graphic duplication of pitch and partly an indication of phrase articulation which duplicates the beaming of note symbols; (5) the pause sign; (6) the pedal release sign; (7) the *staccatissimo* signs; and finally two suggestively graphic signs, (8) the spread-chord indication in bar 1, and (9) the decrescendo and crescendo signs.

From this it can be seen that staff notation is a complex multiple hybrid system with very low redundancy, partly technical and tablature-like, partly representational.

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III. History of Western notation

1. Plainchant: (i) Principal characteristics of neumatic notation (ii) The earliest neumatic notation (iii) The origin of the neumes; accents and cheironomy (iv) Styles of neumatic notation (v) Gothic and square notation (vi) Alphabetical notation (vii) Staff and clef (viii) Rhythm (ix) Rhythmic interpretation. 2. Polyphony and secular monophony to *c*1260: (i) Neume patterns in Aquitanian polyphony (ii) The system of modal rhythm (iii) Currentes, plica, rests (iv) Modal rhythm in practice (v) Organum duplum, irregular modes, pre-modal rhythm (vi) English practice (vii) Mensural notation, 'pre-Franconian' practice (viii) The rhythmic interpretation of polyphonic and monophonic conductus (ix) The rhythmic interpretation of secular monophony. 3. Polyphonic mensural notation, *c*1260–1500: (i) General (ii) Franconian notation (iii) French 14th-century notation (iv) Italian 14th-century notation (v) Late 14th-century notation (vi) English 14th-century notation (vii) 15th-century notation. 4. Mensural notation from 1500: (i) General (ii) Notes: shapes, colours, abbreviations (iii) The division of time (iv) The joining and separation of notes (v) Clefs, staves, leger lines (vi) Accidentals, key signatures (vii) Dynamics (viii) Scores; harmonic and descriptive notations. 5. Alphabetical, numerical and solmization notations: (i) Keyboard tablatures (ii) Tablatures for plucked string instruments (iii) Tablatures for other instruments (iv) Vocal notations. 6. Non-mensural and specialist notations: (i) 20th-century non-mensural notation (ii) Musical shorthand (iii) Notation for the blind (iv) Cryptography.

1. PLAINCHANT. The various styles of neumes are described in detail in NEUMATIC NOTATIONS, where illustrations of each are given, with maps of the areas where each was prevalent. The following section is concerned with the concept of neumatic notation, the impulses behind its development and the stages of its diffusion; in addition, alphabetical notation is discussed. The chief sources of plainchant are described in SOURCES, MS, §II.

(*i*) *Principal characteristics of neumatic notation.* Neumes are graphic signs indicating melodic movement, or repetitions of the same pitch. The basic neumes of Western notations signify respectively: a note of higher pitch than one or both of those next to it (*virga*); a note of lower pitch (*punctum* or *tractulus*); two notes in ascending (*pes* or *podatus*) or descending (*clivis* or *flexa*) order; three notes in ascending (*scandicus*) or descending (*climacus*) order; three notes of which the middle one is higher (*torculus*) or lower (*porrectus*) than the other two. For repetition of the same note either *virga*, *punctum* or *tractulus* might be used. *Virgae* might be used in pairs or groups of three; so might the *apostropha* (in St Gall notation, but less so in others, and not in Lorraine, Breton or Aquitanian notation; Lorraine and Aquitanian notation each used only one basic single-note neume, respectively the *uncinus*, meaning 'hook' or 'barb', and shaped like a sickle, and the *punctum*, meaning 'point' or 'dot').

These neumes are combined to form other more complex ones. Although the possibilities for this are theoretically unlimited, no compound neume usually exceeds eight or nine notes, and extended melismas are usually represented by a series of one- to five-note neumes, graphically distinct. (This is because of the system's connection with cheironomy; but it is also intrinsic in the music's phrase structure.)

There are also neumes indicating liquescence (semi-vocalization of certain notes because of text articulation), and ornamental neumes whose meaning is now not clear: the *quilisma* (always between two notes a 3rd apart) and the *oriscus* (usually in combination with *virga*, *punctum* or *pes*, or between two notes in ascending order, forming the *salicus*; but it is also found alone – Floros (1970) suggested it was the equivalent of the modern *gruppetto*).

Until neumes were placed, in the 11th century, on staff-lines whose pitches were indicated by clefs, their melodic significance was relative. Neither the intervals within a compound neume nor the interval between one neume and another were precisely indicated. Thus neumes were a memory aid to which the cantor could refer in rehearsal or (less often) in performance of a piece whose characteristic tonality and inflections were already known.

(*ii*) *The earliest neumatic notation.* It is not clear when and where neumes were first used in the West. Anglès (*NOHM*, ii, 106) thought Gregory the Great (*d* 604) must have used notation to aid his work on chant, but if that were so Isidore of Seville (*d* 633), who said melodies could not be written down (*GS*, i, 20), would have known of it. It is more probable that the use of notation is bound up with the musical reform from which arose 'Gregorian' as opposed to 'Old Roman' chant. The two main possibilities here would be: that notation was used by the reforming pope or popes (?Vitalian, *d* 672) and exported to the Franks in Pippin's time (under Stephen II, *d* 757, Paul I, *d* 767, etc); or that notation was first used by the Frankish church, which was in need of a means to help assimilate and propagate Roman liturgy in place of Gallican use. It is unclear whether the Synod of Cloveshoe (in England in 747) referred to notated chants when it spoke of 'cantilenae iuxta exemplar quod videlicet scriptum de Romana habemus ecclesia' ('chants [*cantilenae*] according to the written exemplar, the which we have indeed from the Roman church'). There is no definite proof that Charlemagne (*d* 814) knew of notation, although his 'admonitio generalis' has been interpreted in that way: 'Et ut scolae legentium puerorum fiant: psalmos, *notas*, cantus, compotum, grammaticum per singula monasteria vel episcopia et libros catholicos bene emendate' ('. . . that schools cultivate reading by the boys: psalms, notes [*notas*], chant [*cantus*], the computus, grammar, in each monastery or bishop's school, and accurate versions of catholic books . . .'; Monumenta Germaniae historiae, *Legum*, ii, 1881). Nor can reference to it be found in the writings of his chief liturgical adviser Alcuin (*d* 804), or in what his contemporaries said of Alcuin's work in the scriptoria of Aachen and Tours. A different view, however, was held by Jammers, who spoke of Gallican and Roman notations (both developing continuously from grammatical accents), the ancestors of the Aquitanian and the main French–German notation systems respectively. Floros (1970) proposed a wholesale adoption of Byzantine notational practice by Rome in the second half of the 7th century.

The earliest surviving Western neumes may be those in *D-Mbs* lat.9543, f.199*v*, autographed by Engyldeo when *clericus* at St Emmeram, Regensburg, 817–34. More than 20 pieces survive which have been dated in the 9th century (fig.17, p.346). They are usually priest's, not cantor's, chants. The existence of several 9th-century books of texts of the sung parts of the Mass, without neumes, from important liturgical centres, Corbie, St Corneille of Compiègne, Monza and others (those edited by Hesbert in *Antiphonale missarum sextuplex*, 1935), makes it seem unlikely that there were notated cantor's books at this time (although unnoted text books continued to be produced for many years, e.g. the earliest surviving Sarum gradual, *GB-SB* 149, of the late 12th century). The earliest surviving fully notated books date from about 900 or later (*see* SOURCES, MS, §II): these include the St Gall cantatorium *CH-SGs* 359, the Laon gradual *F-LA* 239, the St Martial troper *Pn* lat.1240, the St Denis gradual and antiphoner in Mont-Renaud and the Breton gradual *CHR* 47. The earliest definite references to neumes are by Aurelian of Réôme (*d c*850; *GS*, i, 55ff) and the author of *Musica enchiriadis* (?*c*860; *GS*, i, 153f). Hucbald already knew of different styles of notation before the end of the 9th century (*GS*, i, 117).

The beginnings of this increasingly documented activity might therefore seem to lie near the beginning of the 9th century. Opinions continue to vary on the amount of the repertory it was possible to transmit orally and the number and nature of lost sources.

(*iii*) *The origin of the neumes; accents and cheironomy.* Although it might be argued that the functional demands on the notation system were sufficiently strong to initiate development without drawing upon any pre-existing system, scholars have usually sought a point of departure to explain the origin of the neumes. The accent system of Alexandrine grammar (see Laum, 1920, 1928) has frequently been cited as a possible 'ancestor' e.g. by Mocquereau, PalMus [all references to 1st ser. unless otherwise stated], i, 96; Suñol, 1925, Fr. trans., p.23; Cardine, 1968). The acute accent would have given rise to the *virga*, the grave accent to the *punctum* or *tractulus*, and the circumflex to the *clivis* or *flexa*. In spite of this, the grave accent is hardly recognizable in most notations, except Palaeo-Frankish neumes, where it signifies not one but two notes, i.e. the *clivis*. Only one medieval treatise explains neumes as accents in this way, the anonymous 11th-century *Quid est cantus* (*I-Rvat* Pal. lat. 235; see Wagner, 1905, 2/1912, p.355), in phrases such as: 'De accentibus toni oritur nota que dicitur neuma . . . Ex accentibus vero toni demonstratur in acuto et gravi et circumflexo' ('from accents there arise tones [*toni*], the written sign [*nota*] which is called a neume . . .'). Aurelian of Réôme called two notes in ascending order 'accentus acutus' (the Palaeo-Frankish *pes*), and three notes where the middle one is higher than the others 'circumflexio' or 'circumvolutio' (the Palaeo-Frankish *torculus*). The latter expression hints at the practice of cheironomy, as do 'anfractus' or 'inflexio' for two notes in descending order, 'arsis' for a single higher note, 'thesis' for a single lower note, and 'manus verberans' or 'repercussio' for note repetition.

Cheironomy, the use of hand movements to indicate melodic movement, is extremely ancient (*see* CHEIRONOMY) and is well attested in the Western church (see Huglo, *RdM*, 1963). The word *neuma* is Greek and means 'gesture', as in the *Liber de ordine antiphonarii* (before 844) of Amalar of Metz (ed. Hanssens, iii, 55): 'Cur, inquam, in isto versu neuma facis, cantor? Inquit: quia haec missio manus et tactus oris per intellectum debent conspici' ('Why, I said, do you make a *neuma* in this verse, cantor? He said: Because this that is sent by the hand [i.e. a gesture] and sensed by the head should be perceived by the intellect'). *Neuma* in the Middle Ages usually meant a short melodic passage; the single sign on parchment was *nota*; the single sound was *sonus* or *phthongus*. *Neuma* as 'neume' in the modern sense was a less common usage, although it is found in Berno of Reichenau (*GS*, ii, 64, 79f), and occasionally in Guido of Arezzo; it was adopted for the *tabulae neumarum* of the 11th–14th centuries (see Huglo, 1954) and passed thence into modern terminology.

The idea of neumes as the written counterpart of what it is assumed were a cantor's gestures in directing a choir is difficult to substantiate, since there is no detailed information on the component gestures of Western cheironomy. The predominance of curvilinear shapes in such manuscripts as those of St Gall is nevertheless suggestive (Spanish neumes also suggest cheironomy graphically). Each separate neume is of such dimensions as could be comprised within a movement of the arm: for extended melodies series of neumes were used.

Jammers has carried the theory of derivation from classical prosody signs to the greatest lengths, seeing derivations here also of the *spiritus asper* (as *oriscus*) and *spiritus lenis*, the *hyphen* (liquescence), *apostrophos* (*apostropha*) and *diastole* (*quilisma*). Floros has postulated far-reaching correspondences between Palaeo-Byzantine notation of the Chartres type (in itself largely reconstructed by him, 1970) and Latin neumatic notation, including the liquescent and ornamental neumes and significative letters.

(*iv*) *Styles of neumatic notation.* Since Ferretti (1925) a distinction has frequently been made between point neumes (Fr. *notation en points*, *notation à points détachés* or *liés* or *superposés*; Ger. *Punktneumen*), where each note is represented by a different pen-mark and sometimes by a short stroke rather than a dot (albeit grouped into 'neumes'), and accent or stroke neumes (Fr. *neumes en accents*; Ger. *Akzent-* or *Strichneumen*), which are written without the pen's leaving the page. Aquitanian notation, for instance, is almost entirely disjunct, but the second and third notes of the *torculus* are joined. Spanish and Bolognese notations are almost entirely of strokes, but use a disjunct form for the *scandicus*. A broader distinction has been drawn between two main 'families' of notations: that favouring a disjunct style (Palaeo-Frankish, Breton, Aquitanian, Lorraine, Nonantolan) and those favouring conjunct forms: German (St Gall), French, Bolognese, north Italian generally.

Hypotheses to account for these distinctive styles were given fresh impetus by the publicizing of

TABLE OF EXTANT EXAMPLES OF 9TH-CENTURY NOTATION

Source	*Provenance*	*Notation*	*Main contents - notated pieces*	*Facsimiles*
F-AUT S4 (5)	Flavigny	Fr.	evangeliary	Jammers: *Tafeln* (1965), 107
F-AUT S28 (24)	Autun	Fr.	Cassian - adds. incl. sequence tunes	Günther, *AMw*, xix (1962), 9
D-B theol.lat.2°58	Lorsch	Ger.	psalter - *Carmina Boethii*	Jammers: *Tafeln* (1965), 79; Jammers (1975), pl.1
D-DÜl D1	Corvey	Palaeo-Frankish	sacramentary - mass chants	Jammers: *Tafeln* (1965), 133; Stäblein (1975), 107; 'Notation', *MGG*, Abb.12
D-HEu Pal.lat.52	? Weissenburg	Ger.	Otfrid: *Evangelienharmonie* (old-High German)	Jammers: *Tafeln* (1965), 81; Jammers (1975), pl.2
D-LEm Rep.193	? nr. Trier	Fr./Ger.	misc. music, incl. all. series	Stäblein (1975), 111
D-Mbs lat.9543	St Emmeram, Regensburg	Ger.	Ambrose - all. prosula *Psalle modulamina*	*IMSCR*, vii *Cologne 1958*, 252; 'Notation', *MGG*, Abb.15; Jammers: *Tafeln* (1965), 73
Munich, Hauptstaatsarchiv Abt.I Holzen KL104	?Benediktbeuern	Ger.		
I-Nn IVG68	St Gall	Ger.	sacred and secular Lat. songs	Jammers, *Festschrift Bruno Stäblein* (Kassel, 1967), 136
F-Pn lat.2291	St Amand	Pal.	sacramentary - Gk. *Gloria*	Handschin (1950), 73; Jammers: *Tafeln* (1965), 129
I-Rvat Ottob.313	St Denis	Fr.	sacramentary - *Exultet*	
I-Rvat Reg.215	Fleury	Fr.	Gk. and Lat. *Gloria* and *Credo*	Bannister (1913), pl.10
I-Rvat Pal.485	Lorsch	Ger.	misc. liturgical matter - *praeconium paschale*	
CH-SGs 242	south Germany	Ger.	Sedulius *Carmen paschale*	F. Steffens: *Lateinische Paläographie* (Freiburg, 1903), pl.49
St Omer, Bibliothèque municipale 666	St Bertin	Pal.	Lamentations	
F-TO 184, *Pn* lat.9430	Tours	Fr.	sacramentary – mass chants	PalMus, 1st ser., iii, pl.181; Suñol (Fr. trans., 2/1935), pl.49
F-VAL 148 (141)	St Amand	Pal.	Aurelian of Réôme: *Musica disciplina*	Jammers: *Tafeln* (1965), 131
F-VAL 150 (143)	St Amand	Pal.	Lat. and Fr. *Cantica virginis Eulaliae* - practice pen-strokes	
F-VAL 337 (359, 325)	St Amand	Pal.	*Musica enchiriadis* – 'Noannoeanne'	Smits van Waesberghe (1969), 105
A-Wn Vienna 958	north-east France	Fr.	sacramentary	R. Beer: *Monumenta palaeographica v indobonensia*, 2nd ser., pls.37–46 (Leipzig, 1913)
A-Wn series nova 3645	south-east Germany	Ger.	antiphoner (4 folios survive)	Stäblein (1975), 183

Palaeo-Frankish notation by Handschin in 1950 (it had never been dealt with by the Benedictine Fathers of Solesmes). Mocquereau and Ferretti felt that the system of stroke neumes, going back to classical accents, was older and more widespread, and that mixed styles and point neumes were the result of a progressive evolution from this primitive system. Implicit in this view is the idea that point neumes are innately more diastematic, more precisely indicative of pitch relationships. A refinement of the latter idea has been developed by Jammers, who has argued that the disjunct style of Aquitanian notation could cater not only for pitch differentiation but also for rhythmic differentiation by use of the *punctum* (short) and *tractulus* (long) – an idea first mooted by Cölestin Vivell (*Gregorianische Rundschau*, xi, 1912). Such possibilities were only gradually mastered by scribes practising stroke notation, by use of significative letters to clarify pitch and added strokes to indicate long notes. But Jammers does not see one style evolving from the other but, rather, independent origins, point notation being originally associated with the Gallican church, stroke notation with the Roman. Handschin (1950, pp.81ff) also spoke of pre-Carolingian practice on the one hand and a "'gregorianische" Neumensippe' on the other; and, recollecting Wagner's opinion (ill-founded, however, in 1912, when Palaeo-Frankish notation was unknown) that accent notation was a degenerate offshoot of point notation, he hazarded that accent notation might have developed from notation of the Palaeo-Frankish type and been given a 'humanistic' stamp with reference to the classical accent system.

