

# On the special signs in the early eleventh-century Dijon tonary

## Highlights from the original Dutch text<sup>1</sup> in English

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*This conflict can be solved in several ways. 1. The introduction of microtones. 2. The introduction of a unisono-pes. 3. The observation that there are many frictions between tone letters and neumes. Note 41.*

*The special signs appear as relicts of the neumatic letters from the a-diastematic period. These relicts became increasingly otiose and disappeared when staff-notation became the standard. Note 40.*

*There is a trend in Dijon for more special signs when the melos is less typically Gregorian. Note 16.*

*The differences between the notated Gregorian chant manuscripts suggest that the semi-tone (mi-fa, si-do and la-sa) was much greater in the South (Beneventum) and the ninth century (Laon) than in the North (Klosterneuburg) and the twelfth century (Utrecht). Note 13.*

### Abstract

In 2018 Leo Lousberg earned a PhD at Utrecht University on the thesis that the special signs in the Dijon tonary represent “microtones with a rhetoric function”.<sup>4</sup> In this paper I offer an alternative view based on seven observations about the context of these signs. I give many additional arguments supporting the view that these signs simply represent sub-semitonal pitches with a warning for the correct intonation. I point to eight problems with Lousberg’s theory and analyse all signs in the greatest subset of the Dijon tonary: the offertories. Finally I sketch a perspective for further research into many related issues about the semitone.

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## 1. Introduction with five observations about the signs



Figure 1. First verse of the offertory *Justus ut palma* in Fluxus-notation (St Gall on lines). Three horizontal dashes indicate “forgotten” episema’s (lengthenings) in St Gall (Einsiedeln; CH-E 121), two vertical dashes indicate special signs in Dijon (F-Mof H 158).

[...] If the special signs were about rhetoric, you would expect them in principle on every note (not just sub-semitonal), on the first note of a syllable (not especially on the last), on the word accent (not especially outside of it), in all kinds of melodic contexts (not just strong, sub-semitonal, strong) and also not at various places in vocalises. These are five things that Leo's theory should provide an explanation for. I don't see that explanation. [...]

## 2. Eight problems with the theory of Lousberg

1. [...] The question is: where do these special signs stand for? And then I simply come up with **an alternative** interpretation. Leo interprets the signs as microtones with a rhetorical function and calls these “signal tones”. I tend to interpret the

signs as sub-semitonal tones with a warning to stay on pitch: Be careful, intonate this tone high enough, don't take the semitone too big. So for me they are “signal signs”. That ties in well with my observations. After all, it is mainly the semitone that is often taken too low. This of course mainly happens at the end of phrases, words or melismas and has little to do with the word accent. It is especially relevant when the melos has to be continued on the strong tone again and of course one must also be alert to this in long melismas. So the question is: which of the two interpretations is best substantiated. [...]⁹

2. [...] I think the **microtones in Gregorian chant** that medieval writers speak about can best be compared with microtones in Indian and Turkish classical music, or somewhat closer home, in orthodox liturgical practice. Since Bach, our Western ears have become accustomed to the equal temperament of the piano, where in fact, only the octave is pure. Even fifths and fourths are “out of tune.” This is a consequence of the ubiquitous polyphony and the theory of harmony based on it. In classical monophony, Hindustani ragas, Ottoman makams and orthodox echoi, in principle all intervals, but at least fifths and fourths, are pure. The difficulties that medieval writers had with “microtones” can probably best be understood from that perspective: as a consequence of “pure singing”. The phenomenon of microtonality then lies in the deviation from our equal temperament and therefore essentially applies to the entire tonal system. In my opinion, it is precisely this tuning or intonation problem that is relevant to the reports about Gregorian “microtones”. [...]¹³

3. [...] In Gregorian chant **semitonal signal tones** already exist. E.g. on: *non mōritur* in *Christus resurgens* and *non erubēscam* in *Ad te Domine levavi*. You therefore need an additional argument for deviating microtonal signal tones. [...]¹⁴

### 3. The special signs in the offertories of the Dijon tonary

a b | c d e | f g h | i | k l m | n o p

la si T<sub>1</sub> do re mi T<sub>2</sub> fa sol la T<sub>3</sub> sa si T<sub>4</sub> do re mi T<sub>5</sub> fa sol la

A B (B) c d e (e) f g a (a) bes b (b) c' d' e' (e') f' g' a'

Figure 2. The gamut of Dijon (F-Mof H 158) with the special signs. Below, the more common solmisation, my numbering of the signs (T) and the modern transcription.

