatise which can be directly associated with this source, as a personal adaptation: the treatise on *musica plana* of the *Introductio Musicae* (CS I, 157-175) by Johannes de Garlandia. This is proved by the integration of the following facts:

(a) Juda ben Isaac divides his treatise into five "Portes" (= medieval Hebrew equivalent for "chapters").

The title given by Johannes de Garlandia to his *Musica Plana* was not *Introductio Musicae*; neither were his own the words which follow the title in Coussemaker's edition: "Incipit introductio musicae planae et etiam musicae mensurabilis secundum Magistrum de Ga(r)landia, musicae sapientissimum" (CS I, 157). These are the words of the copyists. The treatise begins with the words: "Introductiones in arte musicae. Primo videndum est...; Secundo..." Thus he says that his treatise begins with seven *Introductiones*. This gives rise to a supposition (no more) that these *Introductiones in arte musicae* are con-

nected with Juda ben Isaac's remark at the beginning of his treatise that the *ars musica* (*pereq hašir*) "se divide en cinq portes".

(b) If one assumes that Juda ben Isaac as well as Johannes de Garlandia, each in his own fashion, adapted the Latin source, then one is struck by the extent to which the order as well as much of the contents are identical in both adaptations. With Juda ben Isaac the emphasis is evidently on the writing of a school *Introductio* for boys, whereas Johannes de Garlandia addresses himself to teachers or university students. Hence the special emphasis on the Guidonian Hand and its application by Juda ben Isaac (I), whereas Johannes de Garlandia takes this knowledge for granted, and only mentions it in passing ("et sic de aliis... per totam sinistram manum", CS I, 159a–160a). However, when the subject is the thorough application of the solmization-mutation theory to the Guidonian Hand, with the enumeration of whether any or none and how many mutations are possible on all the notes from low to high (at that time a new development of ecclesiastical musical theory), then both chapters are as like as two twins (Juda Chapter III, Johannes de Garlandia "Sequitur de mutationibus de quibus dictum est", CS I, 160–162). Then, too, the abridged theory in Juda's Chapter II can be recovered fully in Johannes de Garlandia, CS I, 158–159.

(c) In the course of Juda's treatise close parallelisms with Johannes de Garlandia may be traced, even, in many instances, for those parts in Juda's work which are not common in traditional theory. A summary of the structure of both treatises follows:

JOHANNES DE GARLANDIA

JUDA BEN ISAAC

1. a. Introduction to the concept
Musica ars (CS I, 157–158a)³
- b. Division of tone-letters according to *graves*, *acutae* and *superacutae* (CS I, 158a)
- c. (Guidonian Hand missing)

1. a. I, 2–3
- b. I, 4–10³
- c. I, 11 with I, 14–15 Guidonian Hand; I, 12–13

³ A striking particularity is that here Juda indicates d' as the highest tone, while Johannes de Garlandia is, historically, the first to call e' the highest tone. The relevant passage is missing in the edition of CS I, 158a; it is to be supplemented with the text published by Robert Stevenson in *Notes* XXIV (1967), p. 16. The independent thinker Johannes de Garlandia thereby adapted the ambitus to his time; Juda ben Isaac, on the other hand, who dealt with this subject about a century later, adheres here as in many other points to his *Vorlage* (see also Adler's Introduction, pp. 10–11 and note 57).

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|---|---|
| 2. "Quot sunt proprietates cantus et quot deductiones?" (CS I, 158b-160a) ⁴ | 2. II, 1-6 (incomplete) <i>Inc.</i> : "Combien de (genres de) <i>voces</i> y-a-t-il dans la main?... Et ces trois genres se divisent en sept suites" = (<i>deductiones</i>) |
| 3. "De mutationibus"... "Mutatio diffinitum sic: Mutatio est..."(CS I, 160a) ⁵ | 3. II, 7-8. "Et qu'est-ce que la mutation...?" |
| 4. Summary of the mutationes (CS I, 160b-162b) | 4. III, 1-3; 8-24. The gloss (III, 4-7) ought to be put between III, 2 and 3 |
| 5. Theory of the <i>species cantus</i> , namely of the 13 intervals (CS I, 163a-166b; <i>explicit</i> "Expliciunt omnes species necessariae cantus et utiles omnibus musicis introducendis") ⁶ | 5. IV, 1-9. Incomplete treatment of the 7 intervals ("Et sache que la science de la musique [comporte] sept espèces d'intervalles avec lesquels on compose tout le chant") |
| 6. Remarks regarding <i>falsa musica</i> and <i>pausationes</i> ⁷ | 6. (missing) |
| 7. "De quatuor litteris finalibus" (CS I, 167b-168a) ⁷ | 7. V, 6-11 |
| 8. Square notation with mensural meaning (CS I, 186b) | 8. V, 2-5 (incomplete) |

⁴ Since we are still waiting for a critical edition of Garlandia's two treatises, we cannot be certain whether he interrupted his treatise with titles, such as those which appear irregularly in Coussemaker's edition. For the sake of convenience I have here chosen the question form.

⁵ The version CS I 161a: "Mutatio est divisio", should be: "Mutatio est dimissio".

⁶ Here, as in the case of the ambitus, the difference between Johannes and Juda is striking. The Hebrew text of IV, 1-9 has come down to us in a mutilated state. The Latin *Vorlage* with its faulty explanations of the ditonus as *consonantia simplex* (IV, 7-8), the discussion of the semiditonus after the ditonus, the concept of *septem consonantiae* etc., can be recognized to a large extent in the *Liber Argumentorum* and the *Liber specierum* (ed. J. Smits v. Waesberghe, Amsterdam 1957), pp. 20, 24, 34-35. For our part we assume that this subject matter was taken over somehow into the Latin treatise which served as a *Vorlage* to Johannes and to Juda, and supplemented with other data such as the "son mugissant". In our opinion it is impossible that Juda could have taken over this theory directly from Guido of Longpont (= Guido of Eu) (see CS II, 153a; cf. Adler, p. 10, note 56 and p. 30, note 2). The *Liber Argumentorum* and the *Liber specierum* were written at the end of the eleventh century, most probably in Italy.

⁷ This passage, incompletely cited in Coussemaker, is also supplemented by Robert Stevenson *loc. cit.* In this passage Johannes uses the term *cantus sine littera*.

9. Mnemotechnical formulae of the eight ecclesiastical modes, followed by an applied theory of the modes with music examples, the *formulae tonorum* (CSI, 169a-175)
9. IV, 11, 12: "Nous avons noté des formes pouvant servir à l'apprentissage et à l'exercice dans les huit modes et dans leurs formes et à entonner leur mélodie. Et moi, le scribe, je les ai omises..."

In the above paragraphs 1-5 (8) the sequence in Johannes de Garlandia is wholly identical with that of Juda ben Isaac. From § 7 on there is a change. But the question remains: What was the authentic sequence in Juda's treatise? If we give to IV, 11 (12) the symbol *a*; to V, 2-5 that of *b* and to V, 6-11 that of *c*, then the Hebrew treatise has the sequence *a-b-c*. We have, however, observed that IV, 11 (= *a*) has to be placed after V, 6-11 (= *c*) according to its contents and according to the tradition of the treatises. According to the same tradition V, 2-5 (= *b*) follows after V, 6-11 (= *a*); thus also with Johannes de Garlandia and with his commentators (e.g. Marchettus de Padua, *Lucidarium musicae Practicae*, tract. X). It thus becomes quite possible that in the authentic version the sequence was: *c-b-a*; in this, the sequence of Juda's treatise would be wholly parallel to that of Johannes de Garlandia. In this sense we may supplement what we said earlier (see p. 132) about the contents of Chapter V.

It is clear that we may base our inquiry on one of the following three possibilities: (a) The contents of parts of the subject-matter could be the same in both Johannes de Garlandia and Juda; or (b) They are not alike, and Johannes de Garlandia offers subject matter which cannot be found in Juda; or (c) Juda offers subject matter which is lacking in Johannes.

(a) If we follow the first assumption, that the contents of subject matter are the same in both, then there are two possibilities. The subject matter may have no special features of its own, in other words be common and traditional. On the other hand, it may possess such special features, which appear infrequently; if so, these furnish an *indicium* for a possible identical source for both, and are important to our research. Examples of such uncommon passages, found in both treatises, are:

— Juda I, 3 = Johannes CS I, 157b: etymological derivation of *musica* from *moys* and *ycos* = *scientia* (for the same derivation in other treatises see below, B, Section 1).

— Juda I, 8-10 = Johannes CS I, 158a: about the three voice-registers (see below, B, Section 2).

— Juda III, 4-7 contains a gloss on musical notation (the four lines and *clef*-letters); this gloss did not necessarily have to be located between III, 3 and 8, but could have stood between III, 2 and 3 (if it belongs to Chapter III

at all; it could also have been destined as an introduction to Chapter III, and thus could have come between II and III). Johannes also (CS I, 159b, *infra*) speaks about notation (he calls the *clefs* "signa") "quia in canto plano vel ecclesiastico tantum *quatuor* lineas protrahimus, quia..." He then adds the "modern" view of a system of five lines for polyphonic music. Only after that follows the subject matter which Juda gives in II, 7-9, III, 1 etc.