It seems unlikely that any of these hypotheses will be proved conclusively. The earliest surviving sources of either family are of equal antiquity, and theoretically either can be derived from the other. If Floros is correct in suggesting Roman adoption of Byzantine neumes, then accent notation did not derive from point neumes.

Palaeo-Frankish neumes appear to have been used in an area, with St Amand as its possible centre, that includes several important monasteries of Picardy and Hainaut: Corbie, St Bertin, Anchin, Marchiennes. They are last found in St Amand in the 12th century (see Hourlier and Huglo, 1957).

Breton neumes are held by most modern scholars to derive from Palaeo-Frankish. Their original area of prevalence is not clear, since the primitive stages of several other notations (principally the point notation family) contain forms similar to Breton neumes. It is difficult to decide whether such resemblances are due to a general evolution of other styles from a Breton-type primitive state (Huglo, *AcM*, 1963, p.82, thought it could have been propagated throughout the Carolingian realm; Tours is a possible headquarters. Stäblein, 1975, p.30, spoke of it as a pan-Carolingian counterpart of Carolingian minuscule script), or coincidental, the natural result of the use of very simple graphic designs. More or less 'classical' Breton notation is found in sources from Pavia of the 10th–11th centuries. Huglo's survey of sources in Breton notation shows a progressive retreat from the south-west (e.g. certain features of *F-Pn* lat.1120, 1240, 2135, 5552, from St Martial, Limoges), the Loire valley (e.g. *O* 72, from Fleury, with the organal voice for a tract, a concordance with the Winchester Troper, see Stäblein, 1975, p.29, n.228), Chartres, Maine and Normandy south of the Seine. It was also imported into south-west England (the Sherborne Missal, *Pn* 943; *GB-Lbm* Harl.1117; *I-Rvat* Reg.204; the Leofric Missal *GB-Ob* Bodley 579). It was superseded by French notation in Angers by the turn of the millennium; it survived in the backwater of Brittany to the mid-12th century.

Neither Palaeo-Frankish nor Breton notation distinguished between different ornamental neumes, having no discrete signs for *quilisma* and *oriscus*. This has been connected with the remarks of Johannes Hymmonides (John the Deacon, of Rome) who, in his biography of Gregory the Great (written 874–5), ridiculed in picturesque language the difficulties of German and French singers in reproducing correctly the 'modulationis duliidinem' of the 'true Gregorian chant' (*PL*, lxxv, 1849, p.90). Certainly south Italian notation is richer in ornamental neumes than any other. Adhémar de Chabannes (of Angoulême), writing in the first half of the 11th century, spoke of the adoption of Roman chant by the French: 'excepto quod tremulas vel vinnolas sive collisibiles vel secabiles voces in cantu non poterant perfecte exprimere Franci, naturali voce barbarica frangentes in gutture voces potius quam exprimentes' ('except that the French could not produce perfectly the tremblings or sweet subtleties and the notes to be elided or separated, being naturally of barbaric voice, and rather cracking their voices in their throats than projecting them'; Monumenta Germaniae historiae, *Scriptores*, iv, 1841, p.118). Apart from south Italian books, those of St Gall are richest in ornamental neumes and other subtleties. French books less so. This aspect of notation has also been used in the controversies over the genealogy of neume styles.

The area in which Lorraine (or Messine) notation was used, north-east France and Belgium, includes all the centres from which Palaeo-Frankish sources are known (except the importation to Corvey). Stäblein (1975, p.41) saw it as the direct descendant of Palaeo-Frankish notation. It was also used in the area of Lake Como, and imported into Austria in the late 11th century (see PalMus, xviii, 33; Hourlier, 1951, is a survey of 450 sources).

Elsewhere in German lands, however, German notation predominated (also known as St Gall notation after some of its most sophisticated and earliest surviving representatives). In its early stages, particularly in manuscripts from the Rhine–Moselle area, it is not always easy to distinguish from French notation, and there seems little doubt that this notation family is closely associated with an important archetype of 'Gregorian' liturgy and music (whose original home is both the object of research such as that in *Le graduel romain* and *Corpus antiphonalium officii*, and the subject of the controversy surrounding Gregorian and Old Roman chant). In later sources the division between French and German styles became quite wide. Corbin's work on French scriptoria (*La notation musicale neumatique*, diss., U. of Paris, 1957) has not yet a counterpart for German manuscripts or north Italian ones, in which the relationships might be clarified.

(*v*) *Gothic and square notation*. From the 13th century nearly all notations of the German Empire, i.e. much Lorraine territory, were affected by a change to what is known as 'Gothic' notation. This was caused by the use of an increasingly thick, square-nibbed pen, held at 45°. Curves were replaced by a strict arrangement of horizontals, diagonals and verticals. The Lorraine miniature

Fig.18 TABLE OF ALPHABETIC SERIES

	A	F		C	G		K	D	L		M	N		X	E					Boethius (*De institutione musica*, iv/5): notes in order as measured on monochord
	A	B	C	E	H	I	M	O	X	Y	CC	DD	FF	KK	LL					Boethius (ibid., iv/6–11): diatonic series extracted from chromatic and harmonic
		A	B	C	D	E	F	G	H	I	K	L	M	N	O					Boethius (ibid., iv/14): series used in representing quartal, quintal and octaval structures, beginning with *hypate-hypaton*
	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P					Boethius (ibid., iv/17): diatonic series in isolation
																				Hucbald (*GS*, i, 110)
	A	B	C	D	E	F	G	A	B	C	D	E	F	G	A					*Musica enchiriadis* (*GS*, i, 161)
			A	B	C	D	E	F	G	H	I	K	L	M	N	O	P			Hucbald (missing from *GS*, i, 110)
																				Scolica enchiriadis (*GS*, i, 184, 209)
	F	G	A	B	C	D	E	F	G	A	B	C	D	E	F					Hucbald (*GS*, i, 118)
Γ	A	B	C	D	E	F	G	a	b♭	c	d	e	f	g	a					*Dialogus de musica*
	A	B	C	D	E	F	G	a	b♭	c	d	e	f	g	aa	bb	cc	dd	(ee)	Guido of Arezzo
	a	b	c	d	e	f	g	h	*i*	k	l	m	n	o	p					Guillaume de Dijon
G	*A*	*B*	*c*	*d*	*e*	*f*	*g*	*a*	*b*	*c′*	*d′*	*e′*	*f′*	*g′*	*a′*	*b′*	*c″*	*d″*	*e″*	modern use

sickle (the 'Fliegenfuss' or 'fly's foot' shape) used for a single note practically lost its up-strokes and became a lozenge-shaped *punctum*. The *virga* of both notations became the 'Hufnagel' ('hobnail'), a broad lozenge with a thick vertical tail (in the Lorraine area, only in compound neumes).

French notation followed a similarly stylized path. From the 11th century there was a tendency to mark the top of *virga* and *pes* with a small left-facing head. Eventually each note of a neume was transformed into a regular square, joined to other squares by thin vertical lines. The *virga* had a tail, the *punctum* was without; the *climacus* was disjunct, a *virga* followed by lozenges, the only neume to use them. For the first two notes of the *porrectus* a descending diagonal stroke was used, the only neume to use one. This square notation, still used in modern chant books, was first developed in the Ile de France in the late 12th century; it spread throughout France, and eventually Italy too, where it was adopted by the Franciscans. Hesbert (Monumenta musicae sacrae, ii, 1954) demonstrated the change from north French to square notation within one scriptorium, Jumièges (his table is reproduced in *MGG*). Palaeographical differences did of course remain from one area to another, particularly between Aquitanian and Lorraine notations in transition – the disjunct/conjunct *scandicus*, the left/right-facing *virga* at the top of the *climacus*, the left/right-facing last note of *pes* and *porrectus*, the square or the lozenge used for a *punctum*, and other features.

Beneventan notation (the earliest surviving examples, such as the gradual *I-BV* VI 33, are from shortly before 1000; the notation fell into disuse in the 14th century) also developed a style characterized by use of a broad-nibbed pen held at 45°, with neumes composed of lozenges and vertical, diagonal and horizontal strokes. Some of the earliest manuscripts already display these proto-Gothic features (e.g. the Monte Cassino sacramentary *I-MC* 339, from the third quarter of the 11th century; facs. in PalMus, ii, pl.19; Suñol, 1925, Fr. trans., pl.47; Jammers, *Tafeln zur Neumenkunde*, 1965, p.93).

The tendency behind all these changes was to make the diastematy (i.e. the vertical positioning of the neumes on the page so as to indicate relative pitch) clearer and the neumes more amenable to disposition on the staff. In square notation the neumes have become known as ligatures, since many consisted of squares 'tied together' by thin lines – an obvious rapprochement with point notation.

(*vi*) *Alphabetical notation*. This was rarely applied in everyday music; but since it progressed from theory books to the staff notation of Guido of Arezzo it should be discussed before the latter. The alphabetization of the individual notes of the scale was at first a purely theoretical prodecure. It was intimately connected with the use of the monochord as a teaching instrument, which dated back to Greek antiquity. Boethius (*c*500), whose knowledge of Greek theory came from Porphyry's translation of Ptolemy, demonstrated several features of the Greek *systema teleion* (Greater Perfect System) by this means. For instance, starting from the lowest note of the monochord he gave instructions for finding the different lengths of string necessary to produce different notes, not in scale order. When Boethius juxtaposed each note of the diatonic, chromatic and harmonic genera of the *systema teleion* in a continuous series, and gave a letter name to each, the diatonic series would read A, B, C, E, H, I, M, O, X, Y, CC, DD, FF, KK, LL. Alphabetized in isolation, the diatonic genus read from A to P. The diatonic genus corresponded in interval structure to the medieval *tonus deuterus* (modern *A–a′*).

In the late 9th century Hucbald reproduced this series, among others. Again as a theoretical idea only, the earlier *Musica enchiriadis* (?*c*860) had used a repeating series A–G, A–G, A to represent the same series. But a different system (again a continuous series A–P) was already in practical use in the 9th century. It was recorded by Hucbald and by the *Scolica enchiriadis* (also late 9th century) and was used in instructions for monochord tuning and the construction of organs and bells. In this series 'A' designated not modern A but modern C, i.e. the interval pattern corresponded to the modern major scale, with the semitones between the third and fourth notes and between the seventh and eighth notes: between C and D, G and H of this 'instrumental' notation as it is usually called, not, as in the other, 'vocal' notation between B and C, E and F. Holschneider has found the only example of practical use of this 'instrumental' alphabet in the famous

Winchester Troper (*GB-Ccc* 473: see *Die Organa von Winchester*, 1968, p.89 and pl.1).

The addition of a lower F and G to the 'instrumental' alphabet accommodated it to classical theory, and the series F–G, A–G, A–F resulted, used frequently in monochord prescriptions, and reported by Hucbald and Notker Labeo (*c*1000). The last stage in the 'vocal' system was the addition of a Greek *gamma* to represent a note one tone lower than the lowest A. It was first mentioned in the *Dialogus de musica* (late 10th century; formerly attributed to Odo of Cluny, 879–942). Fig.18 shows the interval structure of each of these series in relation to the modern pitch series.

Another series used in the alphabetical representation of pitch was the Daseian letter series, first used in *Musica enchiriadis*. Each sign is derived from the Greek *daseia* prosodic sign (indicating 'rough breathing', e.g. 'h' at the beginning of a word). A basic set of four signs corresponds to the notes of a tetrachord with the semitone as the middle interval; the signs are repeated for transpositions of the tetrachord, in reverse, inversion and reverse inversion (see fig.11, p.342, and fig.19). It is famous for its use for the incipit of a two-voice version of *Rex celi Domine* (a non-liturgical sacred sequence, where the same music is used for both halves of the text; *see* SCORE, fig.1).

Finally, reference should be made to manuscripts where the interval relationships between notes are indicated by using the letters T[onus] and S[emitonus], or combinations of them. These are found on the staves of some examples in *Musica enchiriadis* and were used in music examples in the works of HERMANNUS CONTRACTUS (see illustration in that article), Frutolfus of Michelsberg and Johannes Afflighemensis. A dot under the letter denoted a descending progression. Frutolfus used a letter to give the starting-note of each piece.

Hucbald showed particular concern over the ambiguities of neumatic notation in the matter of pitch. He weighed up the advantages of both neumatic and alphabetical systems, giving an example in each: the pitches were only generally discernible from the neumes, but exactly so from the letters; on the other hand, letters conveyed no rhythmic nuances ('tarditatem cantilenae'), no ornaments ('tremulam sonus'), liquescence or phrasing (*GS*, i, 118):

> So if these little letters be placed for each separate sound above or next to these [neumes] that we take as musical notes, perception will flow forth perfectly and without any error or harm to truth: for, however the voice is to be raised or lowered, this is indicated; and likewise the subtleties [*varietates*], without which no song fitly proportioned is composed, are firmly fixed in the mind.

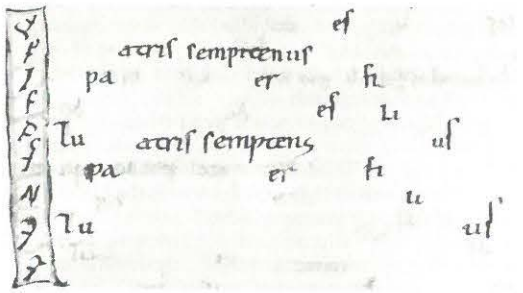
Hucbald's concern for correct calculation of intervals was not of course unique, and many chant books of the 10th and 11th centuries show the same careful attitude. Most of the significative letters found in German, Lorraine and Breton notations (also a few in Nonantolan and English books) are rhythmic (see §viii below), but others refer to pitch. They help principally to indicate the intervals between neumes (for a list *see* NEUMATIC NOTATIONS, §II, 3). The St Gall books are particularly rich in them.

The 'vocal' alphabet is in fact found in practical use in an important group of sources stemming from the work of Guillaume de Dijon (William of Volpiano), the Italian abbot of St Bénigne, Dijon, who from Fécamp reformed most of the leading monasteries of Normandy in the early 11th century. The most celebrated extant example of alphabetical notation, the tonary of St Bénigne, *F-MO* H159 (PalMus, viii), may be his work. It is notated in both neumes and letters (a–p, with *i* for *b*♭); little curved lines above the letters correspond to *quilisma* and *oriscus*; further signs used in conjunction with semitones in the scale are thought to indicate quarter-tones, or some ornament or subtlety of voice production involving a quarter-tone (see figs.20 and 21; for discussion see Gmelch, 1911). Examples of dual notation, or alphabetical notation, are not uncommon in 11th-century Norman manuscripts, from Fécamp, Jumièges, England etc (see Corbin, 1954). A Norman example is shown in fig.22.