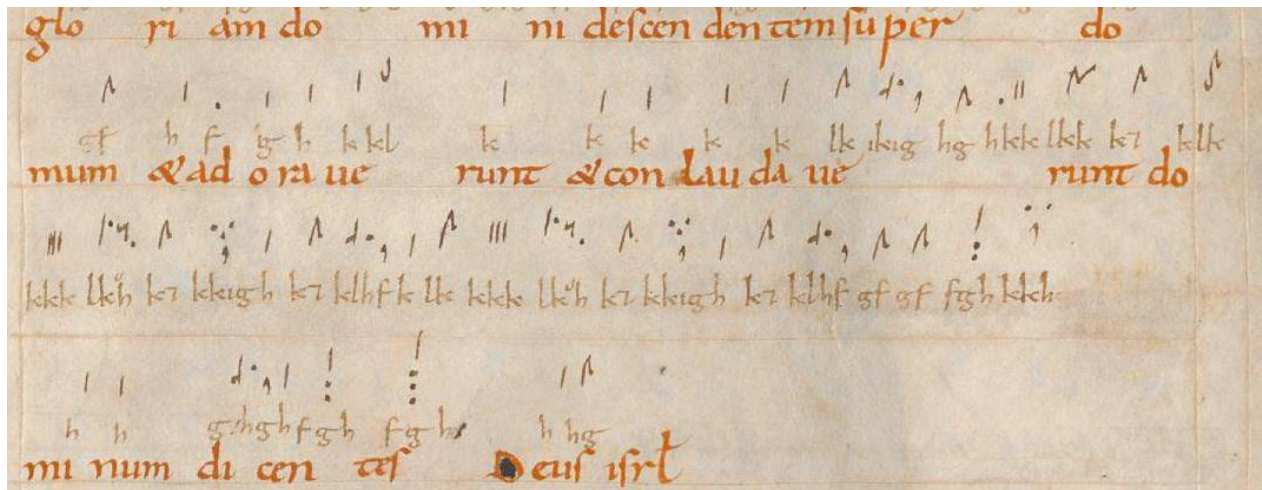


Figure 3. The final passage of the offertory Domine Deus in simplicitate in Dijon (f. 151r). Dijon (F-Mof H 158) was written between 1000 and 1030, published in 1901 and 1905 in the series Paléographie Musicale (Volumes VII and VIII) and is, together with many other manuscripts, online accessible at: <http://musmed.eu/>