— Juda V, 2-4 again deals with notation, but this time with the mensural significance of the square notation in *ecclesiastical music*, going on to remark that the mensural significance also appears in polyphony (V, 5). Johannes de Garlandia is more explicit here (CS I, 168b).

— Above we have pointed out that the division by Johannes de Garlandia into *Introductiones in arte musica* may be connected with the *Portes* of Juda.

(b) The second supposition considers the subject matter which is found in Johannes de Garlandia and not in Juda. Here there are two possibilities: either one of them took over something from the common source, which the other ignored (or treated in a completely different manner), or one of them went his own way. This second possibility may mean either that he drew from a different source or that he revealed his personal views. Here the personal characteristics of an author like Johannes de Garlandia must first be taken into consideration. Thus one can immediately recognize the grammarian and rhetorician Johannes in his favourite pursuit of explaining all terms etymologically as well as grammatically, as for instance the words *introductio* (CS I, 157a), *ars* (CS I, 157b), *vox* (CS I, 158a)⁸, *deductio* (CS I, 160a), *mutatio* (CS I, 160a), etc.; it is not by chance that we owe him the word *dictionary*! When the combination of etymological and grammatical word derivations appears in Johannes and not in Juda we may conclude that they are his own additions. Evidently we have to deal with adaptations of the same *Vorlage* by two persons.⁹

A striking passage which does not appear in Juda but which can be found in Johannes de Garlandia is the one dealing with *musica falsa* and the *pausae*¹⁰ (CS I, 166b-167a). I believe that a passage such as this, for the very reason that it appears in Johannes, typifies the difference between the two.

Let us suppose that a close relationship between the Latin *Vorlage* of Juda ben Isaac and the treatise *De musica plana* by Johannes de Garlandia is un-

⁸ See the completion of the text missing in Coussemaker (CS I, 158a), by Robert Stevenson in *Notes XXIV* (1967); p. 16.

⁹ Unless we suppose that the common *Vorlage* is a treatise written by Johannes in his youth.

¹⁰ See the completion of the text missing in Coussemaker (CS I, 166b-167a), by Robert Stevenson in *Notes XXIV* (1967), p. 16.

mistakable; and that the relation derives from the fact that both followed the same Latin *Vorlage* and “adapted” this Latin *Vorlage*-text each in his own way. One can point to a constant trend in both their manners of adaptation. Johannes de Garlandia’s treatise is shaped by his own personality: grammatical interest, clearness, adaptation to the development of the discipline in his time, and orientation of the discourse for the use of students. This agrees with the picture of Johannes de Garlandia as we know it from his other writings in prose and poetry. Juda ben Isaac’s work is basically “translating and adapting”, which means adhering as closely as possible to the Latin source and occasionally abridging: rewriting here and there but only occasionally adjusting in accordance with the development of the theory, as he read (or perhaps heard) about it. The theory of his Latin source is totally obsolete as a musical-theoretical object of study in this period (the fourteenth century), and probably he was not conscious of its shortcomings. Hence the ambitus to d’ (in Johannes e’), hence the 7 intervals (in Johannes 13), the enumeration of 19 litterae (among which the b-rotundum is not counted; in Johannes 22 tones), etc.

(c) Our third case of comparison: passages which do not appear in Johannes and do appear in Juda. A clear example is IV, 7–9. Here Juda proposes a faulty and illogical theory on the *consonantiae simplices* and *compositae*, in which he mentions the *ditonus* as *simplex* and as a third interval, side by side with the *semi-ditonus* as *composita* and as fourth interval. Such an opinion cannot be expected in Johannes de Garlandia: Adler observes rightly that the passage appears correctly in Guido of Longpont (= Guido of Eu) in CS II, 153a. We have already drawn attention to the fact that Juda’s faulty version can be found in an Italian treatise of the end of the eleventh century, although not literally. I suggest that it was transferred from there into Juda’s Latin *Vorlage*. But whatever hypotheses we prefer, let us not overlook the main point: the difference between the clear, expert and where necessary, original, Johannes de Garlandia and the inexpert — and consequently not always clear — adapter Juda ben Isaac.

Let us see how we can complete this picture of Juda by considering his last chapter “Porte sur la préparation des instruments de musique” more closely.

II. Chapter VI of Juda’s Treatise

With the mensuration methods of Chapter VI (*Porte sur la préparation des instruments de musique*) we leave musical theory, as far as it is connected with the *Musica Plana* of Johannes de Garlandia. Where should we look for the Latin source used by Juda ben Isaac in his “translation” of VI?

In the first place Juda propounds (VI, 1–19) two “Guidonian” monochord

mensurations. For comparison we take the versions of the monochord mensuration in general (see *De Musico-pedagogico... Guidone Aretino*, Florence 1953, pp. 156–184; one can find 71 versions in more than a hundred manuscripts) and in particular those by Guido (see *Guidonis Aretini Micrologus*, Rome, 1955 pp. 96–102, after 60 manuscripts) to which may be added Juda's first monochord mensuration (VI, 5–12) as far as these also appear in Guido's letter to Michael and in his *Regulae rhythmicae*. From this I draw the following conclusions: (1) A Latin source which reproduces both of those mensurations *completely* in accordance with the text by Juda ben Isaac has not been found; (2) "Somebody" made additions to one of the known Latin texts before it was "translated" by Juda. Among those additions (see, for this, Part B of this study) the principal one is the insertion of the mutation-syllables. The mensurations by themselves may be retraced to about 1025 (i.e. the first, by Guido himself) or to the end of the tenth century (i.e. the second, the so-called Oddonic). The addition of the mutation-syllables, however, is highly unusual and it took place only in the thirteenth, possibly the fourteenth century. I deduce the latter after having studied numerous monochord measurements which are transmitted in manuscripts. I cannot provide further particulars on how and where this "someone" made the additions.

We shall now consider the following words by Juda which are remarkable for their contents as well as for containing useful transliterations from the Hebrew (VI, 20): "Et toutes ces mesures sont également appliquées aux [claves instrumenti dicti *lira* a fine usque ad finem octavi]", "la roue tournante" [*rota volubilis?*], "et aussi selon les mêmes mesures le PSaLteYR' et la HYYRP' (see Adler, p. 41).¹¹

I call the text remarkable since it gives information which is as vague as it is important. The beginning is vague. After the monochord measures it says: "Et toutes ces mesures sont également appliquées aux..." By this is not meant what one would expect, namely that the construction of the previously given monochord measures applies also to the instruments mentioned afterwards, but that these instruments are built according to the same Pythagorean proportions: 1:2, 2:3, 3:4 and 8:9. This is because the text deals with a certain kind of instrument, namely chordophones with fixed tuning. This means that the instruments have to be built (respectively pretuned) so that the string does

¹¹ Adler (*loc. cit.*) talks about a "passage obscur" in the discussion of the *organistrum* or *lira*. For my part I see nothing unclear here. That the hurdy-gurdy has 7 or 8 claves from one "end" (i.e. the beginning of the sounding string) to the other "end" (i.e. the bridge — *sustentaculum*, *stefanum* etc.) and that it appears as *lira*, further clarified by the author as *roue tournante*, are facts which can be found in dozens of the preserved *mensurae organistri* and in the *organica dispositio*.

not have to be shortened by the finger, as on a *viella* or *rebec*, but has its fixed pitch.

These chordophones with fixed tuning are: the hurdy-gurdy, psalterium (*cythara*) and harp. To these we may add, as mediaeval idiophones and aerophones with fixed tuning, the cymbala, organ, flute, shawm and panpipe; their mediaeval *mensurae* are limited to those of the *cymbala organica* and *fistulae organicae*. Aribo of Freising (ca. 1070) is the first to give a mensural theory for the chordophones with fixed tuning, the so-called *organica dispositio*.¹² Aribo himself used the proportions 2:3 and 3:4 exclusively; others also apply 9:8 to these instruments, and, exceptionally, 1:2. And with this last we have the key to the author's intention.

After studying the hurdy-gurdy mensurations and the mensurations according to the *organica dispositio* (a publication is in preparation) I must state that nowhere did I find this text ("Et toutes ces mesures...") complete. Yet it must have been written by "someone" who was to some extent knowledgeable and who either thought it unnecessary to go further into the question or was not sufficiently expert. It recalls that unknown "somebody", who must have made additions to the monochord measurements. The information which he gives here (VI, 20) is useful, for it betrays his nationality. Not only is this *organica dispositio* — according to the manuscript tradition — a South-German affair with a slight connection with Lorraine; the word *lira* that he uses also points to this. Until early in the thirteenth century the hurdy-gurdy is called *organistrum* (eleventh–thirteenth century) or *symphonia* (since the thirteenth century). As regards the other string instruments, one could until then make do with *cythara* as a common name for plucked instruments (specified in *psalterium*, *harfa*, *lautus*), as well as with *lyra* for the string instruments (specified in *viella* etc.). The hurdy-gurdy belongs to the stringed instruments by virtue of its construction, of the touching of the string by means of a wheel, and of its sound. With the development of the vernacular in the French speaking areas the formation of the word for hurdy-gurdy began from *viella* (compare *vielle à roue*); the Germans stuck to the conception *lyra* (*Leier*). That is why Ms. London B.M., Add. 339 fol. 100v. (twelfth century, from the Cistercian Abbey of Kast near Regensburg) calls the hurdy-gurdy *lyra organica*, i.e. *lyra* with *organica dispositio*. As to "*le psaltérion et la harpe*": these words are neither foreign to Middle German nor, we may add, to Middle Dutch (with *Lier*, *draailier*, *psaltérie*, *harp*) under the influence of German. However, we can totally exclude the Netherlands here, because of the lack of tradition in the *ars musica*.