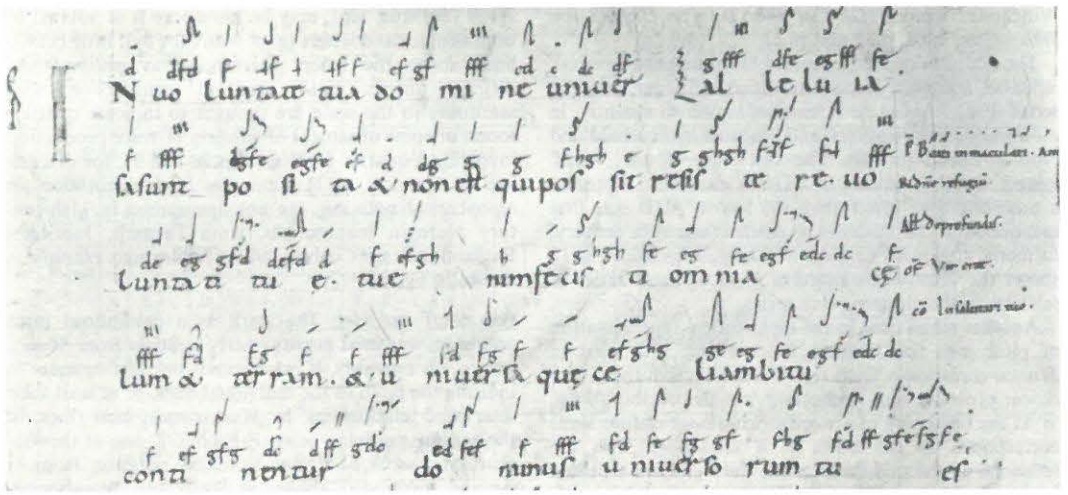
(*vii*) *Staff and clef*. The staff, as a continuous pitch reference, was used in many early treatises from *Musica enchiriadis* onwards. It presupposes one clef or more to indicate the pitch of the individual lines, or at least their intervallic relationship. In *Musica enchiriadis* (facs. of the earliest surviving copy, *F-VAL* 337, one of the 9th-century sources of Palaeo-Frankish notation from St Amand mentioned above, in Smits van Waesberghe, 1969, p.105; ed. in *GS*, i, 156), a five-line staff is used with Daseian letters for each line and an ascending series TSTT confirming the intervals between them. The syllables of 'Alleluia' are split up and set on the different pitch-lines, and a seven-note incipit is thus indicated. The example following that one has an eight-line staff (*see also* SCORE, fig.1).

Such diagrammatic staff and clef combinations are found in many theoretical works. They were too clumsy and wasteful of space for regular liturgical books. The system of GUIDO OF AREZZO, announced in *Aliae regulae* (*c*1030), was eminently practical: its staff had lines only for every alternate note and took up hardly more space than was normally needed by notation *in campo aperto* ('in open field', i.e. without horizontal guidelines); the clef system could take one or both of two forms: the lines might be coloured (Guido preferred a red F line and a yellow C line), and letters from the traditional 'vocal' alphabet might be placed at the beginning of the lines. Learning chant was revolutionized by this system (and its counterpart, the alphabetized hand). The average time it took to learn the repertory, ten years, was reduced to two; unknown melodies could be sung at sight.

Guido's ideas were rapidly taken up in central and northern Italy, northern France and the Low Countries and much of south Germany, where only in certain proud and conservative centres – St Gall, Freising, St Florian, Kremsmünster, Vorau etc – were books still

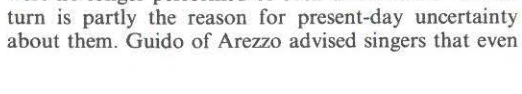


19. Example of organum from the treatise 'Musica enchiriadis' (?c860), prefaced by Daseian letters giving the pitch of each syllable (F-Pn lat.7211, f.10v, detail)

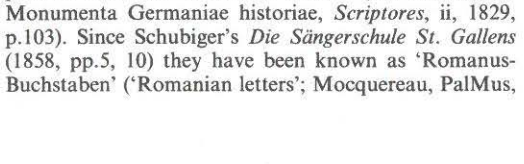


20. Introit 'In voluntate tua' (F-MO H159, f.30r): signs between semitones over '-tate tua'; liquescence over 'universa'; oriscus over 'voluntate'; quilisma over 'posita'

Fig.21 Signs between semitones in *F-MO* H159



The five special signs in this scale always occur linked to the upper note of a semitone, in a *pes* (e.g. *if*), a *clivis* (*f*↓) or a *porrectus* (*f*↓*f*). The sign for liquescence is a semicircle linking the two letters which give the pitches in question. For the *oriscus* a small round hook appears over the letter; for the *quilisma* a wavy line (~) appears over the letter.



22. Alphabetical notation in a lament on the death of William the Conqueror (d 1087) (F-Pn lat.8625, f.33v, detail)

notated *in campo aperto* as late as the 15th century.

Aquitaine was conservative, but less so, and for a different reason. By the mid-11th century its books regularly used a single dry-point line (occasionally coloured), and the point neumes, always tending towards unusually exact diastematy, were by this time precisely heighted: thus a book such as the well-known St Yrieix gradual, *F-Pn* lat.903 (PalMus, xiii), is among the earliest unambiguously readable complete liturgical books. (The early 11th-century Dijon tonary is perhaps the earliest by virtue of its alphabetical notation – the 'spirit of the age' is thus evident in many progressive centres.) The line was often 'keyed' to the mode of the piece notated, a common system being: for the 1st mode an F line, 2nd D, 3rd G, 4th F, 5th A, 6th F, 7th B, 8th G (Stäblein, 1975, p.41, n.372 lists 28 manuscripts). Beneventan notation was similarly slow to take up the Guidonian staff and clef, for the same reason as Aquitanian. Although not far from their place of origin, only in the second half of the 12th century did the staff and clef appear regularly.

The Germans' conservatism was perhaps not merely atavistic. Only German manuscripts retained separate signs for the ornamental neumes after the 12th century (and in many centres they were ignored in the 11th). It has been said that such neumes could not survive the introduction of the staff: calligraphically this view would not be correct. But the medieval psyche is credited with inhibitions about fixing neumes of unstable pitch on to fixed lines. A simpler explanation is that in most centres they were no longer performed or even understood – this in turn is partly the reason for present-day uncertainty about them. Guido of Arezzo advised singers that even liquescence was optional: 'there is no harm in performing them more fully, not liquescing, if you wish: but often it [liquescence] is very pleasant' (*Micrologus*, xv). But liquescent neumes did survive into the 16th century. In polyphonic music using square notation the simple liquescent neume became known as the 'plica' ('fold') after its characteristic notated shape in north France and England. Changes of attitude similar to this abandonment of ornamental subtleties are discernible in the notation of rhythm after the turn of the millennium.

See also STAFF and CLEF.

(*viii*) *Rhythm.* Indications of rhythmic differentiation between notes are found in many 10th- and 11th-century chant books. They take the form of significative letters (already mentioned above in connection with pitch) and modifications of the neumes.

Significative letters are concerned with melody and expression, but mostly with rhythm. (A list following Notker Balbulus's citation of them in a letter to an otherwise unknown monk, Lantbertus, is given in NEUMATIC NOTATIONS, §II, 3.) Ekkehard IV of St Gall (*d* 1036) attributed their invention to Romanus, a Roman cantor who, in 790, with a second cantor Peter, was forced by illness to break a journey to Metz at St Gall. He had brought an authentic antiphoner of St Gregory from Pope Hadrian I, to which he added 'litterae alphabeti significativae'. Notker Balbulus later explained them to 'a certain friend' (i.e. Lantbertus: Monumenta Germaniae historiae, *Scriptores*, ii, 1829, p.103). Since Schubiger's *Die Sängerschule St. Gallens* (1858, pp.5, 10) they have been known as 'Romanus-Buchstaben' ('Romanian letters'; Mocquereau, PalMus, iv, 9: 'lettres romaniennes'). Smits van Waesberghe (1936–42) attributed their invention to Notker. Floros (1970, ii, 134) has connected them with contemporary Byzantine practice, and suggested Byzantine origin (as did Wagner, *Einführung*, 2/1912, p.233). The richest sources of significative letters are the Breton gradual *F-CHR* 47, the Laon gradual *LA* 239, the St Emmeram Regensburg gradual *D-BAs* Lit.6, and three Swiss books – the St Gall cantatorium *CH-SGs* 359, the Hartker Antiphoner *SGs* 390–91, and the Einsiedeln gradual *E* 121, which according to Smits van Waesberghe contain 4156, 12,987 and 32,378 significative letters respectively.

The ways in which neumes were modified varied from type to type. St Gall scribes might use *episemata* (additional short strokes, denoting lengthening), lengthen the *punctum* to a *tractulus* or make curved forms angular (e.g. the *pes*). *F-CHR* 47 and *LA* 239 also have *episemata*, but are chiefly notable for a different way of indicating lengthening: the separation of conjunct neume forms into disjunct ones (Fr. *désagrégation, coupure*; Ger. *Neumentrennung*). Thus the conjunct normal *pes* and *clivis* might separate into two pen-strokes, the *torculus* and *porrectus* into three. For neumes that are normally disjunct, *CHR* 47 uses the *tractulus* for the *punctum*, and *LA* 239 the sickle for the dot. Nonantolan notation uses *episemata* and separation; Beneventan notation uses *episemata*, *tractuli* and separation, and also has angular shapes rounded off to indicate quicker delivery. The principal form of Aquitanian notation used to indicate lengthening is the *tractulus* (*F-Pn* lat.1118, a troper from south Aquitaine, has been the favourite manuscript for investigation; Jammers's theory that Aquitanian notation is the descendant of a Gallican rhythmic notation, whose rhythmic possibilities were emulated by German notation only with difficulty, was discussed above).

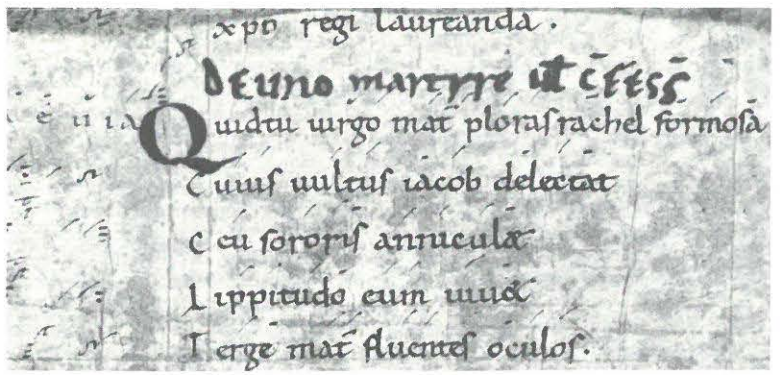
Agreement over rhythmic indications outweighs variance among the manuscripts sufficiently to allow acknowledgment of a common tradition, though even in the closely interrelated south German and Swiss group there are significant divergences (e.g. *CH-SGs* 339 dispenses with letters entirely). These sources are probably the work of cantors not copying mechanically from exemplars but 'editing' according to their own experience (it has been suggested that *E* 121 was sent from St Gall to Einsiedeln as a specially prepared model gradual). Since *SGs* 359, *F-LA* 239 and *CHR* 47 are among the earliest extant sources, their rhythmic tradition may well be related to the putative 'Gregorian' archetype whose restoration is still the motive force behind most research.

(*ix*) *Rhythmic interpretation.* The great controversies since the mid-19th century over the rhythmic interpretation of plainchant have involved two main ideas: first, that the indications cited above were non-mensural nuances of tempo of delivery; and second, that they should be interpreted mensurally, using note values in a simple proportional relationship (crotchet–quaver, or minim–crotchet–quaver) perhaps even grouped into phrases where there is a regular pulse. As Vollaerts (1958) said, the issue is whether or not proportional rhythm of any sort was practised; the method of application of the proportional values is another matter.

As evidence that musicians of the 9th–11th centuries (the period when the manuscripts contained rhythmic indications) thought in proportional terms, the following theoretical writings have been adduced: (i) the group of treatises beginning with *Musica enchiriadis* (?*c*860) and continuing with *Scolica enchiriadis* (*c*900), *Commemoratio brevis* (10th century), *De organo* (10th century) and *Alia musica* (10th century) (*GS*, i, 152, 173, 213; *CS*, ii, 74; *GS*, i, 125); (ii) isolated remarks in *Musica disciplina* of Aurelian of Réôme (*d c*850; *GS*, i, 27; *PL*, cvi, 1521), *De harmonica institutione* of Hucbald (*c*900; *GS*, i, 104), and *Commentum in Martianum Capellam* of Remy of Auxerre (late 9th century; *GS*, i, 63; *PL*, cxxxi, 931); (iii) *Prologus in tonarium* of Berno of Reichenau (*d* 1048; *GS*, ii, 62); (iv) *Micrologus* (chap.15) of Guido of Arezzo (*c*1030; *GS*, ii, 1; CSM, iv), who knew *Musica enchiriadis*, and *De musica* of Guido's pupil Aribo (1068-78; *GS*, ii, 197; *PL*, cl, 1307); (v) *Quid est cantus* (*I-Rvat* Pal. lat.235, 11th century; *Rassegna gregoriana*, iii, 1904; Wagner, 1905, 2/1912, p.355); (vi) *Questiones in musica* (*c*1100; ed. R. Steglich, 1911), mainly compiled from *Musica enchiriadis*, Berno, Guido and Aribo; and (vii) a remark in Johannes Afflighemensis's *De musica cum tonario* (early 12th century; *GS*, ii, 230; *PL*, cl, 1391; CSM, i).

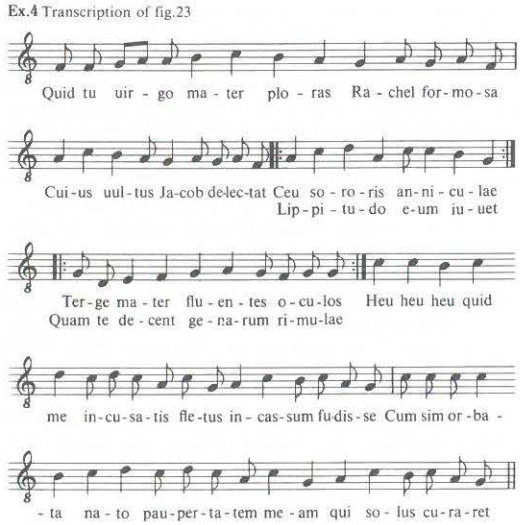
No theorist illustrated his ideas with a chant in melismatic style; all referred to the feet of classical metre. Some spoke of long and short syllables in chant without specifying a simple mathematical relationship between the two (Aurelian, Hucbald and Berno). Hucbald's friend Remy cannot be assumed to refer to chant, but did speak of metric values in the ratio 2 : 1. *Musica enchiriadis* and its successors were more specific: there is a colourful description of the performance of a short antiphon by metrical feet where measure is stamped out by teacher and pupils. But with Guido and Aribo discussion of rhythmic proportions concerns the relationships between short phrases and periods, and there are difficulties in deducing relationships between individual notes. Classical proportion theory, which was usually applied to harmony rather than rhythm, hangs heavily over the discussion. Guido posited identities between harmonic intervals and temporal durations, and Aribo said: 'Jubilation [*jubilatio*] is doubly pleasing when the *neumata* [short phrases] and periods are composed in the same proportion as the sounds themselves that have been selected on the monochord'. The classicizing intent is particularly clear, though the expression confused, in *Quid est cantus*, already noted (§iii above) for its references to prosodic accents. Such ideas are not difficult to apply mensurally to syllabic chants, antiphons and psalms of the Office and Mass, old poetic genres such as hymns (according to Johannes Afflighemensis), and especially the new poetic genres of sequence and trope. Furthermore, apart from Guido and Aribo, all the above writers were Frankish, and, in the case of the author of *Musica enchiriadis* and Hucbald, actively involved in the composition of non-Gregorian sequences, *versus*, tropes, new Offices and also organum.

However, in the manuscripts the rhythmic indications are not restricted to chants in syllabic or neumatic style. It has not been difficult, therefore, for the Benedictine Fathers (Gontier, *Méthode raisonnée de plain-chant*, 1859 – Gontier was a friend of Dom Guéranger of Solesmes; Pothier; Mocquereau, 1908–27, etc) to maintain a non-mensural viewpoint, which sees the rhythmic indications of the manuscripts as nuances (Pothier did not even admit these, treating them as the idiosyncrasy



23. Part of the sequence 'Quid tu virgo', using St Gall neumatic notation with episemata and significative letters: troper and sequentiary from Mainz, c960 (GB-Lbm 19768, ff.18v–19r)

Ex.4 Transcription of fig.23



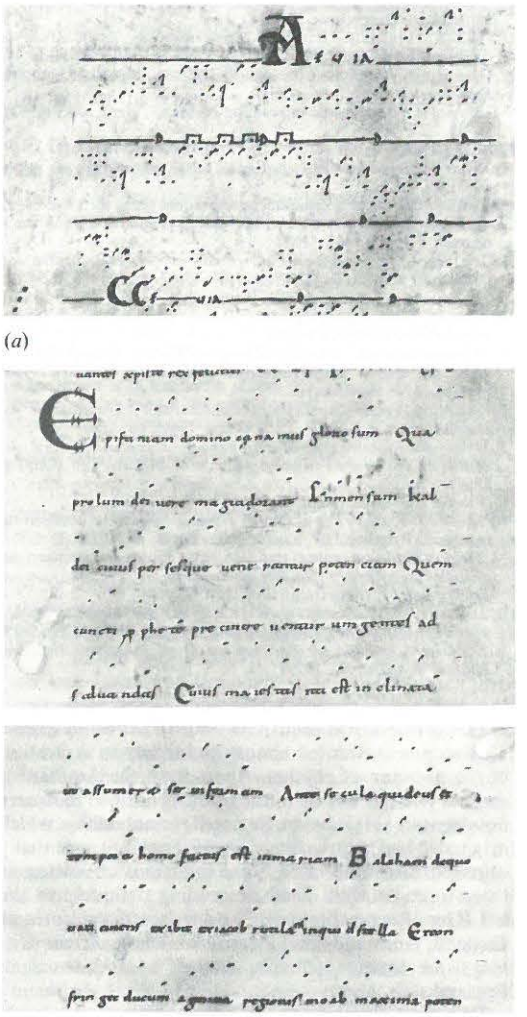
of a special school: see Pothier, 1880, and David, 1927).