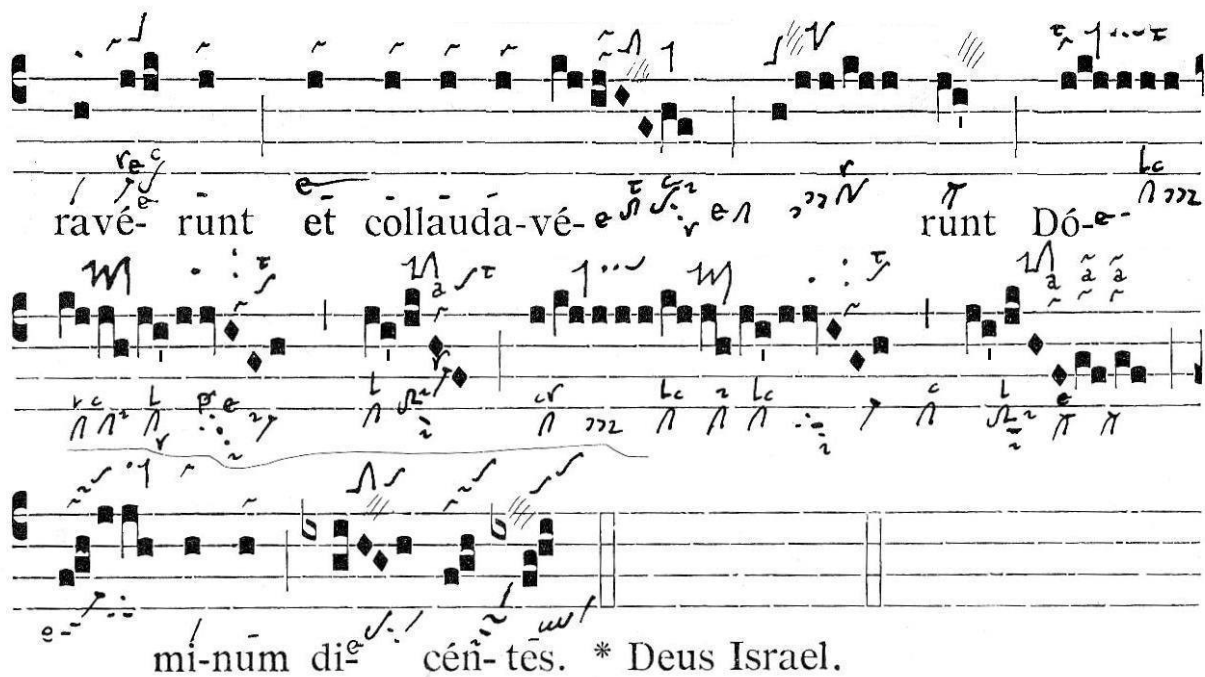


Figure 4. The same passage in the Offertoriale Triplex (pp 160-161).<sup>34</sup> I added vertical dashes below the five notes with special signs (only  $T_4$ ) in Dijon. Below the staff you see the neumes of Einsiedeln, above the staff those of Laon. Einsiedeln (CH-E 121) was written between 960 and 970, and Laon (F-LA 239) between 875 and 900. Laon is the oldest preserved manuscript with the full cycle of Mass chants in musical notation.

<i>Signs (T), offertories &amp; T/off</i>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	total	off.	T/off
number	1	140	35	335	18	529	103	5.14
<i>For the different modes:</i>								
re-modes (mode 1 & 2)	1	36	15	50	-	102	28	3.64
mi-modes (mode 3 & 4)	-	92	16	110	1	219	28	7.82
fa-modes (mode 5 & 6)	-	7	2	37	4	50	16	3.13
sol-modes (mode 7 & 8)	-	5	2	138	13	158	31	5.10

Figure 5. Special signs per offertorium and mode in Dijon.

<i>The five special signs (T)</i>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	<i>total</i>
number	1	140	35	335	18	529
<i>Position:</i>						
on the first note of a word	-	6	6	29	1	42
on the first note of a syllable	-	16	9	42	-	109
on the word accent	1	46	14	140	6	207
on the last note of a word	-	53	9	90	4	156
on the last note of a syllable	-	40	6	107	7	316
on the last note of a neume	1	105	18	239	16	379

Figure 6. The position of the special signs. The signs occur only as last notes of descending neumes, first notes of ascending and middle notes of porrectus-like neumes.

<i>The five special signs (T)</i>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	<i>total</i>
number	1	140	35	335	18	529
S (the strong tone)	c	f	i	k	n	
s (the sub-semitonal tone)	b	e	h	l	m	
<i>The melodic context:</i>						
S-T-S	1	116	24	286	17	444
S-T-t-S	-	4	4	14	-	22
S-t-T-S	-	4	4	14	-	22
S-T-s-S	-	9	2	7	1	19
S-s-T-S	-	4	1	1	-	6

Figure 7. The melodic context of the special signs T, with S indicating the “strong” tone, t a similar neighboring sign T, and s the sub-semitonal tone.<sup>41</sup>

<i>Manuscript</i>	<i>Dij1</i>	<i>Dij2</i>	<i>Eins</i>	<i>Laon</i>
signs (in <i>Dij1</i> ) and corresponding neumes	529	520	518	428
<i>Ornament neumes</i>				
oriscus	20	17	28	25
quilisma	-	-	-	-
liquescent	-	-	3	2
<i>Neume letters</i>				
letter e (equaliter: equal)	-	-	20	-
letter p (parvum?: small)	-	-	-	1
letter s (sursum: up)	-	-	69	3
letter a (altius: higher)	-	-	28	37
other letters (c, i, t, x, v, m ...)	-	-	29	17