This passage (VI, 20) therefore points to South Germany. Unfortunately

¹² See Aribonis *De musica*, pp. 44–45.

this unknown German did not find it necessary to give more than this limited piece of information. Therefore we cannot know whether he had more than a superficial knowledge of the subject.

The two organ mensurae are a different matter. H. Avenary and I. Adler have already observed, as have others, that the mensurae as such date from the eleventh-twelfth century, but the additions concerning the mixturae (VI, 25–28) to the fourteenth–fifteenth century. I shall go into further details in Part B of this study. In passing I would only like to observe that the manuscript tradition of the organ-pipe mensurae in general is so extremely diverse that no particular area can be indicated for the origin of Juda's text. The only important aspect for us is that both as regards the mensurae themselves, as well as the word *MWRGL'* (VI, 21), we are led from the first to think of Germany.

Lastly, the cymbala-mensurae of Juda (VI, 29–41). The manner of measuring corresponds with the text of mensura XIII and XIV quoted in my *Cymbala* (Rome 1951), pp. 49–52, as well as that of mensura XIX (*ibid.*, pp. 54–55). The origin of the manuscripts with these measurements is of interest in this connection. Mensura XIII occurs — apart from the Theophilus tradition — exclusively in South-German manuscripts. From Germany come also the manuscripts of mensura XIV (add to those in *Cymbala*: Munich, Universitätsbibliothek, 8° 375, p. 64; Erlangen, Universitätsbibliothek, Ms. 554, fol. 204 r.v.; Kassel, Landesbibliothek, 4° Ms. Math. 1). With mensura XIX the textual correspondence is weaker. As far as the origin of XIX is concerned (add Bruges, Stadbib. 528, which also contains Johannes de Garlandia, *CS* I, 175–181) no definite area can be indicated; but Germany is not excluded. Since, as stated, the version by Juda conforms most closely to mensurae XIII and XIV, the origin of his source must primarily be thought of as Germany.

At the end of his treatise (VI, 41) there occurs a passage which gives us food for thought. The mis-tuned bells can be adjusted “avec une lime, que l'on appelle *WWYWL'*, ou avec une pierre meulière”. This is a translation of the latin source (*cum*) *lima* vel (*aut*) *lapide*, a formulation which we can trace back to several cymbala-mensurae. As far as the Hebrew “translation” by Juda may be transposed back into Latin, this would run: *cum lima, quod dicitur WWYWL', vel cum lapide molinari*. In no *mensurae cymbalorum* does any vernacular term appear; neither is this to be expected, since the German mensurae — as far as they are not more recent copies — date from the eleventh and twelfth century. It is not likely that the *quod dicitur WWYWL'* is by Juda himself, and it is improbable that he should have found it in his Latin source; speaking as a mediaevalist and musicologist I consider it out of the question. The addition *molinari* (“avec une pierre meulière”) seems to me suspect and not authentic. I thus come to the following conclusion: “somebody” helped Juda ben Isaac and that “somebody” was a German. This “somebody” may have been the

same who gave him the information on the *organica dispositio* (VI, 20). Was he also the same who made the additions to the monochord measurements? Mutation-syllables appear nowhere in the records of the cymbala-mensurae, and are thus an exceptional addition here; similarly the mutation-syllables in the monochord-measurements are an exceptional addition, and both additions could be due to the same cause.

For my part I come to this conclusion. Wherever Juda may have "translated" his treatise, for Chapter VI at least he was guided by a more or less expert German whose remarks he valued and took over directly. This contact must have taken place in the fourteenth century at the earliest, if one considers the vernacular terms and especially the theory of the mixtures. Can anything further be said about this informant, whom we have to seek — as the manuscript tradition indicates — in South-Germany? And where do the mensurae in VI, as such, come from? To this last question we can only answer: considering the interest evinced in VI for a quite complex combination of mensurae-theories (monochord, *organica dispositio*, the two organ-pipe mensurae and the cymbala mensurae) an abbey comes immediately to mind. The mensurae were studied and copied especially in abbeys; *collections* of mensurae copied from various sources — the subject of VI — are found only in abbeys. An example is the collection, dating from about 1100, from the monastery of St. Afra at Augsburg (Wolfenbüttel, Gud. Lat. 8° 334, foll. 90v.–112r.) from which a set of mensurae was copied in the thirteenth century (3 organ-pipe mensurae and 2 cymbala-mensurae, the *organica dispositio*) in the Cistercian abbey of Baumgartenberg (near Per in Austria), a daughter foundation of Heiligenkreuz which was itself founded in 1187 directly from Cîteaux. I note this because the inscriptions of the mutation-syllables adjacent to the Guidonian Hand (Adler, p. 21, with I, 14–15) correspond only to those of the same Manuscript (Vienna (Cpv), Oesterreichische Staatsbibl. 787, fol. 46v.).

Let us now return to Juda I–V. What can be said about the origin of this part, the real *Treatise of five chapters*? Adler, following in the footsteps of others, shows us the way to a certain extent. The treatise must have been "translated" by Juda ben Isaac in Southern France, in the fourteenth century. We immediately make a connexion here with our hypotheses regarding a treatise which may have been Juda's Latin *Vorlage* and on which the *Musica Plana* by Johannes de Garlandia was also directly dependent.

This text may have been either — and this seems unlikely — an earlier version of Garlandia's *Musica Plana* (later, i.e. about 1250, revised in the form known to us), or of a distinct source which became a basis for Garlandia's *Musica Plana*.

On historical evidence Johannes de Garlandia can be connected with Southern France, and especially with Toulouse. Toulouse received its university thanks

to a very generous donation by Count Raymond de Toulouse on its foundation in 1229. The foundation was established on a lavish scale. Salaries were provided for the duration of ten years for fourteen professors, no less than six of whom were to teach the *artes quadrivii*, apparently with special emphasis on the *ars musica*, about which it was said: "Hic [i.e. at the University of Toulouse] organistae populares aures melliti gutturis organo demulcent". To ensure the high level of the professors, and a proper number of students, an enlistment campaign was undertaken at the University of Paris: "plurimi magistri de Parisius et scolares, ut studium generale ibi [Toulouse] fieret, et fides edoceretur ibidem et omnes scientiae liberales". Competition with Paris was even proclaimed publicly. In a paragraph about the *ars astronomia* at Toulouse it is said that this subject, forbidden in Paris, may indeed be taught at Toulouse: "libros naturales, qui fuerant Parisius prohibiti, poterunt illic [Toulouse] audiri, qui volunt naturae sinum medullitus perscrutari".¹³ Among the professors "drained" from Paris was Johannes de Garlandia (in 1229). Not much is known about his stay at Toulouse, except for some lines of poetry: it lasted only for three years, because then the salaries were not paid any more, and Johannes returned to Paris.

We can now come to some conclusions in this inquiry into the origin of Juda's treatise. Going by the historical data given by Adler regarding the time and place of Juda's "translation", the fourteenth century and Southern France, and considering the unmistakable connexion between Juda's treatise (I-V) and the *Musica Plana* by Johannes de Garlandia, taken together with the presence of Johannes at the University of Toulouse during the years 1229-1232, it seems to me that the following hypothesis is well founded: that the Latin *Vorlage* re-worked both by Johannes and by Juda is to be looked for in the sphere of influence of the University of Toulouse, which in the fourteenth century was the second in importance in France.