Lambillotte (1851, 1855) was the first scholar to effect mensural transcriptions of an early manuscript (*CH-SGs* 359). Dechevrens (from 1895, when he delivered a paper to the Bordeaux congress; 1898, 1902, 1911) used regular pulse and bar-lines, admitting a wide range of note values; Alexandre Fleury, Ludwig Bonvin and Raillard were among his supporters. Houdard (1898; followed by Lhoumeau, Bernoulli and Riemann) saw the syllable as arbiter of the basic time unit, each neume whether of one or eight notes being delivered in the same constant unit of time (the 'equalist' objection to this is that typical melodic formulae may be used for both long and short phrases of text; for a long text a syllabic setting results, for a short text a neumatic setting; it is argued that the melody should not be accelerated or slowed on account of the number of syllables to be fitted). Riemann and Houdard both eventually tended to modify the resultant rhythms to fit regular four-beat bars, though Houdard had not originally used bars of constant length. Wagner eschewed bar-lines completely: in 1912 he published transcriptions using the values quaver, crotchet and minim; in 1924 (*Handbuch der Musikgeschichte*) the values he used were quaver, crotchet and dotted crotchet. For Jeannin (1926, 1930, 1931), quaver and crotchet sufficed; he used bars of constantly varying length, except in certain simple antiphons where regular phrase structure resulted in regular bars. In later writing, the contrast between transcriptions that use regular bars (Jammers, 1937, 1962) and those that do not (Vollaerts, 1958; Murray, 1963) has persisted.

The discussion of rhythm has resulted in progressively more minute inspection of the sources and the accumulation of data on each individual neume and type of rhythmic indicator. For instance, recent research by the Benedictine Fathers into the principle of *désagrégation* has revealed the way in which the final note of a neume, after which a caesura takes effect, tends to act as a rhythmic point of repose. The rhythmic indications discussed above have been of crucial importance in this research; and *désagrégation* had long been recognized as of rhythmic significance. But its usual effect had not been highlighted. Again it may be connected with cheironomic practice, where the goal of the cantor's gesture 'attracts' rhythmic weight. This can actually be demonstrated through mensural transcriptions, such as those

of Murray (1963). In his first ten examples (i.e. omitting the Office antiphons) there are 342 neumes of two or more notes, excluding all liquescent neumes. Murray transcribed 223 of these (65%) with first notes short, 119 with first notes long (35%); only 88 have last notes short (26%), while 254 have last notes long (74%). Again, if one attaches the nomenclature B[revis] and L[onga] customary in discussion of mensural music to the rhythmic vocabulary of St Gall manuscripts exposed by Cardine (1968), the following varieties appear: *clivis* – BB, BL, LL; *pes* – BB, BL, LL; *porrectus* – BBB, BBL, LLL; *torculus* – BBB, BLL, LLL; *scandicus* – BBB, BBL, LLL; *climacus* – BBB, BBL, LBB, LLL (never BLB). (Configurations where special 'coupure' or its opposite occur have been ignored.) The only neume used in a long–short form is the *climacus*. The tendency is a striking prefiguration of the principles of modal rhythm (see §2 below), where ligatures begin with a breve and end with a long. Two points should be noted: the predominating interpretation of the neumes is anacrusic, and if a transcription in this style were to be barred, the bar would generally precede the last note of a neume, not the first; and the idea of a stressed final note assorts less well with syllabic music where the iteration of a syllable emphasizes the first note of a neume. In practice, however, conflict is rarely felt, since in syllabic chants unaccented BB or BBB neumes seem to be the norm. But the distinction between melismatic and syllabic music is also significant in the rhythmic interpretation of polyphony of the late 12th century and the early 13th.

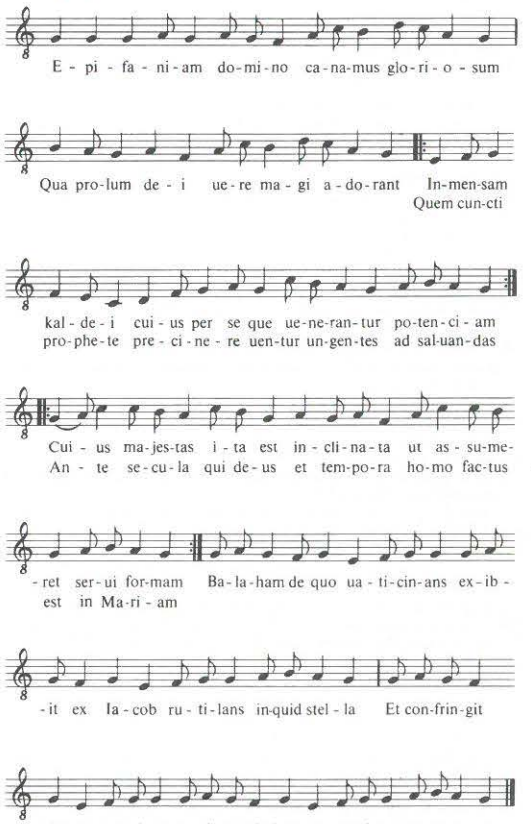
The chants shown in figs.23 and 24, transcribed in exx.4 and 5, are sequences, one in German neumatic notation of the St Gall type, using *episemata* and significative letters, the other Aquitanian. Fig.23 is from a Mainz troper of about 960, *GB-Lbm* 19768. The melody is given over the text as a series of *virgae* and *tractuli* of undifferentiated rhythmic value. In the margin the melody appears in compound neumes with clear rhythmic indications, interpreted here in longs (crotchets) and shorts (quavers). The simple neumes over the text are not superfluous, however, since they also help



(*a*)

(*b*)

Ex.5 Transcription of fig.24



24. Part of the sequence 'Epifaniam Domino' (left) showing Aquitanian notation with differentiation between dots (short) and dashes (long): troper and sequentiary from south-west Aquitaine, 11th century (F-Pn lat.1118); (a) melody (f.134v, detail), (b) text and melody (f.165r–v, details)

clarify the pitch of the melody (e.g. the sixth note of the piece must be higher than the fifth since a *virga* appears over the syllable 'ma[ter]' although in the margin a new neume begins whose relation to the preceding is not explicit). The principal indication of lengthening is the use of the letter *t* (for *trahere*); for short notes *c* (*celeriter*) or dots are used.

The melody of *Epifaniam Domino*, of which a passage is shown in ex.5, is noted without words in one part of *F-Pn* lat.1118 (fig.24*a*) and in a texted version in another (fig.24*b*). Both use the contrast between *tractuli* and *puncta* to indicate long and short. Since the melody is a standard version used for several different texts, it does not agree in every detail with the texted version.

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2. POLYPHONY AND SECULAR MONOPHONY TO *c*1260.

This section is devoted almost exclusively to discussion of the notation of rhythm. Apart from the Aquitanian sources referred to below, the music is notated in square notation (see §1 (v) above). Regional variants of this, which originally had no rhythmic significance but eventually acquired mensural value, were the *climacus* written as three lozenges with a tail descending obliquely to the left (Ger. *Rauten-Ternaria*), used in some scriptoria of England, Normandy and Picardy; and the *punctum* written as a lozenge (rhomb, canted square), used in England.

Detailed descriptions of the sources of early polyphony mentioned here are given in SOURCES, MS. §IV; those containing secular monophony are described in SOURCES, MS, §III.

(*i*) *Neume patterns in Aquitanian polyphony.* A particular feature of the repertory of Aquitanian polyphony, including the Codex Calixtinus (i.e. polyphony of *c*1100–*c*1200), is a gradual increase in the use of melismas of regular, patterned neume-structure (e.g. strings of two-note neumes). Stäblein (1963) charted this phenomenon and suggested that rhythmic patterns similar to those of modal rhythm were present. Ex.6 gives a notable example, with a possible rhythmic transcription of the second system of the contrafactum (ex.6*c*).

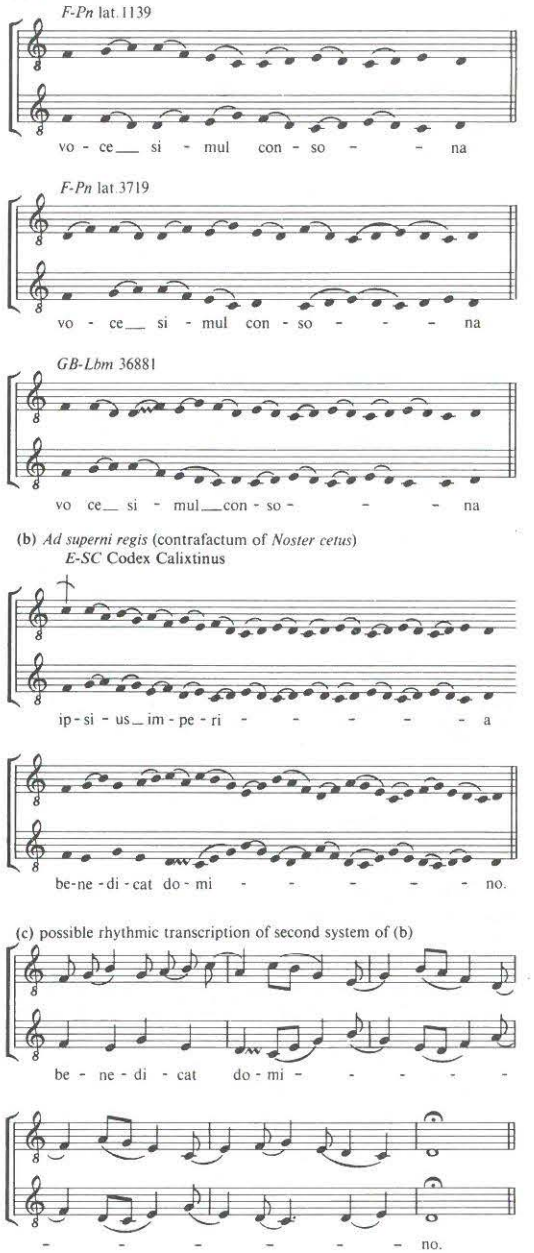
The regular patterns are particularly evident in the final melismas (or caudas) of conductus, *versus* and *Benedicamus* settings; they are also occasionally found in the organal voice of chant settings. A connection with Parisian polyphony is not out of the question, and might even have operated from Paris to south-west France. One of the pieces in the Codex Calixtinus is attributed to Magister Albertus Parisiensis, who is possibly to be identified with a cantor of Notre Dame of the third quarter of the 12th century (but the Calixtinus ascriptions may all be apocryphal). Fuller discovered a Notre Dame composition written in the hand of BERNARDUS ITIER, librarian of St Martial, Limoges, at the turn of the century.

(*ii*) *The system of modal rhythm.* Rules of modal rhythm are given by the following theorists:

Anonymous: *Discantus positio vulgaris* (*c*1225: survives only in a partly revised form; see Reckow, *AcM*, 1967, p.137, n.81); *CS*, i, 94
Johannes de Garlandia (*c*1240: the final chapter of his treatise as it survives in *F-Pn* lat.16663, and, as edited by Coussemaker, postdates Franco); *CS*, i, 96; ed. Reimer (1972)
Amerus/Aluredus (1271); ed. Kromolicki (1909)
Anonymous IV (after 1272); *CS*, i, 327; ed. Reckow (1967)
Dietricus (*c*1275); ed. Müller (1886)
Lambertus (*c*1275); *CS*, i, 269
Anonymous of St Emmeram (1279); ed. Sowa (1930)
Franco of Cologne (*c*1280: see Frobenius, 1970); *CS*, i, 117
Anonymous VII (postdates Franco: see Reimer, 1972, i, 31, n.20); *CS*, i, 378
Walter Odington (before *c*1300); *CS*, i, 235

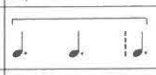
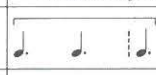
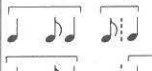
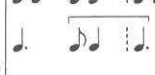
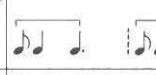
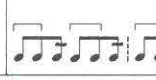
Fig.25 (p. 356) gives the rhythmic modes and concomitant ligature patterns (indicated by brackets over the notes). In each there is a fundamental recurrent pulse, and these pulses tend to group themselves in pairs, fours, eights etc, creating formations at a higher rhythmic level. Each pulse contains three time units (*tempora*). The 6th mode uses one-unit notes; the 1st and 2nd use one- and two-unit notes; the 3rd and 4th use one-, two- and three-unit notes; the 5th uses three-unit notes. A more important distinction is whether the main pulse falls on the first note of the ligature (2, 3*b* and 4) or on the last (1, 3*a* and 6*a*). Most crucial of all is whether the predominant weak beat is the second (of a modern 3/8 unit; 2, 3*a*, 4, 6*a*) or the third (1, 3*b*) and whether the ternary ligature extends over two pulses or only one (the use of the ternary ligature for the 5th mode seems to be restricted to the tenor part in the style of polyphony known as discant, and does not lead to confusion). For all these important distinctions, the note shapes themselves are ambiguous: ligature patterning and consonance between parts help define the rhythm intended. It is precisely these criteria that are least useful in the interpretation of organum duplum, since patterning in them is much less regular and the tenor is a drone. The situation is further complicated by the practice of *fractio modi*, the introduction into a rhythmic mode of smaller note values than normal. Fig.26 gives some of the patterns described by Anonymous IV.

Ex.6 Neume patterns in Aquitanian polyphony (Stäblein, 1963)



(*iii*) *Currentes, plica, rests.* The disjunct form of the *climacus* used lozenges in square notation. These were called *currentes* by Anonymous IV, probably as an extended use of a term originally referring to the extended descending scales found in Aquitanian as well as Parisian polyphony. Johannes de Garlandia did not mention them at all, and never used them in his examples, possibly because they could be confused with

Fig.25 TABLE OF RHYTHMIC MODES AND CONCOMITANT LIGATURE PATTERNS

Mode	*1st mode family (movement on last weak beat)*	*2nd mode family (movement on first weak beat)*	
5 —ligature pattern used in tenors			3-note ligature has 3 pulses
5 —Franco called it the 1st mode and thought all the 1st mode family should be subsumed under it			
1*a*—standard ligature pattern			
1*b*			
2			3-note ligature has 2 pulses
3*a*			
3*b*—'alternate 3rd mode' used particularly by the English: notated either LBB or as a ternary ligature			
4			
6*a*			
6*b* — 1st mode with *notae plicatae*			3-note ligature has 1 pulse
6*c* — 2nd mode with *notae plicatae*			

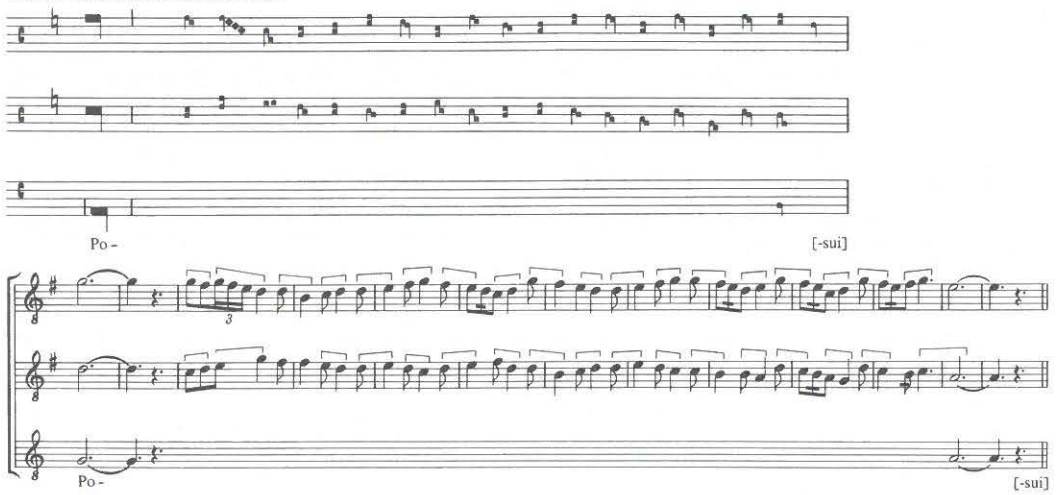
the semibreve. Franco of Cologne, illogically, was to call them *coniuncturae*.