*Figure 8. Ornament neumes and neume letters on the 529 places with signs in Dij1.<sup>42</sup> Dij1 refers to the pitch letters in Dijon (F-Mof H 158), Dij2 to the neumes in Dijon, Eins refers to the gradual of Einsiedeln (CH-E 121) and Laon to the gradual of Laon (F-LA 239). Of all 20 equaliters 18 are in the mi modes. Compared to Albi (F-Pn lat 776) of all 20 equaliters 15 refer to the sub-semitonal tone.*

#### 4. Concluding summary

Above I have outlined how, after initial enthusiasm, I gradually started to doubt Leo Lousberg's theory. Seven observations were decisive, in order of importance:

1. The special signs of *Dijon* appear only in sub-semitonal places.
2. The signs are almost twice as common in mi modes.
3. The signs appear almost exclusively in a specific melodic context (S-T-S).
4. The signs appear often at the end of a neume, syllable or even a word.
5. The signs are mostly not on the word accent.
6. Sometimes there are signs on multiple consecutive syllables.<sup>40</sup>
7. Sometimes there are several signs in a single long melisma.

Rather than pointing to rhetoric, these facts point to the tone system as such. In addition, I have discussed in detail eight problems that argue against Leo's interpretation. In order of importance:

1. There is a simple interpretation of the special signs that is more in line with the seven facts mentioned above.
2. There is a better explanation for “microtones” mentioned by medieval writers.
3. Clearly identifiable semitonal signal tones do already exist.<sup>14</sup>
4. There is no good reason to prescribe ad libitum performance issues.<sup>18</sup>
5. There are no contemporary sources for specific microtones.
6. In the quoted passage, Smits van Waesberghe says nothing about microtones.
7. Leo's sample is very problematic.
8. The emphasis on the Utrecht antiphonar is misleading.

Finally, I inventoried and analyzed all special signs in a substantial and precisely defined sample of *Dijon* (all offertories). That only increased my doubts. My conclusion therefore is:

The interpretation of the five special signs in *Dijon* as “microtones with a rhetorical function” is an unnecessarily wild speculation. After all, there is a less wild interpretation that does more justice to the facts. The reference to microtones by medieval writers is not about specific tones with a rhetorical function, but about the tone system as such. The special signs, just like the added letters to the a-diastematic neumes, most likely have a corrective or warning function: stay on tone, keep the sub-semitonal tone high enough. One should therefore use Ockham's razor: Exit microtones, or more precisely: The five special signs do not refer to microtones.

## Notes

The notes provide relevant references. Some notes provide detailed technical or philosophical explanations, especially 8, 9, 13, 40, 41 and 42. This English text only gives (excerpts of) notes 1, 4, 9, 13, 14, 16, 18, 34, 40, 41, 42 and 47.

1. The original Dutch text was published in November 2023 on the site of the *Gregoriaans Platform* as: [De speciale tekens in het tonarium van Dijon: “microtonen” of toch iets anders? - Van signaaltonen naar signaaltekens](#), and in: Geert Maessen (2023, 3rd edition), [Heimwee naar wat nooit is geweest - Bespiegelingen over het Gregoriaans](#), pages 283-308, available at [ABC](#).

4. Leo Lousberg (2018, PhD thesis), *Microtones according to Augustine - Neumes, Semiotics and Rhetoric in Romano-Frankish Liturgical Chant*. [Volumes I & Volume II](#), Utrecht University.

9. My interpretation is in line with the suggestions of all other special signs [...] Lousberg (2018), *Volume II, Appendix IV, The Notation*, page 21 ff. That is e.g. clearly visible in the special diastematic clivis sign. [...] The low note of the clivis is indicated by a horizontal line. That line clearly appears to indicate “uphold”. [...] Ike de Loos (1996, PhD thesis), *Duitse en Nederlandse muzieknnotaties in de 12e en 13e eeuw*, Utrecht University, pages 185-186. [...] A second argument is that my interpretation also fits in nicely with the added letters at the parallel places in *Einsiedeln* and *Laon*. Those letters indicate “uphold” (s and a) much more often than a “small interval” (e and p). See Fig. 8. [...] A third argument [...] A fourth argument [...]