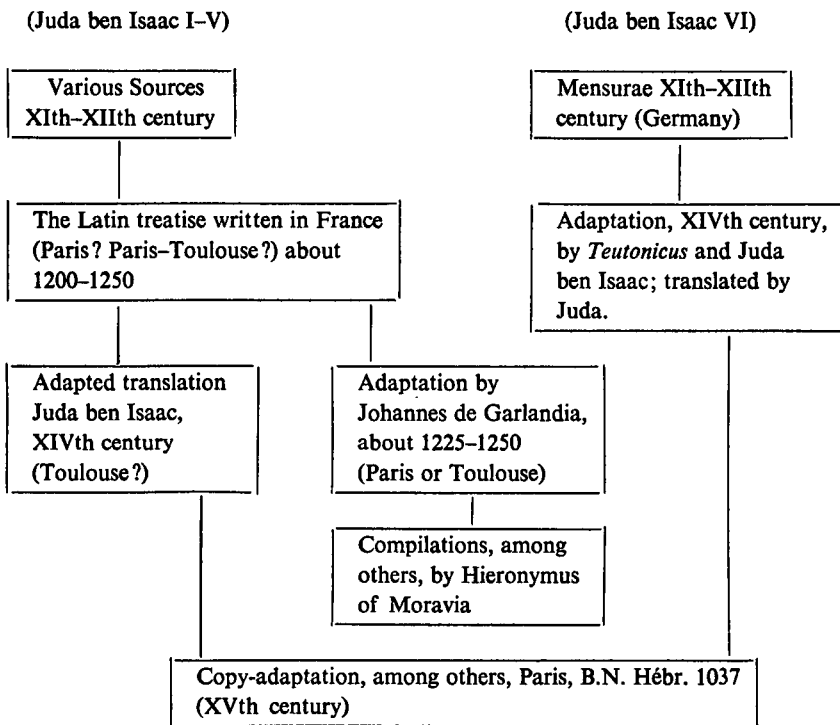
As to Chapter VI, this is a set of mensurae which originated in Germany, and most probably in a South-German monastery, in the eleventh-twelfth century; it was available in Southern France in the fourteenth century, and, I assume, within the sphere of influence of the university of Toulouse. Most probably on Juda's request, a *teutonicus* (probably the possessor of the set of mensurae) reworked this set of mensurae together with the mutation-syllables, with some additions to the mensurae and an occasional commentary (such as can be found at the end of the cymbala-measurement). Possibly he also influenced I-V.¹⁴

¹³ This was changed shortly after 1300 at the Sorbonne, namely by Johannes de Muris who taught the *Cursus planetarum* (1318) there and wrote several treatises in this field.

¹⁴ Especially Ch. I, since I have been able to locate the chart with all the tone letters and mutation syllables (in Adler, p. 21) exclusively in the Vienna Manuscript (Österreichische

In any case, the presence of German mensurae in Southern France is not as exceptional as it may seem at first glance. There is a similarly unexpected German organistrum-mensura, which appears in Berno's modal theory (cf. Juda V, 6-11) in the treatise by Amerus, written most probably at Genoa in 1271 (Bamberg, Staatsbibl. Lit. 115, fol. 77v.).

Here, then, this musical and historical study has come to an end; at this point, at the same time, a new direction of research presents itself to my colleagues working on Jewish cultural history in Western Europe in the Middle Ages. They may provide us with information about a free Jewish community in Toulouse around 1300; they may most probably also enlighten us about contacts between this community and German intellectuals. Perhaps, if this study turns out to be positive, new facts will arise about a Hebrew culture within the sphere of influence of the University of Toulouse. For musicologists there may have accrued some insight into the teaching of the *ars musica* at the University of Toulouse and especially in connexion with Johannes de Garlandia. Meanwhile I present my interim results schematically as follows:



Nationalbibl. Ms. 787, fol. 46v, from the Cistercian Abbey of Baumgartenberg in Austria). I already pointed out that in the same manuscript there also appears a set of mensurae, although not the same as Juda's. It may perhaps be useful to remember that there was a Cistercian Abbey — Granselve — near Toulouse.

B. THE HISTORICAL ARGUMENTATION BASED ON THE SEPARATE DATA
OF PART A

I. Juda I, 3:

Et le nom *musica* provient de eau et science, car moys est eau et sica est science, car elle fut trouvée sur les courants d'eau au son de leur écoulement.

Taken as a whole, this etymological derivation of *musica* (cf. Adler, p. 14 and p. 18), differs from the many etymologies of *musica* in the mediaeval theoretical tradition, which also vary among themselves. If one wants to retrace the interpretation by Juda ben Isaac, as far as this is possible, it is advisable to subdivide his version as follows: (1) moys est aqua; (2) sica est scientia qui inventa (reperta) est "sur les courants d'eau"; (3) "au son de leur écoulement". The first part of the definition is widespread and does not offer a point of departure for the determination of a definite source. The second part, on the other hand, appears only in a dozen treatises.

(a) ca. 1250, Johannes de Garlandia (*CS I*, 157):

Dicitur etiam musica a *moys*, quod est aqua, et *ycos*, quod est scientia juxta aquas inventa, et loquitur de numero relato ad sonos.

(b) 1279, Anonymus, Munich, Bayerische Staatsbibl., Clm. 14523, fol. 134v. (ed. H. Sowa, *Ein anonymes glossierter Mensuraltraktat 1279*, Kassel 1930, p. 2):

Musica... dicitur a moys quod est aqua, et icos, scientia, quasi scientia inventa iuxta aquas. Secundum quod dicitur Grecos in mari musicam invenisse, vel quia melodia naturalibus instrumentis formata absque humore possit nullatenus generari, vel dicitur a moys, aqua, et sico, ventus...

(c) ca. 1325, Philippe de Vitry (*CS III*, 17; ed. *CSM VIII*, p. 20):

Musica dicitur a *Moys* quod est aqua, et *ycos* scientia, quia inventa fuit iuxta aquas.

(d) ca. 1400, Petrus Thalhander (Rome, Bibl. Vat. Lat. 5129, fol. 159v., "lectura" nondum edita):

et dicitur a *moys* quod est aqua et *ycos* quod est scientia, quia haec scientia reperta creditur super aquas.

(e) Fourteenth century (?). Anon. O.F.M. (Simon Tunstede?) (*CS IV*, pp. 2-3):

Musica... vel dicitur a *Moys* graece, quod est aqua latine, quasi scientia juxta aquam inventa, quia sine humoris beneficio nulla cantilenae vel vocis delectatio subsistit.

(f) Fifteenth century, Berlin, Pr. Staatsbibl., Ms. mus. theor. 1599, fol. 1r:

Dicitur enim musica a *Moys* quod est aqua et *ychos* quod est scientia, quasi scientia juxta aquas inventa.

(g) Fifteenth century, Anonymus ex cod. Vaticano lat. 5129 (ed. A. Seay, *CSM IX*, p. 21):

Dicitur a *moys* quod est aqua et *ychos* Graece quod est scientia inventa in aquis.

(h) 1501, Nicolaus Wollick, *Opus aureum* (ed. K. W. Niemöller, *Beiträge zur Rheinischen Musikgeschichte XI* [1955], p. 11):

Dicta autem a *moys* Graece, quod Latini aquam vocavere, et *ycos* scientia, quandoquidem secus fontium decursus seu fluentium undarum marginem fertur esse adepta.

Since it has already been established that there is so much in common between Juda's treatise and that of Johannes de Garlandia, it seems to me that — leaving aside the question as to the most literal correspondence — de Garlandia's text (a, above) is of especial importance here. It would have been most surprising if his text had been missing in this summary.

The third part ("Au son de leur écoulement") is a formulation which I find too vague for the establishment of a possible Latin source-text. Is it an addition by Juda ben Isaac?

This definition of *musica* is preceded by two preliminary sentences (I, 1 and 2: see on this Adler, p. 18). One should note the definition in the second sentence: "La musique est une science qui fait comprendre et enseigne" l'emplacement des notes et leurs intervalles..." Here is an indication for a *terminus a quo* of the Latin source of Juda ben Isaac: for this instruction in "l'emplacement des notes et leurs intervalles" could only have been proposed by an author who was familiar with the Guidonian line-notation. If we add to this his description of the Guidonian Hand (I, 11) with the mutation-syllables, we can define even more precisely the *terminus a quo* for Chapter I, namely, after about 1150.

It is also striking that the description of *musica* (I, 1-3) lacks the element typical of this kind of definition in the university treatises ("Musica secundum... est..., vel secundum quosdam..." etc.). This is one of the many facts which indicate that Juda intended his instruction as a *De musica* for boys, not for university students.

II. Juda I, 8-10 on the vocal registers and I, 4-7, 11, about the ambitus of the tones. Juda I, 8-10:

Et les "lourdes" [= graves] sont appellées ainsi parce qu'elles donnent un son lourd, chanté avec une voix épaisse [dans la poitrine ?] et aussi dans la gorge, et les "petites" [= *acutae*] sont chantées dans la gorge (et ?) dans la bouche, avec une voix plus élevée et aiguë que les premières. Et les "doubles" [= *super-acutae*] sont plus légères que [les précédentes] et sont chantées à la hauteur de la tête avec une voix suraiguë et elles sont écrites en double.

This division into three vocal registers might originally have been an isolated observation, which was inserted later — as here by Juda — into the division of

the tones according to *graves*, *acutae* and *superacutae*. This theory of registers appears only rarely in the musical instruction of the Middle Ages. We find them in the following sources:

(a) about 1250, Johannes de Garlandia (*CS I*, 158a; see Adler, p. 19), who immediately follows upon the three divisions with:

sciendum est quod omnis vox humana se habet in triplici differentia: aut est pectoris aut gutturis aut capitis. Si sit pectoris, tunc se habet in gravibus; in fundamento cantus debet ordinari. Si sit gutturis, mediocriter se habet ad utrasque, scilicet ad graves et ad acutas. Et sicut vox pectoris tantummodo se habet in gravibus, ita vox capitis se habet in superacutis...