The liquescent forms of neumes were also used in melismatic polyphony in modal rhythm, where obviously they had no function of text articulation. Usually they indicated a breve on a weak beat (see modes 6*b* and 6*c*). The fact that the extra note fell on a weak beat was significant in a notation where the place of the pulse was deduced rather than mensurally indicated. From the fact that the liquescent single note was usually written like a U or an inverted U, the note was called a plica ('fold'). A vertical stroke added to the end of ligatures made them 'plicata'. The liquescent neume did not abandon its original function in texted music (conductus, secular monophony, and also in chant settings if the chant cantus firmus demanded it): this is another aspect of the distinction between the notation of organum on the one hand and conductus and secular monophony on the other. (For further discussion *see* PLICA.)

Vertical strokes were used independently for two purposes: to indicate changes of syllable (if the tenor was melismatic or sustained) or of word (where the tenor was syllabic); or to indicate a rest. For the first purpose 12th-century scribes frequently wrote a roughly vertical line through both the staves (often not vertical at all if alignment of parts was faulty – this frequently occurred if the tenor was noted before a florid duplum). In Parisian sources this was reduced to a small stroke through one or two lines only. Where a rest was intended its duration was not indicated.

For the notation of tenors undifferentiated single notes were usually used, whether the tenor was a long, held note in organum or moved with the pulse in

Ex.7 Pérotin: *Alleluia, Posui adiutorium*



discant. Only in the later layers of clausulas were patterned ligatures (and therefore breves) regularly used for tenors. Although a stroke appears after each note of the tenor in organum, the note appears to have been sustained beneath the continuing organal voices. Anonymous IV called this a *burdo*.

(*iv*) *Modal rhythm in practice*. The system of modal rhythm outlined by the theorists is a mental abstraction from flexible practice. The patterns they cited are of course frequently met in the early 13th-century repertory (they are particularly relevant to the tenors of late clausulas, hockets and motets); their illustrations are drawn from works of the period. But in practice the patterns were extensively intermingled, not merely vertically in different voices but successively in one voice. However, rhythms from the 1st mode were rarely mixed with those of the 2nd mode.

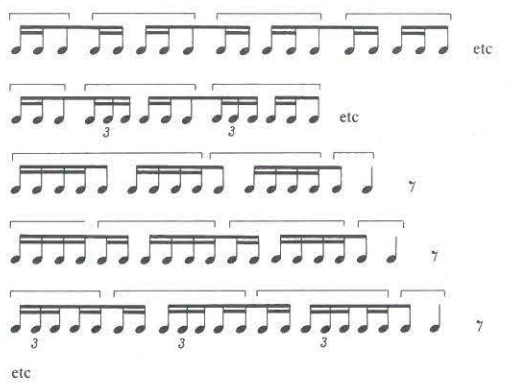
The ambiguities of the system may be demonstrated in two examples. Ex.7 gives the opening of the verse section of Pérotin's *Alleluia, Posui adiutorium* (*I-Fl* Plut.29.1, f.36*v*). To judge from the ligature patterns, the triplum part is notated in the 2nd mode; the duplum part appears to lack a final three-note ligature to match the triplum, in which case one might interpret the penultimate note as a long. Yet consonances between the second note of each ligature are greater in number than between the first – a transcription in the 1st mode thus seems appropriate, so that each pulse is coincident with a consonance. Ex.8 is from a *Benedicamus Domino* (the first in *Fl* Plut.29.1, f.41*r*). The passage might be transcribed in the 6th mode (as Husmann, 1940) or in the 3rd. But most of the rest of the piece is in the 1st mode. The choice of mode will also influence interpretation of the third phrase: *Fl* Plut.29.1 notates the duplum in a 2nd-mode pattern, *D-W* 677 in 1st mode. Cadences such as that of ex.8 frequently present problems of interpretation; the transcriptions given here are among many possible readings.

(*v*) *Organum duplum, irregular modes, pre-modal rhythm*. Since there are neither theoretical writings nor sources of Parisian organum duplum dating from before about 1225, knowledge of its rhythm is largely a projection backwards from the developed system of modal rhythm. The system accords well with the notation of later parts of the repertory – organum triplum and quadruplum, and clausulas – but less well with organum duplum and conductus (except for the melismatic sections which occur in many conductus, known as caudas). Waite (1954) transcribed the organa dupla of *D-W* 677 according to the modal system. However, this interpretation may be incorrect, since, outside discant and copula sections, many of which are the work of revisers (?Pérotin), regular ligature patterning is not common. (For discussion of the stylistic evolution of the music *see* COPULA, COPULATIO; DISCANT; ORGANUM; *see also* LÉONIN; MAGNUS LIBER; PÉROTIN.)

Flotzinger (1972) reported a formulation of six rhythmic modes ('modi') or metres in Alexander de Villa Dei's poetic treatise *Doctrinale* of 1199. Long and short units are mentioned, in the mathematical ratio 2 : 1. The six modes correspond to those of modal rhythm, but in the order 3, 5, 1, 4, 6, 2.

It is not known when the distinction was first made between a long of three *tempora* and one of two. Both *Discantus positio vulgaris* and Johannes de Garlandia referred to the long of three *tempora* as 'ultra mensuram'. Much later, Walter Odington (late 13th century) wrote: 'With the earliest polyphonists the long was worth only two *tempora*, as in verse metres; but later on it is brought to perfection so as to contain three *tempora*'. It is not known if this refers to Parisian organum duplum as we know it or to a more primitive type.

Fig.26 Patterns of *fractio modi* after Anonymous IV (ed. Reckow, i, pp.38–9)

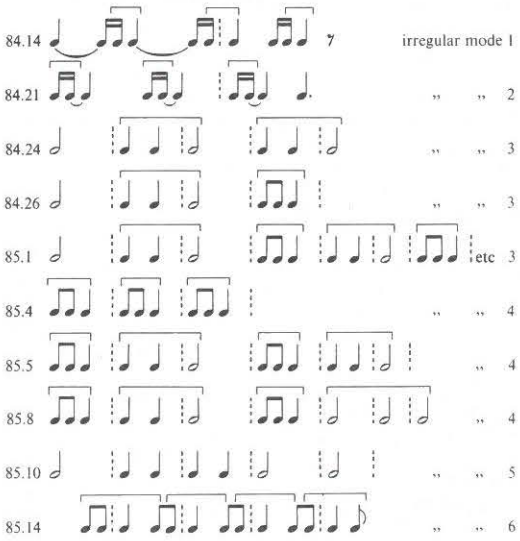


More perplexing are the 'modi irregulares' described by Anonymous IV. While the first two appear to be rhythmically sharper versions of the normal 1st and 2nd modes, the rest may imply binary mensuration of the long (Reckow however argued that Anonymous IV describes nuances of tempo, not changes of measure). Fig.27 gives possible interpretations. Anonymous IV's final remarks may indicate that he was here dealing with a pre-modal order:

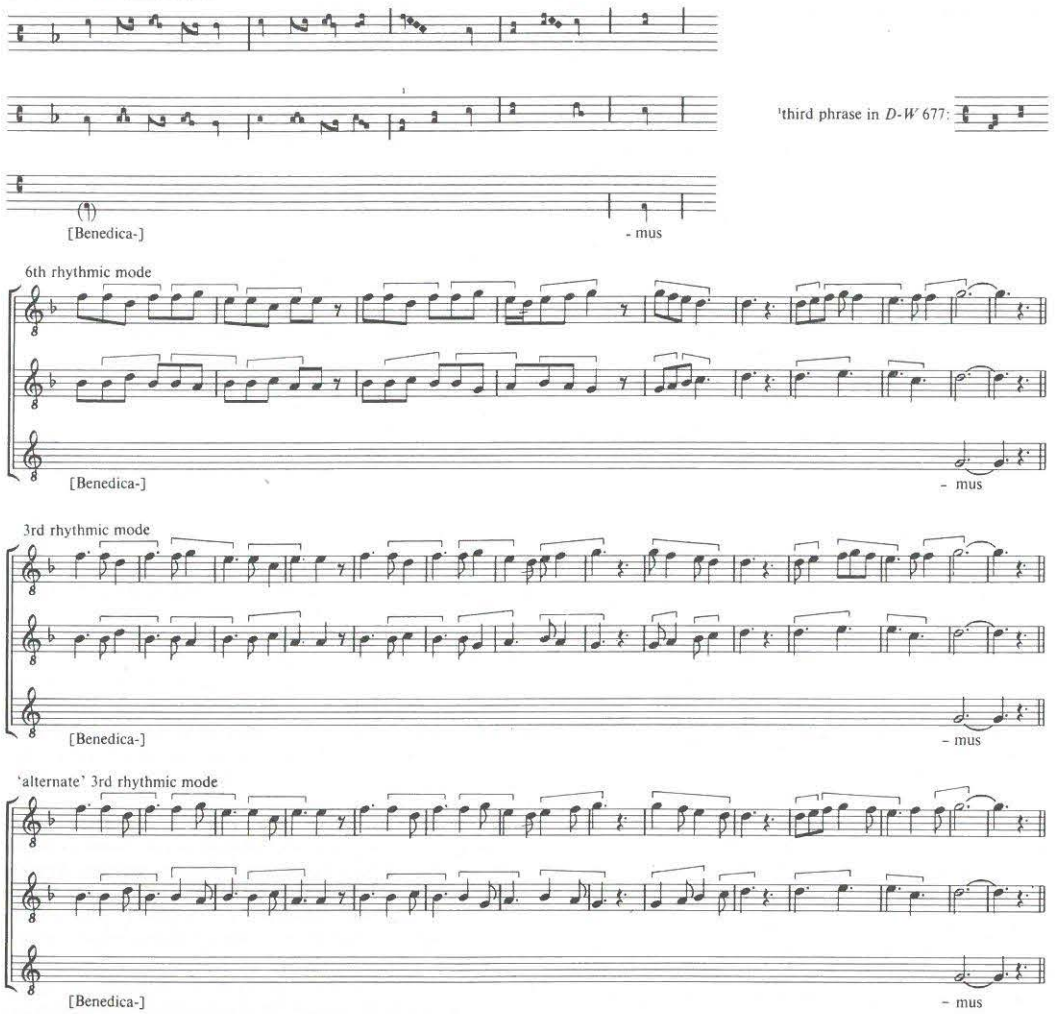
> And in like manner as the seven gifts of the Holy Spirit is the most noble and worthy 7th mode, greatly to be desired and pleasing. And this mode is a mixed and common mode and is of all the two mentioned above and of all the three and of all the four, etc. And strictly speaking it is called *organum purum et nobile*, etc.

On the other hand, Anonymous IV also gives rules of harmonic consonance for determining which notes should be long and which short: notes in harmony with

Fig.27 Anonymous IV, chap.vii: 'De modis irregularibus' (references are to page and line numbers in Reckow's edn.)



Ex.8 from *Benedicamus Domino*



the tenor will be long, discords will be short. Yet it is unlikely that, even using harmonic consonance as a guide, ligature patterning could have been disregarded. (See Apel, 1942, pp.267ff, and 1949; the fullest discussion is in Reckow's edn.) It is possible that Johannes de Garlandia referred to a similar practice when he said:

> Organum *per se* is that which is performed not in *modus rectus* but in *modus non rectus*. By *modus rectus* we mean that type of *modus* which is used for discant. In *modus rectus* longs and breves are usually understood according to the first mode. In *modus non rectus* however the longs and breves are not understood according to the 1st mode but from the context [*ex contingenti*].

(*vi*) *English practice*. It has convincingly been demonstrated (Sanders, 1962) that pairs or longer chains of lozenges ('English breves') used in English manuscripts up to about 1300 signified 1st-mode rhythms (LB, LB etc). Such breves are found in *D-W* 677 (even in non-English works: see facs. of Pérotin's *Sederunt*, SOURCES, MS, fig.30), *GB-Lbm* Harl.978 (some pieces 'reformed' by adding tails [= long] to alternate lozenges) and the Worcester Fragments (earlier layers). Johannes de Garlandia and Anonymous IV both reported that the English interpreted ternary ligatures in what has become known as 'alternate 3rd mode' (3*b* in fig.25, p.356).

(*vii*) *Mensural notation, 'pre-Franconian' practice*. All the chief sources of Parisian polyphony to about 1260 distinguish between a single long and a single breve in a few rare instances involving repeated notes (the long had a downward stem attached to its right-hand side). The opening of the organum quadruplum *Sederunt* has already been cited; another well-known example is the clausula *Mulierum* (Apel, 1942, facs.52*a*).

The ligature that became known as 'having opposite propriety' (*cum opposita proprietate*), written with an ascending stroke to the left, is first seen in *D-W* 1026. Johannes de Garlandia was the first to describe such a ligature, but whereas he understood that the last note would be long and all the other notes together would occupy the time of one breve ('si sint ibi plures sive pauciores'), later practice was to read the first two notes as semibreves and the rest according to the usual rules of propriety and perfection (see §3 below). An alternative form of the descending ligature *cum opposita proprietate* was three lozenges with tail descending obliquely from the left of the first, found in some French and many English manuscripts. Double longs are also frequently distinguished in the chief Parisian sources.

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Fig.28

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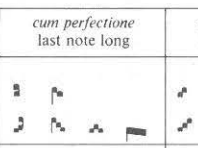
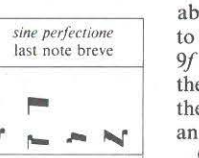
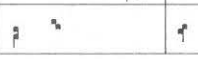
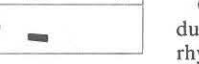
cum proprietate 1st note breve (in mode 1, 1st note of ternary ligature is long)		
sine proprietate 1st note long		

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Given the difficulties of transcribing polyphonic conductus, where it might be expected that a 'consensus' rhythm would become evident from the coincidence of the parts, it is not surprising that the problems of monophonic conductus are even greater. An interpretation with syllables of equal length is often complicated by the presence of compound neumes of six or more notes (these are occasionally present in polyphonic conductus also). Ex.10 gives a modal transcription of the opening of *Turmas arment christicolas*, on the murder of Adalbert of Louvain, Bishop of Liège, by German knights in 1192. The principle of equal syllables has been applied wherever a syllable carries one, two or three notes; where it carries four or more its value has been extended to two dotted crotchets or more. If such an interpretation was intended, it displays nothing of the regular ligature patterns characteristic of the organa tripla and quadrupla of this period; nor is the 'natural' stress pattern of the text complemented.