13. [...] You can tell where someone is coming from by the size of the semitone. [...] “[...] For the performance of Christian singing in antiquity, the key question is whether the lowered e- and b- not only occurred in theory but also actually occurred in practice and were 'common'.”: Wouter Swets, *Gregoriaans en Mediterrane monofonie*, [Tijdschrift voor Gregoriaans \(1994-3\)](#), pages 124-133. [In my view the expertise of ethnomusicologist Wouter Swets (1930-2016) is of inestimable importance for the study of Gregorian chant, especially for the transition from the a-diastematic to the diastematic period, where everything revolves around the semitone. Because Swets' work is severely underestimated, I have attached this text in English in the Appendix. More details about his work in Dutch at Leiden University: [Extensive musical collection donated](#).] See also the CD-booklet of [Sabâ Kâr-ı Nâtık, İlâhîler, Gregorian Hymns](#), of Wouter's *Ensemble Al Farabi* (2001), page 5: “[...] What differs in this large region is f.e. the extent to which the E and B are dropped, varying from 1/9 to 1/3 of a tone.”

[...] [Gregoriana Amsterdam](#) has collaborated many times with the Eastern Turkish imam Mesrur Coşkun. It was no problem to sing along with his ilahis based on the Turkish text. However, it was virtually impossible for me to write down those melodies on the five-line staff. That felt like an echo of the experiences of medieval writers as the aforementioned Emo van Bloemhof and Rudolf van St. Truiden. The differences between the notated Gregorian manuscripts suggest that the semitone was much larger in the South (Beneventum) and in the ninth century (Laon) than in the North (Klosterneuburg) and in the twelfth century (Utrecht). This may have been associated with “extra” (microtonal) positions between the sub-semitonal tone and the strong tone. See also note 42. [...]

14. [...] [For obvious reasons, see my fourth problem, there are only a handful of such semitonal signal tones. I mention two of them: on *non mórítur* in the alleluia *Christus resurgens* and *non erubéscam* in the offertory *Ad te Domine Ievavi*, in *Graduale Novum* (2011), 199.6 and 6.2 respectively.] [...]



16. [...] See: Marcel Zijlstra (1997, PhD thesis), *Zangers en Schrijvers. De Overlevering van het Gregoriaans van ca. 700 tot ca. 1150*. Utrecht University, e.g. on page 92. Zijlstra also points out (page 86) that the added letters occur most often in places that are least formulaic, such as the verse *Lapidem* of the gradual *Haec dies*. [Something similar also appears to be the case with the special signs: There is a trend in *Dijon* for more special signs when the melos is less typically Gregorian. This is not immediately clear in melodic classification, but we can see it in the contour classification. [...] Contour classification of the offertories in six other traditions shows that they correspond best to Ambrosian or Milanese chant (M), then to Old Roman (R), then to León (L), Beneventan (B), Cisneros (C). and finally to Old Hispanic chant (A). But the classification in one of the last four traditions (L, B, C and A) shows that the more often this happens, the more special signs the offertory has. Offertories that do not classify in any of these (32 pieces) have an average of 3.91 signs. Offertories that classify there only once (37 pieces) have an average of 4.97 signs. Offertories that classify there twice (27 pieces) have an average of 5.26 signs, and offertories that classify there three or more times (7 pieces) have an average of 11.15 signs. See: Maessen (2023), Chapter 11, *Het Mozarabisch melos en andere tradities*, pages 86-108 (co-authored by Peter van Kranenburg and Darrell Conklin) and Appendix D, *De Gregoriaanse offertoria (GRE)*, pages 224-231.]

18. [Leo specifically refers to the “improvisational” character of the alleged microtones. See e.g. Lousberg (2018), *Volume I*, pages 196 & 200. However, why notate things that should be free of choice? Especially where related manuscripts notate much of the same phenomenon at different locations; on which both De Loos (1996), page 186, and Lousberg (2018), *Volume I*, page 62, agree.]