(b) about 1280, Hieronymus of Moravia (ed. S. Scerba, p. 188). He devotes to this subject a separate passage at the end of his musical instruction (cap. 25):

... vulgariter loquendo quaedam voces sint pectoris, quaedam gutturis, quaedam vero sint ipsius capitis. Voces dicimus pectoris quae formant notas in pectore, gutturis quae in gutture, capitis quae formant notas in capite. Voces pectoris valent in gravibus, gutturis in acutis, capitis autem in superacutis. Nam communiter voces grossae et bassae sunt pectoris, voces subtiles et altissimae sunt capitis, voces vero inter has mediae sunt ipsius gutturis.

(c) 1318–19, Marchetto da Padova, *Pomerium* (*GS III*, 120):

Vox gravis dicitur illa quae ... quidem formatur in voce pectoris, quae est inferior resonantia et magis propinqua cannae pulmonis, a quo procedit vox: et ideo dicitur gravis quia in illo inferiori loco primitus est formata... Acutae dicuntur eo quod acutum reddunt sonum respectu gravium praedictatum: formantur enim in superiori loco, sc. in voce gutturis, et ideo super illas sonum reddunt... Superacutae dicuntur eo quod super praedictas acutem sonum reddunt. Et ratio est, quia formantur in excelsiori loco, sc. in voce capitis.

(d) ca. 1430, Ugolino d'Orvieto, *Declaratio* (ed. A. Seay, *CSM VII*, p. 31):

Humanae vocis differentia etiam noscitur esse triplex: pectoris, gutturis et capitis... Primi pectoris vocem habent, secundi gutturis, tertii capitis; primi gravium, secundi acutorum, tertii superacutorum tenent loca sonorum.

(e) XVth century, Anonymus (cod. Berlin, Pr. Staatsbibl. Ms. mus. theor. 1599, fol. 2r.). This unpublished treatise contains the same passage as d, above.

As with the etymological derivation of *musica* (I, 3) here again none of the quotations corresponds exactly to Juda ben Isaac. But it is again important that here too, in this limited number of quotations, we find a text by Johannes de Garlandia — which also follows immediately on his classification of the three tone categories. Again a relationship between the treatise of Juda ben Isaac and Johannes de Garlandia is confirmed, but at the same time it also becomes apparent that Juda's treatise is an original version, either his own, or — which is more probable in view of Juda's modest knowledge of musical theory — that of some Latin author, whom Juda translated into Hebrew.

At this point it is also most instructive to compare the methodology of the five treatises noted above with that of Juda's treatise. Each of these is immediately recognizable as a teaching treatise aimed at the University level; in Chapter I of Juda's manual there is no trace of this, and in Chapters I-V such an intent can at best be found in occasional passages, and even then does not carry much conviction. We may thus conclude that Juda's treatise is an introductory manual for schoolboys: and that as such it is an adaptation of sources, most likely not by Juda himself (who only "retouched" it) but, as has already been said, by an expert author who wrote in Latin. That treatise, as will become evident, from other data, has not come down to us.

Juda I, 4-20. The authentic text first gives the traditional ambitus of 19 tone letters, i.e. from A-D (in I, 4); he then describes the ambitus on the Guidonian Hand from Gamma up to d'. A later copyist added e' here as the highest tone.

These are relevant indications for the dating of the "Latin source of Juda's treatise". The basic conformity between Johannes de Garlandia's treatise and that of Juda — i.e. Juda's "Latin source" — is beyond doubt. Now it was thought until recently that the extension of the ambitus from d' to e' took place during the second half of the thirteenth century. However, it has lately become obvious from the supplement of a hiatus in CS I, 158a (by Robert Stevenson, *Notes XXIV* [1967]: 16) that Johannes' ambitus has six *superacuti* (a' - b' - h' - c' - d' - e') as highest tones. It is assumed that Johannes wrote his treatise *De musica plana* shortly before his *De musica mensurabili*, during the years 1240-1250. As far as we know at present, he was the first to extend the ambitus to e'. Juda's Latin source still has d' as highest tone. That Latin source has much in common with the text of Johannes de Garlandia, who adapted it in his own way (with attention to etymological derivations etc.) and on the university level. The Latin source must have come into being, as argued above, after about 1150. We may thus deduce that it was written between about 1150-1250.¹⁵

III. Juda I, 11 (see Adler, pp. 20-21): The Guidonian Hand.¹⁶ For a good picture of the Guidonian Hand in Ms. Paris, B.N. Héb. 1037 I refer to the facsimiles in *Musica Disciplina* IV (1958): 57 (article by Avenary-Loewenstein) and in the *Encyclopédie Fasquelle* "(Musique) Juive" (II, p. 649). As Juda says in his Preface, he does not picture the usual left hand but the right hand,

¹⁵ This is the period after the so-called Cistercian treatises (after ca. 1135) and before the first university treatises on the *Musica plana* (ca. 1240).

¹⁶ The drawing given by Adler omits at the tone of *a-acutas* the *re* of *a-la-mi-re*. The facsimile, as well as the "tableau des mutations" given by Adler on p. 24, proves that this is simply a drawing error.

and that on purpose: “pour y situer les indications de l'emplacement des notes afin d'utiliser les lettres à la manière de notre écriture qui est à l'envers de la lecture de leur écriture”. This is a clear argument.

Adler does not go further into the “hébraïser” of the Guidonian Hand by Juda. Nevertheless, this is a very curious phenomenon for those who — like the present writer — are not familiar with the methodology of the reading of Hebrew as taught in the schools, and it may lead to unjustified objections to the pedagogical methods of Juda ben Isaac.

From the first, the musical pedagogy of the Middle Ages chose the left hand, for well-considered didactic reasons,¹⁷ because one may then “y situer les indications de l'emplacement des notes et leurs intervalles” (Juda I, 2) with a finger of the right hand. If the pupil wants to learn the sequence of the tones, i.e. with the difference between major and minor seconds, with the mutation syllables (Juda I, 12–13) and with their placing on or between the lines (Juda I, 14–15)¹⁸, then the pointing finger moves from left to right, from the bottom to the top, from right to left etc., in short, spirally. The outsider thus asks himself whether Juda ben Isaac did not decide on this unprecedented change from the left to the right hand “afin d'utiliser (les lettres) à la manière de notre écriture”. I do not venture to express an opinion here and leave this to my Hebrew colleagues. I ask them — and the answer may also be of interest for the history of Jewish musical education based on the European tradition — whether the change of the hand by Juda is justified didactically by the methodology of Hebrew reading.

In connexion with the foregoing: “Et toutes les notes sont notées, l'une sur la ligne et l'autre dans l'interligne” (Juda I, 14) I observe that: (a) the succession of the tones is given according to the theory of mutation beside the Guidonian Hand; (b) he does not place the tones on lines, respectively *in linea* or *in spatio*; (c) the aforementioned usage appears for the first time in treatises of the thirteenth century; that Juda's combination of the drawing of the Guidonian Hand and the series of tones according to the theory of mutation (as found in Ms. Paris 1037) appears in only one other case which I have been able to locate, namely in Ms. Vienna (Cpv) 787, fol. 46v, which comes from the Cistercian Abbey of Baumgartenberg (a foundation of Heiligenkreuz) near Per in Austria. The manuscript is of the thirteenth century and the mutation syllables are put *in spatio* or *in linea*.¹⁹

It is also strange that Juda does not give the names of the tones in his

¹⁷ See J. Smits v. Waesberghe, *Musikerziehung im Mittelalter* (Musikgeschichte in Bildern III/3, Leipzig 1969), p. 124.

¹⁸ See, among others, *Hieronymus of Moravia*, ed. S. Cserba (Regensburg 1935), p. 48.

¹⁹ See J.S.v.W., *Musikerziehung im Mittelalter*, Fig. 73, pp. 138–139. The idea of placing the notes on or between the lines (Juda I, 14) is found already in the “Cistercian” tract by

application of the Guidonian Hand, i.e., the spiral enumeration of the tones (Juda I, 13). This is contrary to all usage, and indeed the didactics ask for it. Did Juda omit this, or did his Latin source? The same question is raised again by Juda's discussion of the organ pipe mensurae (VI, 21–24). He does not indicate any tone syllables there; however, he does so in the two preceding monochord-mensurae as well as in the cymbala-mensurae which follow the organ pipe mensurae (Juda VI, 5–19 and 28–29). There is every reason to assume that he did not omit or add anything on this point, with reference to his sources, in these chapters on the mensurae. For this reason I presume that in I, 13 likewise Juda did not leave out any tone syllables, but that they were absent in his Latin source. That Latin source, however, as will appear from many other details, has not come down to us.