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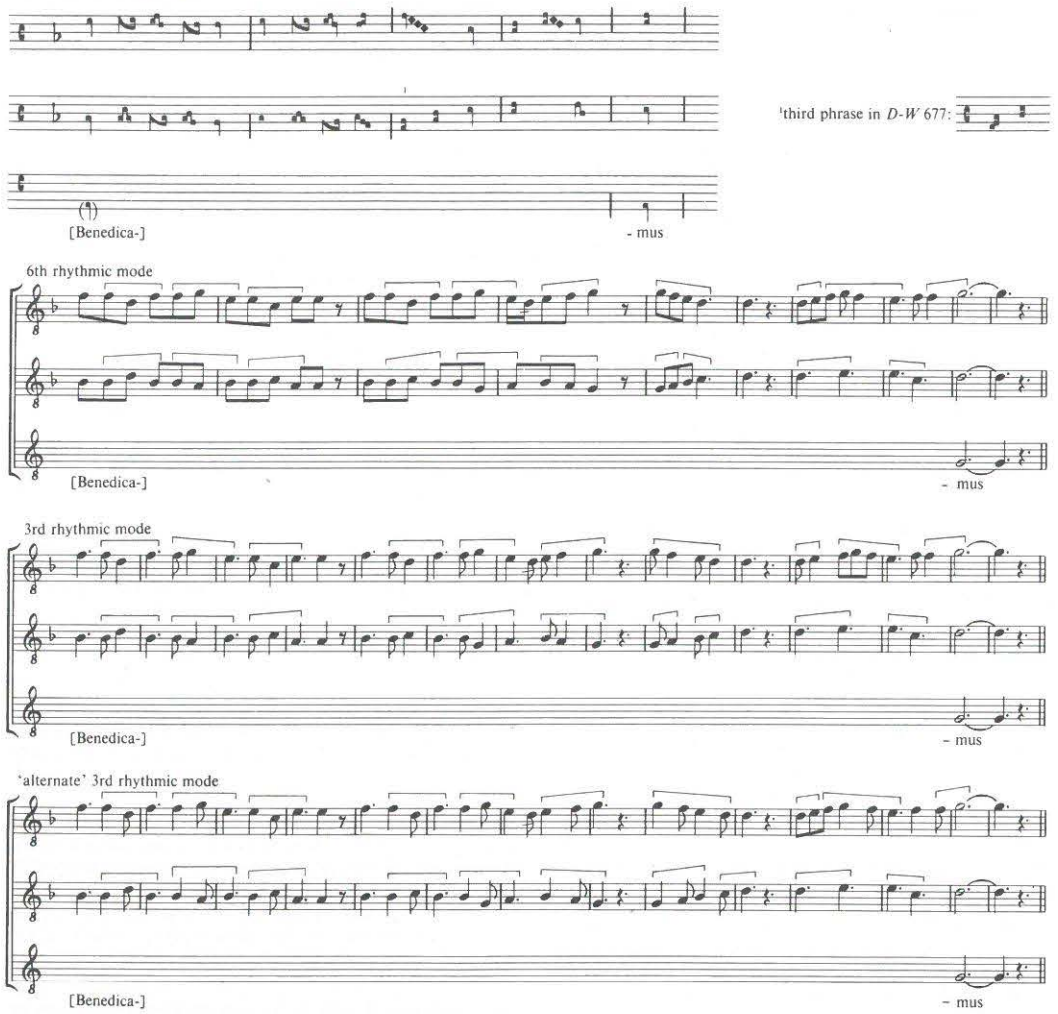
Ex.8 from *Benedicamus Domino*



the tenor will be long, discords will be short. Yet it is unlikely that, even using harmonic consonance as a guide, ligature patterning could have been disregarded. (See Apel, 1942, pp.267ff, and 1949; the fullest discussion is in Reckow's edn.) It is possible that Johannes de Garlandia referred to a similar practice when he said:

> Organum *per se* is that which is performed not in *modus rectus* but in *modus non rectus*. By *modus rectus* we mean that type of *modus* which is used for discant. In *modus rectus* longs and breves are usually understood according to the first mode. In *modus non rectus* however the longs and breves are not understood according to the 1st mode but from the context [*ex contingenti*].

(*vi*) *English practice*. It has convincingly been demonstrated (Sanders, 1962) that pairs or longer chains of lozenges ('English breves') used in English manuscripts up to about 1300 signified 1st-mode rhythms (LB, LB etc). Such breves are found in *D-W* 677 (even in non-English works: see facs. of Pérotin's *Sederunt*, SOURCES, MS, fig.30), *GB-Lbm* Harl.978 (some pieces 'reformed' by adding tails [= long] to alternate lozenges) and the Worcester Fragments (earlier layers). Johannes de Garlandia and Anonymous IV both reported that the English interpreted ternary ligatures in what has become known as 'alternate 3rd mode' (3*b* in fig.25, p.356).

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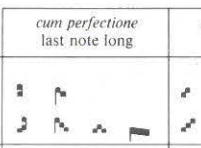
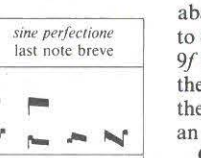
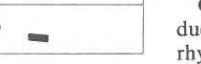
cum proprietate 1st note breve (in mode 1, 1st note of ternary ligature is long)		
sine proprietate 1st note long		

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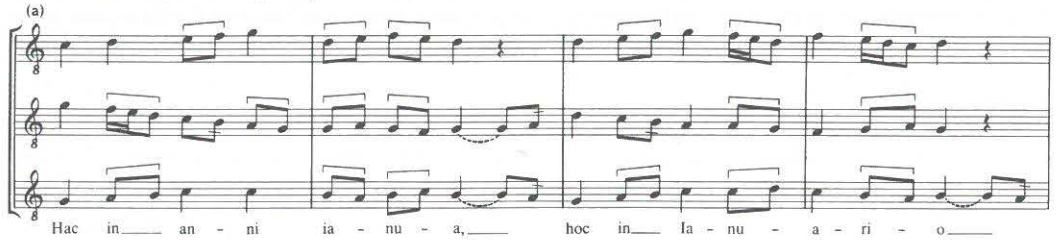
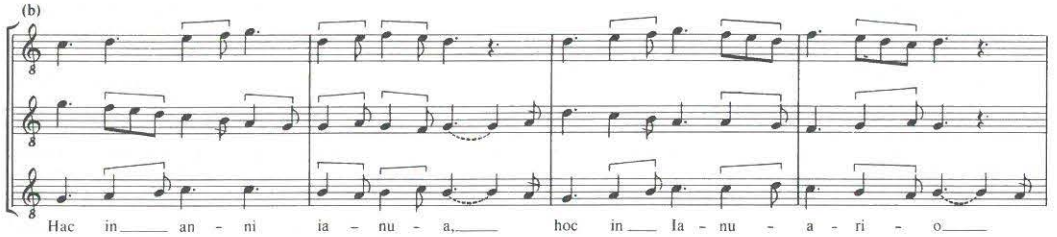
Ex.9 *Hac in anni ianua* (*I-Fl* Plut.29.1., f. 229v)

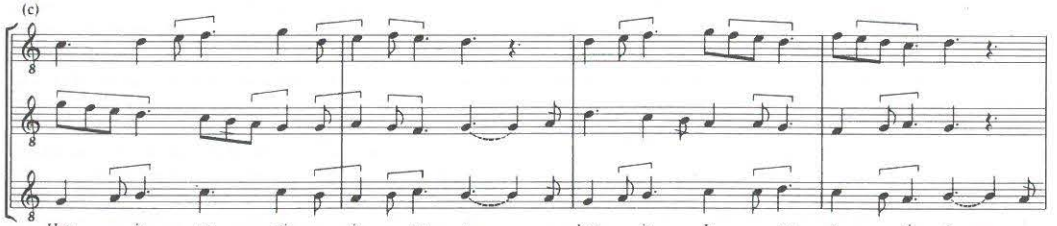
(a)



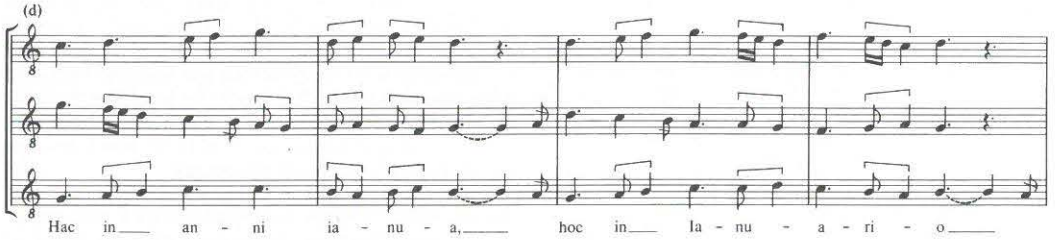
(b)



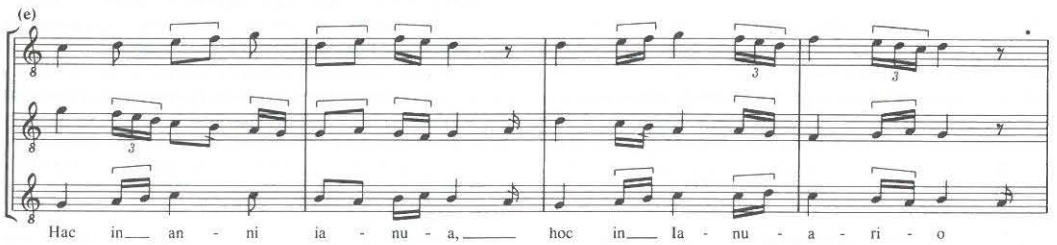
(c)



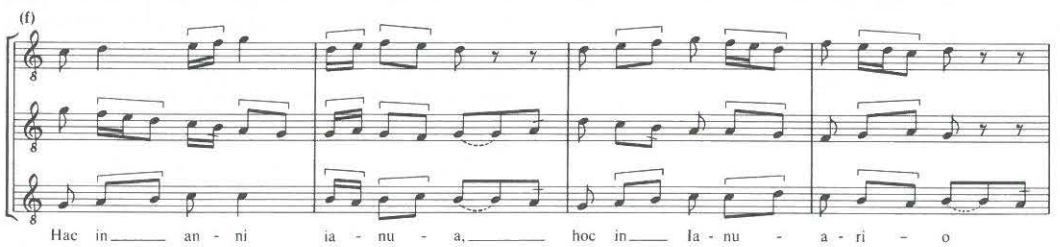
(d)



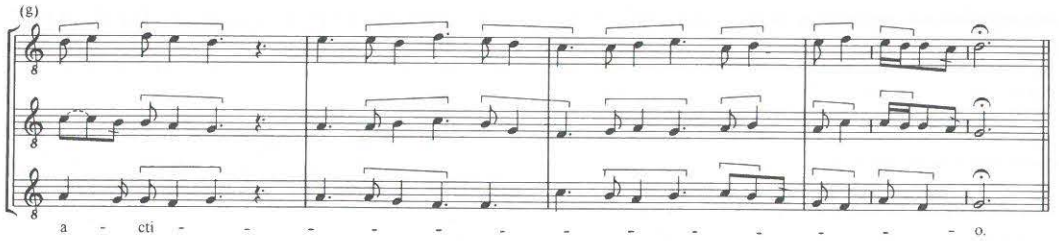
(e)



(f)



(g)

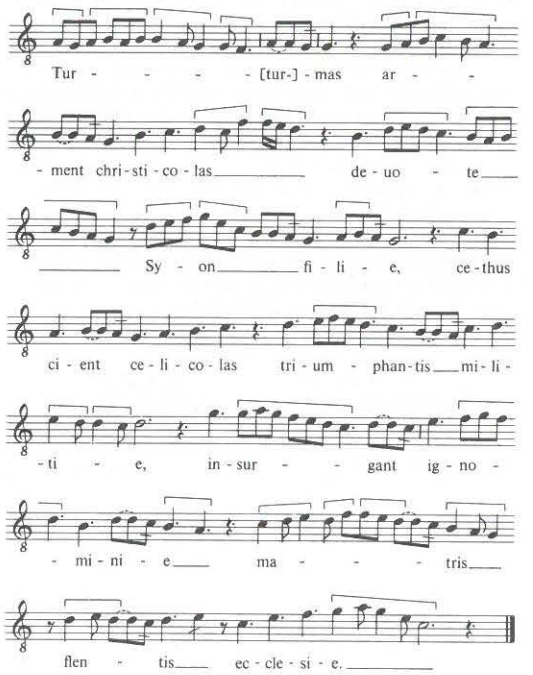


which are an independent repertory). That rhythm involving longer and shorter notes in mathematical proportions was intended is open to question. There is no evidence that modal rhythm has any direct relevance to secular monophony from outside Paris and before 1200 (e.g. the bulk of the troubadour repertory).

For simple songs, rarely having more than two notes to a syllable, with a regular pattern of stressed syllables, long and short notes are easily assumed. The more ornate the melody, the greater are the difficulties of mensural interpretation, and the less do regular patterns such as those of modal rhythm seem intended. In retrospect, Ludwig's initial suggestion to Aubry (see Gennrich, 1958), that troubadour and trouvère melodies might be transcribed in rhythmic patterns resembling those of the rhythmic modes, seems to have been adopted with excessive zeal. Given the difficulties faced by the first scholars of the repertory, modal rhythm must have seemed like a lifeline in unfathomable waters. But the evolution of modal rhythm was itself a slow process, perhaps not completed before 1200. The rhythmic modal theory which was taken over and applied to secular monophony was an abstraction belonging to the early 13th century. It was intended to clarify the rhythmic meaning of series of ligatures in melismatic music.

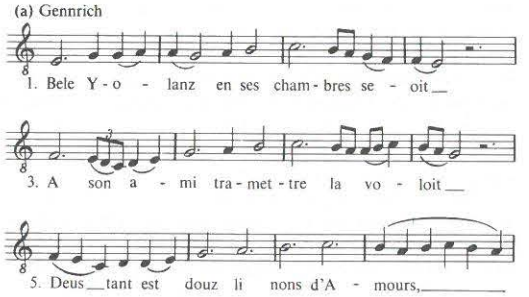
Except for the songs that can be linked directly with the circles where modal polyphony was cultivated in the 13th century, modal rhythm seems difficult to justify. Some scholars have held that a basic time unit does nevertheless underlie the rhythm of the songs. Anglès, for instance, held that the time occupied by one syllable was the basic unit; if a syllable was sung to more than one neume, then each neume occupied a unit of time. Jammers transcribed songs so that each group of stressed and subordinate unstressed syllables together forms the basic unit; compound neumes may cause the addition of extra units. Ex.11 gives three lines from each of the transcriptions by Gennrich (modal), Anglès and Jammers of a trouvère song (F. Gennrich: *Exempla*

Ex.10 *Turmas arment christicolas* (*I-Fl* Plut.29.1, f.431v)

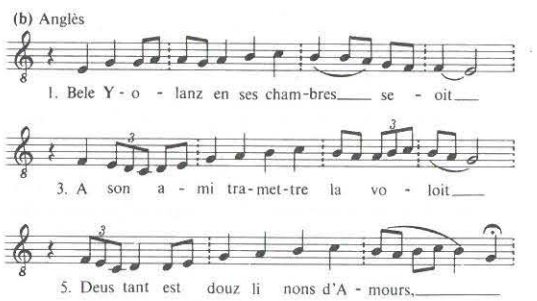


Ex.11 *Bele Yolanz* (*F-Pn* fr.20050, f.64v)

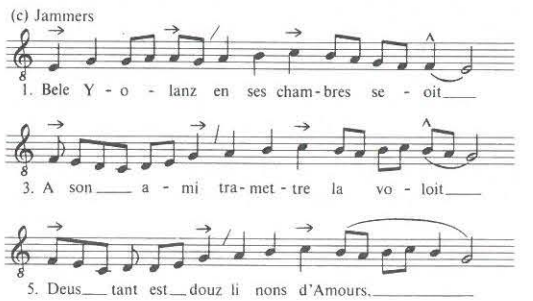
(a) Gennrich



(b) Anglès



(c) Jammers



altfranzösischer Lyrik, 1958, no.9; H. Anglès, 1960, 2/1962, p.18; Jammers, 1975, p.62). Other scholars have eschewed the idea of a constant time unit capable of being transcribed mensurally. For instance, Vanderwerf (1972) and Stäblein (1975) used undifferentiated note heads.

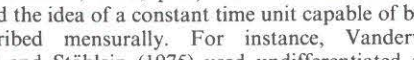
For bibliography see end of §3.

3. Polyphonic mensural notation, *c*1260–1500.

(*i*) *General.* Well before this period the notation of pitch had lost all ambiguity apart from occasional uses of the plica and the operation of the rules of *musica recta* and *musica ficta* (*see* PLICA and MUSICA FICTA). The four-line staff used for plainchant was still sometimes retained in polyphony, especially for a voice presenting plainchant, but the five-line staff had come to be used for polyphonic voices. A six-line staff became normal for the 14th-century Italian repertory, and was occasionally used outside it. Additional staff-lines were provided throughout the period wherever the range of a voice demanded, though the leger line itself was rare. The most commonly used clef was the C (on any line), as in plainchant, and its position was readily movable from line to line when range or a copying error made this expedient. Of the other two clefs used in plainchant the F came increasingly into use with the gradual extension of the lower pitch register, but the B♭ – that is, the ♭ sign used on its own as a clef – was rare in polyphony, probably because of the growing use of the same symbol to supply what would now be called a key signature. The G clef appeared in the 14th century; it came increasingly into use, especially in England, again in connection with extension of range. (*See* STAFF and CLEF.)

Score notation had disappeared by about 1260, except for late copies of the organum and conductus repertory, and certain categories of composition in England, for which it was retained late into the 15th century (including carols, homophonic sequences and cantilenas, and English discant). Notation in separate voices reflected their new rhythmic independence.