34. Rupert Fischer (1985), *Offertoriale Triplex*, Abbaye Saint-Pierre de Solesmes.

40. The lack of a visual score with horizontal lines sometimes seems to be compensated with the special signs. The special signs in Leo's six manuscripts, i.e. including the special neumes on lines, are therefore rather relicts of the added letters from the a-diastematic period then witnesses to a “lost performance practice”. These relicts became less and less relevant as staff notation advanced. When “square” notation in the West and “horseshoe” notation in the East became the standard after 1200, the “special signs” disappeared. I think the novelties of William of Volpiano and Guido of Arezzo gradually imposed a tonality on Gregorian chant that never existed before the year 1000. Presumably the semitone was much larger than in our equal temperament. Probably there were regional differences between the size of these semitones, perhaps with different

types of ornamentation (see notes 13 above and 42 below). Here are 28 passages from the offertories, each with at least three nearly consecutive special signs. Each underlined syllable has one or more special signs. The passages are in the order of *Dijon* with slashes between the mode pairs. Between brackets page and line in the *Offertoriale Triplex*: *filios hominum* (73.6); *adipsum ore meo* (73.6); *laetitia* (164.4); *plaudite manibus* (76.4); *in terram fluentem* (61.7); *de terra Aegypti* (62.8); / *cornu arcum scutum et gladium* (56.4); *et obedientes me disperdidisti* (44.1); *Michael* (109.3); *investigasti* (129.9); *doce me facere voluntatem tuam quia Deus meus es tu* (51.7); *Deus laudem meam ne tacueris* (38.2); *quia os peccatoris et dolosi super me apertum est* (38.3); *sperent in te omnes* (85.6); *quia ecce venio et* (12.5); *qui ambulat in lege Domini* (29.1); *eius in toto corde exquirunt eum* (29.3); *contemptum quia mandata tua* (29.5); *confortamini et* (9.7); *non pusillum vobis certamen praestare* (10.8); *vocabitur nomen* (11.3); / *ut sciant quia manus tua* (75.2); / *et non egrediebar* (113.10); *simul contristare* (49.5); *et vultus vestri non erubescant* (104.1); *veritatem tuam in ecclesia* (138.6); *apparuit ei Dominus* (160.3); *et collaudaverunt Dominum* (160.9).

41. [...] In the *Dijon* mi-mode graduals I found 95 special signs (46 x T<sub>2</sub>, 11 x T<sub>3</sub> and 38 x T<sub>4</sub>). [With three exceptions all are in line with the trend of Fig. 6 and 7. The exceptions can be found on the word *adiutor* in the gradual *Tibi Domine*. This word seems to provide the only real argument that the signs refer to microtones]. [...] In the tone letters of *Tibi Domine* the word *ad-iu-tor*, has eT<sub>2</sub>-eT<sub>2</sub>-T<sub>2</sub>f which means: sT-sT-TS. In the neumes there is three times a pes (so: low-high). Apparently here is a conflict. This conflict can be solved in several ways. 1. The introduction of microtones. 2. The introduction of a unisono-pes. 3. The observation that there are many frictions between tone letters and neumes. I prefer the third option. In fact, this is the core of my criticism of the semiologists' restitutions (see my 2008 study on the unisono-porrectus). Both letters and neumes have their own meaning and expressive power. It seems inappropriate to resolve frictions between the two with wild speculations. The crucial point here is that these frictions are marginal exceptions. If we ignore the neumes, we can read sT-sT-TS as: ee-ee-ef. If we consider the notes erroneous, we can also interpret the neumes as: ef-ef-ef. The former does not match the neumes and many manuscripts, the latter does not match the tone letters, but it is clear that such frictions, although exceptional, are much more common in the repertoire. [...]

42. There are of course ambiguities here. The letters a and s could also be interpreted as referring to "microtones". After all, what does "up" mean here? Is it "high enough" or "higher than usual" (a different tone)? If we see the letters as referring to "other" notes, we have a problem with all intervals that are not minor

seconds. But there these letters are also common (see Fig. 4). That makes “microtones” implausible. If you mean microtones, it seems logical to refer to them explicitly, for example with a p [...]. Fig. 4 shows only one p [...] immediately followed by an e. However, that p does not refer to a special sign, but to a trigon [...] in my view one of those figures the semiological movement misinterprets. As the neumes of both *Einsiedeln* and *Laon* clearly suggest, the trigon is not do-do-si, but si-do-si or, si+-do-si. [...] It is striking that all these phenomena (the special signs, the unisono-porrectus and the trigon) relate to the semitone and the transition in notation [...] it also relates to Gregorian modes (mi-modes in particular) and makams, ragas and echoi. A excellent topic for further research. See: Charles M. Atkinson (2009), *The Critical Nexus - Tone-System, Mode and Notation in Early Medieval Music*, Oxford University Press; Oliver Gerlach (2011), *Studies of the Dark Continent in European Music History - Collected Essays on Traditions of Religious Chant in the Balkans*, Aracne editrice, Rome; [...] However, in my view, the observations of Wouter Swets should be leading.