IV. Juda IV, 1–5:

Qu'est-ce l'intervalle? Un mouvement composé de deux sons, et à moins de deux sons il ne peut y avoir aucun intervalle. Et sache que la science de la musique (comporte) sept espèces d'intervalles... L'un est appelé *tonus*... Et comme les sept jours de la semaine reviennent à tour de rôle et servent toute l'année...

The copious commentary by Adler (p. 30) may be supplemented by the following considerations: The Latin *Vorlage* would not have had *intervallum* (see Adler IV, 1, note *a*), which came into use only later, but *consonantia*, the equivalent of our concept of the interval ("Quid est consonantia?"). Adler points out rightly that the enumeration of 7 *consonantiae* appears only rarely.

I found the passage by Juda IV, 1–5 in its entirety only in the *Liber Argumentorum* (ed. Sm.v.W., p. 20) in these words:

Quid est consonantia? Consonantia hoc est simul sonantia, quia nisi simul duae voces sonuerint, consonantia esse non potest. Quot sunt consonantiae? Septem. Quai sunt illae? Tonus, semiditonus... diapason, per quas omnis cantilena discurrit... Nam sicut finitis septem diebus in hebdomada eisdem repetimus.

This text stands very close to that by Juda ben Isaac; the author is an Italian of the second half of the eleventh century. The text has been handed down in only three manuscripts, one of which originates from Southern France (Paris B.N. lat. 7211, 13th century). Since, according to Adler, Juda's text probably originates from Southern France (Adler, pp. 7–8), there might be a reason to implicate this manuscript (respectively its source) in the search for the sources of Juda's treatise. However, the contents of this important and comprehensive manuscript (see the description in my edition of the *Micrologus*, pp. 48–50) do not show any further relationship with Juda's treatise.

Guido of Eu (CS II, 151) and returns in Hieronymus of Moravia: "Omnes autem claves harmonicae solum in linea et in spatio collocantur" (ed. S. Cserba, p. 48).

V. Juda IV, 7:

“Et les musiciens anciens n’avaient pas ces (sept espèces) sinon l’octave”. Here Adler observes rightly (p. 33), that these “anciens” may be a reference to Guido. Guido of Arezzo fixed the number of intervals used in plain-chant at six. At about the same time there came into being in the school Reichenau (Herman of Reichenau) the system of nine intervals, by addition of the prime and the minor and major sixth. This is the point of departure for the discussion on the number of intervals in plain-chant in the music schools of Europe: on the one hand a taking over and development of the Reichenau system; on the other hand a Guidonic tradition in Italy, which during the eleventh century added to Guido’s six *consonantiae* the principal *consonantia*, the octave. That is what Juda VI, 7, means, translated by Adler as follows: “Et les musiciens anciens avaient ceux-là (les sept espèces) excepté l’octave.”

I have found this opinion about the extension from six to seven *consonantiae* only in the *Commentarius Anonymus in Micrologum*²⁰ which originated between 1070 and 1100 either in the school of Liège or in Bavaria. In this the extension from six to seven is motivated, whereas other Italian treatises from the second half of the eleventh century (the *Liber Argumentorum*, cap. IX, ed. J.Sm.v.W. *Expositiones...*, p. 21 and the *Liber Specierum*, cap. X–XXI, *ibid.*, pp. 34–47) state the number of *consonantiae* to be seven, without comment.

The question of the number of *consonantiae* is naturally a subject which interests nearly every scholar of mediaeval music theory. It is possible, as already said, to recognize two evolutions: the “modern”, which starts out from Reichenau — and this trend is followed by Johannes de Garlandia who sets the number at 13 (CS I, 163–166) — and the “old”, which, so to speak, “plays with 6 to 7 *consonantiae*”. To this last school belong Juda’s Latin source and Guido of Eu (CS II, 153). A survey of both schools is found again in Jacobus of Liège, who wrote shortly after 1300 (CS II, 295, 377–383).

Meanwhile attention ought to be given to the fact that Juda’s source is not congruent with Johannes de Garlandia, and, on the other hand, is very closely related to the *Liber Argumentorum* and to Guido of Eu. Juda IV, 7, continues with:

... le ton et le semiton et le diton sont appelées simples et unitaires, et les quatre dernières, à savoir le semiditon, et la quarte, et la quinte, et l’octave, sont appelées composées.²¹ Car le son de la quatrième espèce est composé de...

This is an incorrect division of the *simplices* and the *compositae*, as *tonus* and *semitonus* are considered to be “unitaires” and the *ditonus* is thus a *consonantia composita*. I have found Juda’s faulty opinion to recur only in Chapter XXIV of the *Liber Argumentorum*²¹ (J.Sm.v.W., *Expositiones...*, p. 24):

²⁰ J.Sm.v.W., *Expositiones in Micrologum Guidonis Aretini*, (Amsterdam 1957), pp. 106–107.

²¹ *Liber Argumentorum*, ed. J.Sm.v.W., pp. 24–25, cap. XXIV; Guido of Eu, CS II, 153a.

Simplices (consonantiae) sunt quae non componuntur nisi per voces, ut tonus, semitonius et ditonus. Compositae sunt quae componuntur, ut semiditonus, diatessaron, diapente et diapason.

A version of a good division and its justification is given by Guido of Eu (CS II, 153a):

Sunt autem duae simplices conjunctiones vocum, sc. tonus et semitonium...
Ex quibus duabus simplicibus, quatuor compositae nascuntur, sc. ...

It is striking that this Guido declares immediately afterwards that the octave is also a *conjunctio*, whereupon follows what we have called the “play with 6 to 7 *consonantiae*”:

Harum septem conjunctionum, ubi diapason includamus...

How can one form an idea about the relation between Juda’s source and the two other treatises, the *Liber Argumentorum* and the one by Guido of Eu? The author of the *Liber Argumentorum*, an Italian of the second half of the eleventh century, cannot be judged as a theoretician on a high level; I consider him to have been capable of this faulty conception. His treatise has been handed down in a Southern French manuscript (Paris, B.N. lat. 7211, this part datable to the beginning of the twelfth century). If we add to this that Juda made his translation in all probability in Southern France (according to Adler), then there could be a relationship between this manuscript and Juda’s Latin source, similar to the relationship between the manuscript and its correction by Guido of Eu. But I find only hypothetical grounds for this theory.

VI. Juda V, 2:

Et sache que chaque point pourvu à sa gauche (= droite) d’une queue tirée vers le bas, on le prolonge en chantant dans son mouvement... (the Latin basic text being presumably: “Et sciendum est (Et nota) quod omne punctum in dextra parte caudata...” or: “cum tractu in dextra parte”).

Let us recall that Juda’s reversal of the Guidonian Hand from the right to the left induced us to ask our Hebraist colleagues whether this reversal could have been justified by the methodology of the reading of Hebrew. Here, in V, 2, Juda reverses the usage of square notation, moving the *cauda* or *tractus* to the left of the *nota quadrata* instead of on the right. This transfer, however, has nothing to do with reading methodology: it concerns solely the decision to adopt, or not to adopt, a current musical notation symbol. Why? With what benefit? Was the square note indeed written in Hebrew music manuscripts with the *cauda* on the left? I await an answer from my Hebraist colleagues, but I suspect that what we have here is just an unwarranted intervention,

in the sense of Juda's words: "En place de pierres crayeuses brisées j'ai mis des pierres précieuses enchassées d'or pur" (Préface, Adler, p. 17).

Apart from this: the square note "in dextra parte caudata" is mentioned more than once in mediaeval treatises from the thirteenth century onwards, but I have not found anywhere an *incipit* similar to the one quoted above.

VII. Juda V, 5:

Et les queues (servent) d'indication aux chanteurs en déchant, c'est-à-dire lorsque deux chantent ensemble..."

To the excellent commentary by Adler (p. 35) I would like to add the following:

(a) We have not been able to locate a passage corresponding to the complete text of V, 5. If this is really a translation of a Latin source, it does not give the impression of an author who taught on a high level, as we have already observed.

(b) The transcription of the Hebrew *disqant* (from the Latin *discantus*, here used by Juda as a vernacular term) does not point, by itself, to a certain town or region; the term appears in Germany, in Flanders and in the Netherlands²². Nothing here obliges us to think exclusively of the school of Paris, at that time the centre of polyphonic music. If Adler believes that the origin of Juda's translation can be traced back to Southern France, then one may think of the city of Toulouse, for example, in connexion with the relationship between polyphony and Southern France. A Toulouse text of 1229 (cited above, Part A, p. 135) talks of polyphony, and Johannes de Garlandia, of whom we possess a *De musica mensurabili*, taught there for a short time (1229). Besides, Johannes de Garlandia himself says that he composed a conductus with a text on the city of Toulouse: "Unde in conductu meo de Tholosa dicitur: 'Alto gradu gloriae tollitur Tholosa'" (J. Handschin, "Conductus-Spicilegien", *AfM* IX [1952], p. 115).

VIII. Juda V, 6-11 on the ambitus of the ecclesiastical modes.

This subject remained a problem throughout the Middle Ages. When the Latin basic text was written, "Oddo", Guido of Arezzo, Berno of Reichenau and Guido of Eu counted as the most authoritative theoreticians.