Fig.29



Throughout the period there were three principal signs for what are now called accidentals. They did not function as modern accidentals do, in that they did not signify the automatic raising or lowering of an otherwise 'natural' note by a semitone. They were adjuncts of the solmization system: the signs in fig.29*a* (alternative forms adopted by different scribes) designated the note following it to be sung to the syllable *mi*, and fig.29*b* designated it to be sung to the syllable *fa*. Fig.29*c* was often used simply as an alternative to fig.29*b*, though it seems to have been used by some scribes to refer to notes in the upper octave of a given voice range. In consequence, the note F, for example, would be rendered not flat but F♮ by the placing of the 'flat' sign (fig.29*b*) before it; a 'sharp' sign before the note E would render it E♮. Ambiguity could arise with A and D as to whether a flat sign meant natural or flat, and with G and D as to whether a sharp sign meant natural or sharp; but this ambiguity could usually be resolved by consideration of context. Significantly, the three clef signs discussed above were all indications of *fa* in the three basic hexachords (based on G, C and F respectively).

See ACCIDENTAL; SCORE, §3; SOLMIZATION, §I; SOURCES, MS, §I.

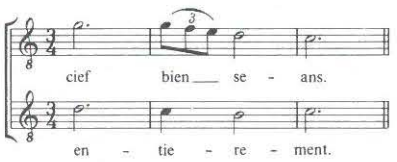
(*ii*) *Franconian notation.* The development of notation during the period *c*1260–1500 was almost exclusively in the realm of rhythm, and specifically concerned with achieving precise notation for note values shorter than the long and breve. The 13th century saw the gradual adoption of graphic distinctions between the long and the breve, both as isolated note shapes (*simplices*) and as they appear within ligatures. The forms of square note with and without stem had been used arbitrarily in the Florence manuscript (*I-Fl* Plut.29.1), but were used throughout the next generation of sources, including the Montpellier manuscript (*F-MO* H196), to indicate long and breve respectively (*see* SOURCES, MS, §V for these sources). Ligatures began to have fixed evaluations regardless of their modal context, even though they still often adhered to modal patterns and though the values assigned to them derived from their modal interpretations. These and other fundamental changes can be traced in the musical sources, and are mentioned in the theoretical writings of Johannes de Garlandia (*c*1240), Magister Lambertus (before 1279) and the St Emmeram Anonymous (1279), all of which are now dated earlier than the main formulation of these changes by Franco of Cologne (*c*1280) on whose rules the following summary is based.

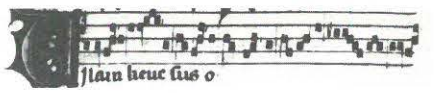
The Franconian system required that note symbols should be capable of indicating the rhythmic modes rather than being determined by them. Under this system, each of the three principal note values had two states. The long was either 'perfect' or 'imperfect', there was also a duplex long, worth two longs, which Franco explained as a means of avoiding repeated notes. The breve was either *recta* or *altera* ('other' – Robert de Handlo in 1326 proposed that the breve be thought of as *alterata*, 'altered', *CS*, i, 385). The semibreve could be either 'major' or 'minor'.

The perfect long was worth three breves. The imperfect long was worth two breves, as had been the earlier long, and was used in combination with a preceding or following breve; it could not stand on its own, and hence could not be called *longa recta* (but see Johannes de Garlandia, ed. Reimer, i, 37). When a long preceded a second long the first must always be perfect (thus, in terms of breves, 3–3 or 3–2).

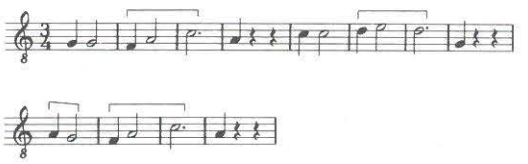
The *brevis altera* was worth two *recta* breves. It arose as the second breve in the context breve–breve–long (1–2–3 breve units respectively): see fig.30*a* (in the upper voice the first breve is subdivided into semibreves).

30(a). F-MO H196, f.365v, with transcription below





30(b). F-MO H196, f.361v, with transcription below



Although identical in duration with the imperfect long it could not be written thus because of the preceding rule. Where a long followed by a breve would normally be imperfect, it could be rendered perfect by the placing immediately after it of a dot or stroke, variously called *tractulus*, *signum perfectionis* or *divisio modi*, as in fig.30*b*. A long followed by two breves was perfect unless preceded by a single breve. The following set of patterns illustrates the operation of the system (numerals represent multiples of breve-values; primes represent signs of perfection):

LBLB = 2–1–2–1
L′BLB = 3–1–2–1
LBBL = 3–1–2–3
BLBBL = 1–2–1–2–3
LB′BL = 2–1–1–2
LBBBL = 3–1–1–1–3
LB′BBL = 2–1–1–2–3
LBBBBL = 2–1–1–1–1–3
L′BBBBL = 3–1–1–1–1–2

The *brevis recta* might contain not more than three semibreves and not fewer than two. If three, they would be equal and all minor; if two, they would be minor–major (1–2). Franco made no provision for two equal semibreves, though several earlier theorists did not specify the value of a pair of semibreves when it constituted a breve nor did they recognize a group of three (Garlandia, ed. Reimer, i, 50; Dietricus, ed. Müller, 5; Amerus, p.II). (The semibreve pairs in *F-MO* H196 and *D-BAs* ED.N.6, and possibly other sources, in most cases lend themselves much more comfortably to equal performance, and it is not always certain that Franco's rules apply.)

There is no provision for the breve to be imperfected by the semibreve, or for the semibreve to stand alone: the breve–semibreve relationship was not at that stage analogous to that of the long–breve. This meant also that the principle of 'alteration' did not apply. A breve preceding a second breve is not said to be perfect, because there is no question of its being imperfected. Similarly, the second of a pair of semibreves is not said to be 'altered' before a breve, because a pair of semibreves is rendered iambically, regardless of what follows. Hence the following patterns (numerals represent multiples of semibreve-values):

BSSSS = 3–1–2–1–2
SSS′SS = 1–1–1–1–2

Several of Franco's contemporaries (e.g. St Emmeram Anonymous, 1279) added to the semibreve-pair rule 'and vice versa', implying the reverse interpretation (2–1); and one later writer, the author of the *Quatuor principalia* (*CS*, iv), even attributed this interpretation directly to Franco.

Franco defined ascending and descending plicas for the long and breve. Plicas continued in use in the 14th century, but their pitch and rhythmic evaluation are sometimes open to question (see Handlo's evaluations, *CS*, i, 383ff). They were obsolete before 1400, by which time any surviving plica shapes no longer have the former significance of a plica.

Franco took over the existing ligature shapes with their connotations of propriety and perfection depending on the presence or absence of stems (see §III, 2 above). He provided evaluations that were mostly consistent with the earlier system but which could stand independent of their modal meanings. The first note of a ligature 'with propriety' was a breve, the last note of a ligature 'with perfection' was a long. He opened the door to many hitherto unused ligature shapes and provided a means of evaluating them, simple for anyone familiar with the existing shapes. A ligature with a stem ascending from the first note was described as having 'opposite propriety': it signified two semibreves. All notes other than the first and last were breves. In practice, downward stems were occasionally used to create a long in the middle of a ligature; the upward stem could occur elsewhere than at the beginning to create two semibreves; and the long body of the duplex long or maxima could be used to create this value anywhere in the ligature. These are later modifications to Franco's system. Notes in ligature were subject to the same rules for imperfection and alteration as single notes, but in practice grouping in ligatures tended to favour certain groupings as strongly as did a *divisio modi*.

Franco advocated the use of ligatures where possible; if possibility here implies absence of constraints from word underlay, he did not say so. However, it remains generally true (with a few exceptions) that two syllables do not have to be fitted to one ligature. On the other hand, Franco disallowed the pre-Franconian practice of notating 5th-mode tenors in motets as three-note ligatures and insisted on a succession of separate longs.

Fig.31

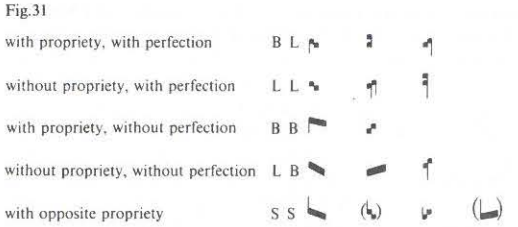
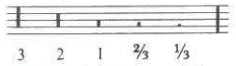


Fig.31 shows the principal ligature shapes of the Franconian system. (An oblique shape involves only two pitches: the first and last covered.) In evaluating ligatures of more than two notes, the first and last were treated as though each formed a two-note ligature with its neighbour. Middle notes were breves unless modified by stems making them longs or semibreves, or by extension of the note body to make a duplex long or maxima (see fig.32).

Fig.32

Fig.33 shows the rests given by Franco, together with their values in terms of *recta* breves. They are respectively the perfect long, the imperfect long and *brevis altera*, the *brevis recta*, the major semibreve, the minor semibreve and the *finis punctorum*, which marked the end of a section or piece and was immeasurable. All these rests were fixed in value, not subject to imperfection or alteration.

Fig.33



Franco made no provision for a binary division of the long, though it is generally agreed that some pre-Franconian compositions require this. Such a division became common in the following generation (see Sanders, 1962). After Franco the breve was further subdivided, being replaceable by more than three semibreves. The evaluation of these smaller semibreves differed, both in theory and in practice, in the separate 14th-century traditions of France, Italy and England, and the resulting rhythmic differences contributed largely to the musical distinctness of the three styles. Franco was the starting-point for all three. In none of them was a primary division of the breve into more than three semibreves called for: smaller note values were achieved by further subdivision of the primary divisions – subdivisions that were still regarded as types of semibreve, and were written without differentiation as semibreves. In addition, French and Italian theorists introduced imperfect time, with two equal semibreves constituting one breve, on an equal footing with perfect time.

Jacques de Liège alleged that Petrus de Cruce had used up to seven semibreves in the space of a breve. He said that 'another' had used up to nine semibreves, and Handlo and Hanboys said the same of a 'Johannes de Garlandia' (*CS*, i, 389); both cite pre-Ars Nova motets (*F-MO* H196) in support. They do not specify the semibreves' values. But Petrus seems to have earned Jacques' approval for staying within the Franconian tradition and distinguishing the semibreves adequately from each other without recourse to stems; and Handlo attributed to him the orthodox Franconian division of the breve into two unequal or three equal semibreves. In view of these two facts, there is no compelling reason to assume that his shorter notes were anything other than forerunners of one of the 14th-century systems, all of which arranged the shorter notes, according to rules prescribed in increasing detail as the century progressed, within the primary perfect or imperfect division. (Apel's claim (1942, 5/1961, p.319) that Petrus introduced a system without precedent or progeny using five or seven equal semibreves is based on a misreading of Jacques, who would surely have condemned such temerity.) There is no mention of Petrus in the early French or Italian treatises.

(*iii*) *French 14th-century notation.* The first theoretical formulations of French 14th-century notation were those of Philippe de Vitry and Jehan des Murs dating from the early 1320s. Their starting-point was explicitly the teaching of Franco. In addition to the triple division of the breve permitted by the latter, they reintroduced duple division and further subdivided these semibreves into shorter notes, which were regarded as different orders of semibreves, and were at first not differentiated graphically. The first surviving musical instances of this practice are some of the motets interpolated in about 1316 into one copy of the *Roman de Fauvel* (*F-Pn* fr.146). Vitry cited these, and may well have been the composer of them, for composer and theorist alike were concerned mainly with a metrical scheme in which the breve was divided into two equal semibreves each of which was in turn subdivided into three smaller values. Fig.34 shows the interpretation of the contents of the breve when subdivided by two, three, four and five

Fig.34

semibreves respectively. Other musical sources of these motets corroborate these interpretations by distinguishing the shorter order of semibreve with an upward stem, thereby converting them into a new level of note value known as the *minima*. Italian theorists of the time (see §iv below) also gave these interpretations.

Vitry himself established the following hierarchy of five possible subdivisions of the breve: 'minimum perfect time' (i.e. Franconian, although he stated that interpretation of semibreve pairs as 2–1 had been superseded by that of 1–2, and thus departed from Franconian practice in his only statement about perfect time), three semibreves; 'minimum imperfect time', two semibreves each comprising two minims; 'medium perfect time', three semibreves each comprising two minims; 'major perfect time', three semibreves each comprising three minims; 'major imperfect time', two semibreves each comprising three minims.

Taken together with later treatises embodying the theory of the Ars Nova as it developed (including Jehan des Murs' later treatise, *Libellus cantus mensurabilis*, *c*1340, and Anonymous V of *CS*, iii), the French system can be summarized as follows. There was a graphic distinction of the minim by an upward stem from approximately the time of Vitry's treatise. The four principal levels of note value, the long, breve, semibreve and minim, were thus visually distinct. The relationships between these four levels of note value were given names: *modus* ('mode' or 'mood') for the long–breve relationship, *tempus* ('time') for breve–semibreve, *prolatio* ('prolation') for semibreve–minim. Each of these relationships might be binary or ternary. The various relationships of mode, time and prolation came to be termed 'mensurations'. The four combinations of *tempus* and *prolatio* were what Vitry referred to as the 'quatre prolacions'. Various special signs were proposed for the available mensurations, but none was much used during the 14th century. Their appearance in the later part of the century reflected the existence in composition of a wider range of possibilities and therefore the need to specify which combination of relationships was in force. Yet they were in practice confined, with few exceptions, to the circle for perfect *tempus* and the half-circle for imperfect *tempus*, with a dot in the centre to designate major *prolatio* (its absence designated minor).

The existing range of symbols for rests was extended. The semibreve rest became a short vertical bar suspended from a staff-line, and the minim a similar bar placed upon a staff-line. These rests, like Franco's, were fixed in value. Within a given mensuration, which established the value of each rest as perfect or imperfect, no rest was imperfectible or alterable – a situation that did not apply in either Italy or England.

Dots were used to mark off groups of notes according to *tempus*, that is according to breves'-worth, by extension of Franco's principle, and also to indicate perfection. This led in later treatises towards the idea of a 'dot of addition' which added half again to the value of an imperfect note. At first this concept was expressed in terms of showing the perfection of an imperfect note. Jehan des Murs stated that an imperfect note might be made perfect by the addition of half its value (*Libellus*; no dot is mentioned there, but one source of the treatise has a musical example with a dotted breve in imperfect time). Anonymous V stated that 'a dot, when it perfects, always adds to the note after which it is placed the neighbouring part' (i.e. the next note value down).

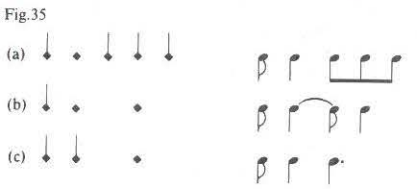
Vitry prescribed red notes for various purposes. Where black notes were perfect, red indicated imperfect mode or imperfect mode and time. The roles of black and red could also be reversed. Red could be used to prevent individual notes from being perfect or altered (i.e. to fix their value regardless of context). Red could effect octave transposition (though no surviving examples are known) or pick out a plainchant voice.

Franco's rules for imperfection of the long were now also applied to the breve and semibreve, and his rules for alteration of the breve to the semibreve and minim. The precise evaluation of any note depended on the governing mensuration and on the context.

Not only could the long be imperfected by the breve, the breve by the semibreve and the semibreve by the minim, but imperfection by non-adjacent values was permitted – for example the long by the semibreve and the breve by the minim. A note could be imperfected to a varying extent: a breve might be imperfected by one minim or two. Vitry specified four types of semibreve: the *major* (i.e. *altera*), equal to six minims, the 'semimajor' or imperfect equal to four or five, the *recta* or *vera* equal to three, and the *minor* equal to two. The minim was often described as a *semibrevis minima*, the lowest value that a semibreve could have.

Franco's rule that a long preceding a long was always perfect came to be strictly applied to breves and semibreves, and was later formulated as the rule *similis ante similem perfecta* ('like before like is perfect'). Particular contexts yielded fixed values for certain notes by requiring them to be perfect: for example, the semibreve shown in fig.35*a* could be imperfect, yet the first semibreve in fig.35*b* had to be perfect, so that only by means of the *minima altera* could the rhythm given in fig.35*c* be shown. Such alteration of the minim became possible

Fig.35



only when the minim was graphically distinct: a pair of unstemmed semibreves, according to Vitry, was trochaic. The full application of these relationships on all levels was not yet in operation at the time of Vitry's treatise.