47. Based on the assumption that the special signs refer to microtones, Leo's theory may be defensible. But it is important to critically question assumptions. After all, absurd assumptions can lead to absurd consequences. Not only with deadly viruses and climate change due to CO<sub>2</sub>. A theory about a lost performance practice that never existed may be less dramatic than lockdowns or CO<sub>2</sub>-taxes, but absurdities can pile up and cause truly Orwellian situations. This is no different in the world of Gregorian chant. At this point I would therefore like to thank Leo. It is because of his theory, that I started to delve into this matter.

### **Appendix: Tone system and modality (Wouter Swets)**

*This text was published in Dutch as: 2 Toonstelsel en modaliteit, (pages 129-130), in: Wouter Swets, Gregoriaans en Mediterrane monofonie, [Tijdschrift voor Gregoriaans \(1994-3\)](#), pages 124-133*

The tonal system of Gregorian melodies as we know them today has eight different tones: the diatonic series c d e f g a b with an added b-flat. Nowadays these tones are intoned according to our equal temperament, but this did not yet exist in Antiquity and the Middle Ages. Eight tones from the Pythagorean spiral of fifths may have been used at that time, tones that can easily be achieved via tuning in perfect fifths or fourths on stringed instruments. According to that tuning, the e and b in particular sound a bit higher than we are used to. The tonal series contains three major thirds: c-e, f-a and g-b, with a frequency ratio 81/64,

which when played simultaneously produce greater dissonance than our equal temperament major thirds. In addition, the ancient Greek theory also knows major thirds of  $5/4$  frequency ratio, which together produce a consonant and, if thus intoned above the c and the g, form the tonal series c d e- f g a b- c. These e- and b- are significantly lower than our e and b and differ from the e and b of Pythagoras by a syntonic comma,  $81/80$  frequency ratio or  $\pm 21.5$  cents, which is more than  $1/10$  of a tone. By continuing the Pythagorean spiral of fifths downwards, as in the current Turkish theory, one reaches a fes and a ces, which are almost identical to the e- and b- discussed above, but differ from the Pythagorean e and b a Pythagorean comma or  $\pm 23.5$  cents.<sup>3</sup> According to current Greek-Byzantine theory, the major third is intoned even lower, namely as  $243/196$ , i.e.  $49/48$  or  $\pm 35.5$  cents =  $\pm$  one and a half Pythagorean comma lower than the Pythagorean third. The Arabs already mention in their early theory an even lower e- and b- of  $27/22$ , which are  $33/32$  or 53 cents, so more than a quarter tone lower than the Pythagorean e and b. The phenomenon of e- and b- is characteristic of Turkish and Arabic traditional art music, of Greek-Byzantine church music and that of other Eastern Christians and in the folk musics of the Eastern and Southern Mediterranean basin. The intonation of the e- and b- differs per region and culture, but good musicians stick to the local intonation. It is undeniable that the e- and b- are considered basic tones in all these cases, in other words, these e- and b- are the substitutes for the e and b in neighboring related cultures. If an e-/b-/culture also uses an e and a b, as in Turkish and Arabic, they are perceived as chromatic increases of the "normal" e- and b-. Nowadays, modes with all their melodic features easily move from a heavily lowered e-/b-/practice to a lighter or less lowered e-/b-/practice in another area and from there to an equal temperament e/b/practice in the now westernized parts of the Balkans. For the performance of Christian singing in antiquity, the key question is whether the lowered e and b not only occurred in theory but also in practice and were "common". Why not? Considerations of consonance or dissonance of the thirds do not play a role here because it is monophonic song. Moreover, modal moves as outlined above are also plausible for antiquity. The fact that e- and b- are largely absent only in the most westernized countries of the Mediterranean speaks volumes. Performance of Gregorian chant with e- and b- is therefore probably much closer to early Christian practice than performance according to the Pythagorean tuning with e and b. There is no reason why the early Christian practice of intonation could not have continued throughout the monophonic era.

3. See for example: D'Erlanger, R.: *La musique arabe* t. V, p. 27, fig. 8, et al.