Juda's text is totally corrupt here. No student of music theory could understand it. The musicologist of today may supplement and correct the essentials (see the elaborate commentary by Adler, pp. 35-37).

²² In the sixteenth century it was still sung in Dutch:

Dronckaerts omne den tijdt overbryngghen
 Altemet met dischant een liedeken zynghen
 Drunkards to pass the time
 Soon were singing a song with discant.

The beginning “Et toutes les mélodies, vocales et instrumentales” strikes one as unhistoric for such an introduction to the theory of the ambitus of the modi. In this context instrumental music was always disregarded. Personally I believe that Juda’s source had the more common *incipit*²³: “Omnis cantus ecclesiasticus...”, an *incipit* which Juda did not want to take over, for obvious reasons; an interpolation and change into “Et toutes les mélodies, vocales et instrumentales” offered itself as a fitting solution. One may also think of an *incipit* similar in style to the one in Oxford Bodl. Rawl. c. 270, fol. 4r.: “Quattuor finales sunt voces, quae omnibus tropis... conveniunt” (end of the twelfth century, probably Northern France).

Those who are acquainted with the many divergent views on this problem of the ambitus in the Middle Ages will realize that an attempt to repair Juda’s corrupt text on the basis of any one of these views would be a thankless task.

IX. Juda VI, 2-3:

Celui qui veut trouver le réglage de l’emplacement des notes sur le (mono-)corde, et la mesure de leurs intervalles, procèdera ainsi. Les deux extrémités du (mono-)corde, appelées en grec *magadis* (...)

Let us begin with the second sentence, because its origin points back rather certainly to the *Mensura monochordi* by Berno of Reichenau (ca. 1048), which Gerbert (*CS* I, 331) published as “Anonymous I”: “Duo semisphaeria, quas magadas vocant”. The first sentence starts with the well-known words from the theory of the mensurae of *cymbala* and *fistulae*: “Quicumque vult...” I have not yet met such an *incipit* in connexion with a monochord mensura, except in the prologue of Berno’s monochord-measure which was not published by Gerbert: “Quicumque sibi artificium inchoat...” However, this *incipit* is not followed by anything resembling Juda’s text. On the other hand, one does not find Juda’s sequel in the epilogue of Berno (not published): “Ecce... et monochordi dimensionem et chordarum seu tetrachordarum nomina et positionem, et consonantiarum vocabula et rationem...” It remains uncertain whether the Latin basic text was indeed made up of Berno’s prologue and epilogue in combination. However the case may be, Juda’s “Les deux extrémités...”, unfortunately not continued, corresponds in concept with Berno’s *mensura monochordi*. The text of this mensura with prologue and epilogue,

²³ A short treatise about the ambitus theory of the modi, beginning “Omnis cantus ecclesiasticus”, appears in the chant-books of the Dominicans from the thirteenth century (among others in Paris [old signature] Bibl. du Conservat., Rés. 1531, fol. 1r (thirteenth century); Bruxelles, Bibl. Royale 6429-30 and 3585-86 (from, respectively, the fourteenth and fifteenth century). The Dominican Hieronymus of Moravia (ca. 1280) quotes from this in his 21st chapter (ed. S. Cserba, p. 159).

is preserved only in Ms. Vienna (Cpv.) 51, foll. 52v.b–55r., a twelfth century copy from Southern Germany. I see no correspondence between the remainder of the contents of this manuscript (with two *mensurae fistularum* and one *mensura cymbalorum*) and Juda's Latin basic text.

X. Juda VI, 4:

Et selon le sens de la lecture de la musique chez les gentils, de gauche à droite... et selon notre lecture qui est à l'envers de la leur, nous commencerons à droite, mais j'expliquerai (la mesure du monochorde) selon leur lecture, car tous les instruments de musique ont été préparés selon celle-ci.

This passage is of course by Juda himself. As with his application of the Guidonian Hand, and the musical notation (placing the cauda not to the right but to the left of the *nota quadrata*) he wished to depart from the "Christian method" in the monochord as well, and reversed from left-right to right-left. But here he will not do this, "car tous les instruments de musique ont été préparés selon celle-ci". This is a curious point of view, because for the monochord, as well as for the other instrumental *mensurae*, a calculation from left to right or from right to left is equally possible theoretically and both do appear in the treatises; although the left-to-right procedure is much more frequent. I am of the opinion that here Juda wished to deviate from what he thought to be a tradition (compare "en place de pierres crayeuses brisées j'ai mis des pierres précieuses", Préface, Adler, p. 17); but since he was not expert enough to transform the two *mensurae* which he had before him so as to adapt them to the direction of Hebrew writing, he decided to follow the reckoning "selon la lecture des gentils". I leave it undecided how far he was and could be convinced of the motivation "car tous les instruments de musique...".

This consideration does indeed confirm that Juda's knowledge of the theory of music was limited: he is more of an outsider-translator than a professional teacher of music.

XI. Juda VI, 5–12: First monochord-*mensura* = "*mensura secunda*" by Guido of Arezzo, *Micrologus*, cap. III; Juda VI, 13–19: Second monochord-*mensura* = "*mensura prima*" by Guido, *ibid.*, also in his letter to Michael of Pomposa (*GS* II, 46) and in his *Regulae rhythmicæ* (*GS* II, 26), cf. Adler, VI, 11–12, note *b*.

The most conspicuous feature in both *mensurae* is that Juda connects the notes with the solmisation-syllables; with the notes *b-rotunda* and *b (q)-quadrata* he writes B-mi before the *gravis* B; but before the *acuta* and *superacuta* "b-mol", "q-dur", he writes respectively "bb-mol", "qq-dur". This linking of the notes and the syllables is particularly striking since no *mensura* appears in this way

in the 71 different *Mensurae monochordi* from the period of about 850 to 1200 which I checked for comparison. One may therefore conclude that Juda's source dates after 1200. Or did Juda himself perhaps insert these solmisation-syllables? This cannot be assumed for two reasons. First, as already mentioned, he does not give any mutation-syllables for his two *fistulae*²⁴ measures although he gives them for his *cymbala* measure since he inserted them in the monochord measure — why then not in the *fistulae*-measure? Secondly, it is clear that he had not mastered the subject of the mutation syllables (and neither had his source). He calls the B-gravis B-mi according to the mutation-system, which is correct. But whereas Guido in his monochord mensurae speaks of b-rotunda and ♮ (in cap. II of the *Micrologus* with the addition “♮ quadravimus”), Juda puts here “♮-dur”, “♮♮-dur” (VI, 7 and 19) and “b-mol”, “bb-mol” (VI, 10, 11 and 18). The Latin basic text would then have had here “♮-durum” and “b-molle”, which is a deviation from the Guidonian terminology. Nevertheless, those two monochord-mensurae by Guido have not come down to us in manuscript in this form. Consequently we must decide that the manuscript of Juda's Latin *Vorlage*, or a copy of it, has not reached us.

Some more details which confirm this conclusion:

- (a) Juda's first monochord-mensura is begun by Guido with the words “Cum primum a... ad finem...”; the second with “Gamma itaque in primis affixa...”. With Juda these *incipits* are as follows: “A l'extrémité gauche on écrit...”, “A partir de l'extrémité gauche, où l'on a écrit ut...”. It is precisely this start from the left, which, as we assume, was not very welcome to Juda, which is lacking in Guido. We found something similar only once, namely in Ms. Rome, Bibl. Vat. Pal. 563, fol. 141v. (from Lorsch, eleventh century): “In primis ad levam scribis letteram Gammam...”.
- (b) Juda VI, 11–12, like VI, 19, is an addition which does not appear in the authentic *Micrologus*-text. As a trend of thought, but not in Juda's formulation, it occurs in a few manuscripts (see my edition of *Micrologus*, p. 101; *De Guidone...*, pp. 174–176, Mensura No. 44–50).
- (c) The expression which appears frequently in monochord-mensurae “reliqui (passus) vacant” is reproduced unexpectedly by Juda as “et après lui tout est en blanc jusqu'à la fin”: this, indeed, renders the result referred to, but not the action required to reach it.

²⁴ In connexion with the dating I point out that even if the version of Ms. Leipzig is completed and corrected with regard to its missing *incipit* and its faulty tone-letters, it will still be a condensed edition of a more extensive original text. I suppose that in this original the author did not continually repeat the word *auferatur*, but, following the contemporary usage of the authoritative theoreticians, would have used synonyms — as, for example, Aribon in a *fistula measure* (ed. J.Sm.v.W., *Aribonis de Musica*, p. 41): *aufer, tolle, ablata, reseca, amputabis*.

(d) Only in one manuscript have I found the two monochord-mensurae from the *Micrologus* copied separately, namely in Durham Cathedral Ms. Hunter 100 (beginning of the twelfth century). But a critical textual comparison (see the edition of the *Micrologus*) shows that these manuscripts were not the basis for the Latin text of Juda's monochord-mensurae.

XII. Juda, VI, 20. Adler proposes a translation with a question mark in the text, which I would like to reconstruct as follows: "Et toutes ces mesures sont également appliquées aux clefs de l'instrument nommé *lira*, la roue tournante, d'un bout jusqu'au bout de la huitième clef, et aussi, selon les mêmes mesures, le psaltérion et la harpe."

XIII. Juda VI, 21–28: The *fistulae*-mensurations in general.

I take as known the literature given by Adler, and also his "Les mensurations des tuyaux d'orgue..." in *AMI* XL (1968), pp. 43–53.

It is not always easy to understand the mediaeval mensurations of the monochord, organ pipes, hurdy-gurdy and cymbala and this gives rise — as happens here with Juda's measurements — to differences of opinion. The difficulty is not in those monochord-mensurations which start from the lowest tone and divide the length of the vibrating string, for instance, into nine equal parts. With the first interval, i.e. after 1/9th part, corresponding to the ratio 9:8, the point has been found where the higher placed major second sounds with respect to the lowest tone. In this way the higher tone is calculated from the length of the lowest tone, and thus an "échelle ascendante" originates. This is a very simple theory; however, the way in which it is formulated causes difficulties. These arose, in my opinion, in the calculation of organ-pipes or cymbala (and the transfer of this calculation to the monochord), where the quantity of the highest tone was taken as the starting point, namely the shortest pipe, or the "smallest" (highest) bell from which a descending series of pipes or little bells is created. This problem must be discussed in detail, since Adler's view on the "*antiqua mensura*" (VI, 21–23) differs from that of others, including those who are at present preparing the complete edition of the *mensurae fistularum*, Dr. Klaus-Jürgen Sachs (as I see from my correspondence with him about the manuscripts with these mensurae), and the present writer. Let us take the theory first. A descending series of organ-pipes or cymbala implied a series of pipes of increasing length (and increasing diameter), or an increasing weight of wax from which the quantity of metal for the cymbalum was calculated. If it was assumed that the second pipe (or cymbalum) had to be a major second lower than the first, i.e. highest, then the ratio of the quantity of the first to the second was 8:9.

The formulation of this simple theory caused difficulties to the theoreticians

of the Middle Ages. These arose already in the extended formulations, but were augmented further in their abbreviated versions. The complete formulation is: "Take a quantity X (length, diameter, weight of wax) destined for the highest tone; take the same quantity X again and add to this $1/8$ X taken from the first (the highest), and you obtain the quantity for the second fistula (or cymbalum)." The abbreviated formulations limit themselves to the absolute minimum: "Take $1/8$ part of the first fistula (or cymbalum) and you have the second fistula (or cymbalum)." These abbreviated texts are encountered in the instructions for making a variety of instruments, as follows:

(a) Applied to a monochord-mensuration:

Dividatur (chorda) in octo et per octo ulterius procedendo primus tonus perficitur (Kassel, Landesbibl. 4° Ms. Matth. 1, fol. 20r.)

One sees how the idea of "transfer $1/8$ of the distance to the other side" has been reproduced very vaguely by "et per octo ulterius procedendo".

(b) Applied to a *fistulae*-mensuration:

Prima (fistula) ... in octo partibus dividatur. et octava parte primae. sit major secunda. quam prima (Bern B 56, fol. 2v).

Here the verb of action has been totally omitted.

(c) Applied to a hurdy-gurdy (organistrum) mensuration — here for the ratio of 3:4:

Per III usque F et in IIII habes C (Munich, Bayerische Staatsbibl., Clm. 18937, fol. 240v.; Leipzig, Univ. Bibl., Paul. 1493, fol. 52v).

Here, too, the technical action referred to has been passed over.

(d) Applied to a cymbalum-mensuration:

Ad primum tintinnabulum quod est A littera... dividet... aequae in octo partes, et recipias sequens B (cf. J.S.v.W., *Cymbala*, p. 39).

Up to this point the author has taken over an existing measurement (cf. *Cymbala*, p. 37). Becoming aware that the formulation is unclear, he then adds:

videlicet eiusdem appensionis iterum octo partes alias (for the new bell!), addita insuper nona parte.

Whether his explanation has really made the question more lucid for a layman remains questionable.

XIV. Juda VI, 21–23: *Antiqua mensura fistularum*.

Adler rightly points out (*AMI* XL (1969), pp. 45–46), as a Latin source text, the Manuscript Leipzig, Univ. Bibl. Paul. 1493, fol. 61a (from which we have taken example (c), above). According to the survey by Kl. J. Sachs (unpublished), the same text also appears in Munich, Bayerische Staatsbibl. Clm. 18937, fol. 297 r.v.; Paris B.N. lat. 7377, fol. 44r.; Rochester, Sibley Music Library,

Eastman School of Music, ML 921100, pp. 180–181; Washington, Library of Congress, ML 71, J. 56, fol. 31v.

The Latin text of this mensura resembles the above-mentioned examples in incompleteness and therefore in unclearness. Juda's text corresponds to the Latin, with this difference that Juda has one additional introductory sentence: "Et le premier on fera sa longueur comme l'on voudra" (compare, among others, "Prima quantaecumque quantitatis..."). This is in fact an indispensable beginning, for this is what the beginning of the Leipzig text assumes and follows with: "Prima fistula in VIII divisa, octava pars auferatur et erit (fistula) secunda". The incomplete text can easily be completed according to the given examples: "From the length (and diameter) of the first pipe one takes away an eighth part and adds this to the same quantity as the first, intending this for the second pipe, so that the first is related to the second as 8:9". The second fistula is therefore not $7/8$ of the first, as one is led to think by reading the uncomplemented text, but $9/8$, and thus longer and consequently "lower of tone". Thus originates a decreasing series in which pipe 2 is one major second lower than 1; 3 similarly lower than 2; 4 one fourth lower than 1; 5 a major second lower than 4; 6 a major second lower than 5; 7 a major second lower than 6; 8 — in Ms. Leipzig correctly "duplum", the double of 1, with Juda, incorrectly, one half of 1. Through this an octave-series is created: e' - d' - c' - h' - a' - g' - f - e, namely a descending series (this is also the opinion of Kl. J. Sachs). The absence of a synemmemon-measure is striking: this points to an early period — the eleventh century, if not before.

I may add to this that while Kl. J. Sachs and I agree on this decreasing series, Sachs arrived at it through his study of the organ-pipe mensurations; the present writer, through his study of the cymbala-mensurations (in preparation). Besides, we will again meet a similar way of measuring, but more clearly formulated, in Juda's mensuration of the cymbala (Juda VI, 29–39).

XV. Juda VI, 24–28. *Nova mensura fistularum.*

I agree with Adler that here a rising series is meant. For one detail of his commentary I propose a simpler interpretation. After the author has calculated the second fistula by means of the ratio $8/9$ from the first, there follows: "le tuyau III est d'un 'demi-quart' plus court que le tuyau II". This "demi-quart" in parentheses may have been in Latin *dimidium quarti* or *quartae (partis)*, in other words $1/2$ of $1/4$, which is $1/8$; the third fistula has $1/8$ of its quantity less than the second fistula (I read, complementing the text: "le tuyau III est un huitième de sa longueur plus court que le tuyau II"). The result of this measure is the same for me as for Adler. It appears in the measures for various instruments.

XVI. Juda VI, 22, 25–28.

It is beyond doubt that these sentences are additions to an original mensuration text. For an eventual dating of these additions one should, as I was informed by Kl. J. Sachs, make a distinction between the practice and theory of the *mensurae fistularum*. In practice the “jeux de mixture” and the “diamètre variable en fonction de la longueur des tuyaux” were applied before the fourteenth century (the “jeux de mixture” already many centuries earlier). However, the “diamètre variable” was not written about in the mensurae-treatises before the fourteenth century. To this I add: If VI, 22 may have appeared in a *mensura fistularum* which was known to Juda, then this would have been from the fourteenth century; I have not found VI, 25–28 in any *mensura fistularum*.

XVII. Juda VI, 29–38: *Mensura cymbalorum*.

Juda's formulation is generally clear; where it is unclear, Adler has supplied a good commentary. Referring to what I said about this in the first part (A), I add here, for the sake of clearness, that I have not been able to retrace Juda's way of measuring, taken as a whole, to any one manuscript. Theoretically corresponding, but formulated entirely differently (“Primum quanticumque ponderis. Secundum sesquioctavum primi. Tertium sesquioctavum secundi...”) it appears in the lost Strassburg manuscript printed in *GS* I, 149a (see *Cymbala*, p. 53, mensura XVII).

XVIII. Conclusion as to the dating.

Though we have at our disposal dozens of manuscripts with the mensurae which are dealt with by Juda in his VIth chapter, we could locate no one manuscript in which any one of Juda's measures appears in exactly the same way. It may be assumed that the mensurae originated in the tenth–eleventh century, that they were collected afterwards, and that one of these collections was adapted in the thirteenth–fourteenth century. This lost collection was translated by Juda, with mistakes, and with additions which do not always bear witness to expert knowledge. The copy of Paris B.N. Hébr. 1037 has in no way improved Juda's translation.

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