Syncopation was discussed by theorists, and was allowed by Jehan des Murs in perfect or imperfect mood, time and prolation. Although it was not discussed systematically, it seems clear from the musical sources that the means of syncopation were notes or rests of fixed value (e.g. any rest, or a note imperfected by coloration or perfected by a dot). Dots of syncopation are in effect dots of division unusually positioned to show displacement. A note set off by two dots, as found in later 14th-century sources, is thus isolated as the agent of displacement or prevented from alteration.

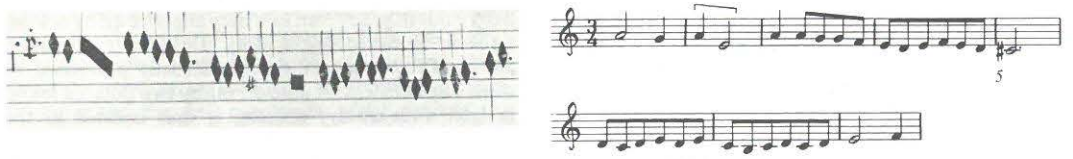
See also Ars nova; Fauvel, roman de; Isorhythm; Sources, ms, §VII.

(*iv*) *Italian 14th-century notation.* The early development of Italian trecento notational theory has been clarified by reference to treatises which apparently antedate Marchetto da Padova, who had long been regarded as its first exponent (Gallo, *La teoria della notazione*, 1966). Amerus, in 1271, recognized exclusively binary division of the long with each of the two breves further subdivided into two semibreves. Guido frater (?1310–15) showed the systematic fusion of this binary tradition with Franconian teaching, dealing with perfect and imperfect time, and agreed in most essential points with Marchetto's *Pomerium*.

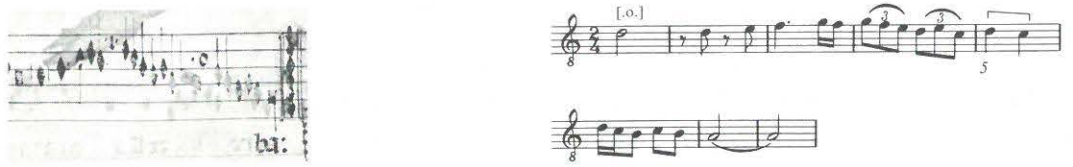
In perfect time the breve was divided into three 'major' semibreves (the use of the term is different from Vitry's). Each of these might be divided into two 'minor' semibreves (as in fig.36*a*), and each of those into two 'minimum' semibreves, totalling 12 minimum semibreves or minims (Guido: *semibreves minime*; Marchetto: *minime*). Alternatively, each major semibreve might be divided into three, making nine in all; Guido, unlike Marchetto, spoke of this as a French practice. (Guido called the resulting nine notes minimum semibreves, whereas Marchetto called them minor semibreves.) In imperfect time the breve was divided into two equal major semibreves and was defined as two-thirds the value of the breve of perfect time. Each of these two major semibreves might be divided into two minor semibreves, and each of those into two minims, making eight minims in all (Guido: *semibreves minime*; Marchetto: *minime in secundo gradu*; see fig.36*b*, bars 1–3, 6–8). Guido and Marchetto both called this manner of division the 'Italian way'. Alternatively, each of the two major semibreves might be divided into three minims (Marchetto: *minime in primo gradu*), making six minims in all (as in fig.36*b*, bars 4–5); this Guido and Marchetto call the 'French way' (their evaluations are shown in fig.37). Marchetto admitted, but did not enlarge upon, the further division of the six minims of imperfect time into two to make 12, and into three to make 18.

Unstemmed semibreves (*naturales*) were evaluated according to certain prescriptions which could be overruled artificially (*via artis*) by means of stems. Downward stems (as in fig.36*b*, bar 3) indicated longer notes whose precise value depended on context as well as on the 'division' (approximately equivalent to the French 'mensuration') which was in operation. Upward stems indicated the minim, whose value was fixed within any division that contained that level of note. The use of these stems was not necessary, even that of stems for minims, if what was required was the normal arrangement of a certain number of notes within a certain division. It became necessary only with abnormal arrangements of notes.

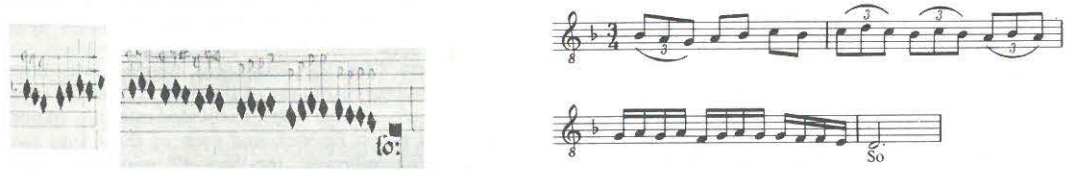
The primary division of perfect time placed the longer of two notes at the end of the *tempus* unless a downward stem was attached to the first note (as in fig.36*a*, bars 1, 8). This is not the same as alteration in French notation,



36(a). Donato da Cascia, 'Un bel girfalco' (I-Fl 87, f.71v), with transcription



36(b). Giovanni da Cascia, 'Agnel son bianco' (I-Fl 87, f.1v), with transcription



36(c). Lorenzo da Firenze, 'Ita se n'era' (I-Fl 87, f.45v), with transcription

since here a semibreve in such a position need not precede a breve; the procedure is Franconian. Whenever unequal division of notes within an 'Italian' division was called for, the longer note (or notes) was again placed at the end (as in fig.36*a*, bars 2–3) unless modified by stems. But the 'French' divisions, whose evaluations as given in the right-hand column of fig.37 are taken from Guido, normally placed the shorter notes after the longer. Though not entirely consistent, and thus in defiance of Marchetto's attempt to impute superior logic to the French system, they are the rhythms most commonly encountered in contemporary French music.

Unless bounded by a breve or ligature, each *tempus* group of semibreves was marked off by a dot. Any ligature comprising two semibreves occupied a full *tempus*. Although Guido provided two forms of semibreve rest (both standing on the staff-line), one occupying a quarter, the other a third of the space between two staff-lines (ed. Gallo, p.27), he did not equate these with the three levels of semibreve. In practice, rests were inconsistently indicated and were as much subject to variation in value as the notes to which they corresponded; this was diametrically opposed to the French use of rests, to which however Italian notation moved closer as the century progressed.

The breve could not be imperfected: the rhythm that French notation rendered as an imperfect breve followed by a semibreve (2–1) was represented in Italian notation by a semibreve with a downward stem followed by a plain semibreve: that is, a semibreve prolonged by *via artis* to two-thirds of a *tempus* followed by a major semibreve. Hence, since a semibreve could not occupy a *tempus* alone, no semibreve could be used alone. That also derives from Franco.

Marchetto proposed that the initial letters of certain *modi* and divisions be used to identify them. This was the counterpart to the French mensuration signs (see §iii above), which found no place in the Italian tradition until it merged with the French later in the century. Marchetto advocated '.i.' and '.p.' for 'imperfect' and 'perfect' *modus* (see figs.36*b* and *a*), not for the divisions of *senaria imperfecta* and *perfecta* (see fig.38) which had not yet acquired these names. The letters '.b.' and '.t.' were to indicate the binary and ternary divisions of the breve (CSM, vi, 164). The letters 'Y' and 'G' were to indicate the Italian and French (literally 'Gallic') manners in imperfect time. In addition, the letters 'S.G.' were used presumably for *secundum gallicos* or *senaria gallica* in *I-Rvat* Rossi 215. The later uses of letters, derived from musical sources and subsequent theoretical writings, in particular from Prosdocimus de Beldemandis, are shown in fig.38. There seems to be no theoretical or practical justification for the widespread modern teaching that undesignated semibreves in *senaria imperfecta* are to be read with the longest note last (in the bar or in each half of it); if anything other than the French way was wanted, it was specified by stems.

Minims were present only in the French divisions and in the third division or beyond of the Italian manner. They did not technically halve the value of a semibreve, although two minims were equal to one minor semibreve, because they were themselves a kind of semibreve. Semiminims, on the other hand, which were mentioned by Vitry but not by the Italian theorists, came into use in later musical sources to divide the minim in half. They had a loop to the right or left of the minim stem. Triplets – three minims in the time of two – were shown by a loop in whichever was the opposite direction (as in fig.36*c*).

Other innovations of the later sources included the dragma – a semibreve with upward and downward stem (fig.39*a*) – with a fixed value of two minims. This was often used to represent three minor semibreves in the

time of two major semibreves. The same effect could also be achieved by void coloration, which could give three notes in the time of two or four in the time of three. A note augmented by half was represented as

Fig.39

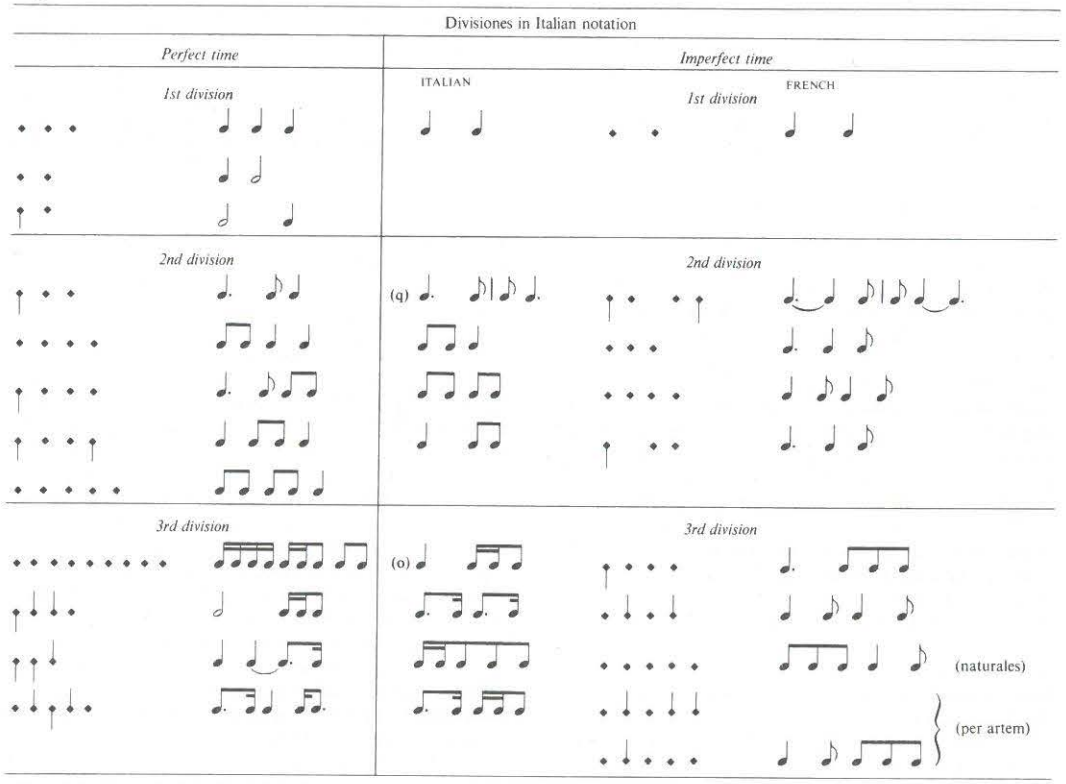
(a) (b)

shown in fig.39*b*. A dot could not be used because of its function as marking the division.

See also SOURCES, MS, §VIII.

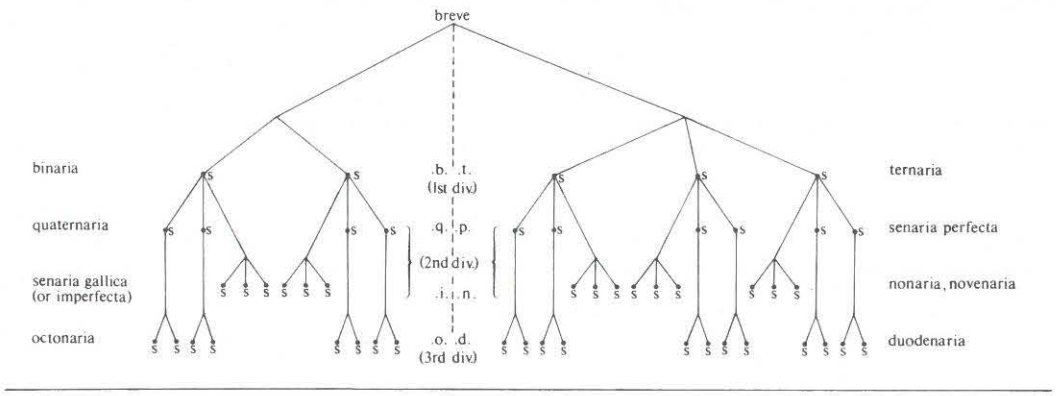
(*v*) *Late 14th-century notation.* Towards the end of the century, in the music of Landini's generation, many French features had entered Italian notation. The Italian division signs, although Prosdocimus's formulation of them was even later, were increasingly superseded by actual or implicit French mensuration signs. Dots of division, downward stems and variable rests gradually disappeared. Breves were imperfected, and dots of addition replaced the other special signs. The notational unrest of this stage was reflected in many pieces combining French and Italian characteristics, and in the existence of more than one notated version of some pieces, an otherwise rare phenomenon (Fischer, 1959).

Fig.37



[These examples are taken from Guido frater]

Fig.38



The eventual absorption of Italian notation by French was the result of a final exploitation of the inherent possibilities of both systems. Extreme rhythmic complexities were indulged in by composers of both nationalities, largely in the orbit of the schismatic papal court at Avignon and of Gaston Fébus, Count of Foix.

The principal technique used was syncopation. The existing means of fixing the values of notes that were to act as syncopating agents were greatly expanded by the use of a variety of stems, hooks, dashes and loops whose precise meaning varied from piece to piece and sometimes within a single piece, as well as by the use of displaced dots of division. Specialized colorations were also used. These sometimes fixed note values and were thus additional means of achieving syncopation, and sometimes they expressed a proportional relationship of one passage to another (see §vii below). The main manuscripts containing this sophisticated and short-lived repertory are *I-MOe* α5.24, *F-Pn* 568 and *CH* 564.

See also ARS SUBTILIOR and SOURCES, MS, §VIII.

(*vi*) *English 14th-century notation.* Robert de Handlo, in 1326, gave clear indications that the English continued to pursue the notational individuality they had shown in their pre-Franconian notation (see §2 above) into the 14th century, and musical sources confirm this. Handlo's treatise is an expanded and glossed version of Franco; his other chief authorities were Petrus de Cruce and a certain 'Johannes de Garlandia' (considered apocryphal by most recent commentators on Garlandia). Here if anywhere there is justification for crediting Petrus de Cruce with an important stage in notational development; however, Handlo's account does not permit the ascription to him of any advance on Franco that was not more exhaustively dealt with by Garlandia. All three follow Franco in accepting only a ternary division of the breve. (Other than an apparent reference to duple time in the problematic dicta of Petrus le Viser (*CS*, i, 388), there is no theoretical support for duple time in England until the late 14th-century treatise of Hanboys, though a few compositions at an earlier date require duple interpretation.)

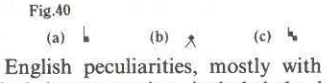
The basic ternary division of the breve was into three 'minor' semibreves. If two semibreves took the place of a breve, one of them became major and was distinguished by a downward stem. Some evidence, more musical than theoretical, points to pairs of semibreves without stems and separated by dots often being performed trochaically (see §ii above). Evidence for trochaic performance of undesignated pairs of breves in 13th-century English music is strong (Sanders, 1962): this may support the 14th-century case, but the grounds are musical rather than notational, because Franco's long–breve relationship was not applied at the level of the semibreve (i.e. like Italy, unlike France).

Each of the three minor semibreves was subject to a further subdivision into three. Each minor semibreve's worth might be marked off by a small circle, or *signum rotundum*, which was quite distinct from the dot of division used to mark off *tempus*. If only two semibreves fell within one such division they were to be read unequally as 1–2 (*minima–minorata*) unless the reverse was indicated by a downward stem on the first of the pair. As in Italy, the French concepts of imperfection and alteration were entirely absent and cannot thus be used to justify iambic interpretation of strings of semibreve pairs. The system of circles reflected an English reluctance to use stems where a note could be evaluated by convention, although not many occur in surviving musical sources. If four was considered the basic Italian division of the breve and six the French, the English was nine, which necessitated some additional clarification by stems or circles.

Later in the century, after the period of French influence discussed below, Hanboys (?*c*1375) distinguished within imperfect time between *curta* and *longa mensura*, the former having four minims to the breve, the latter eight (as in *GB-Lbm* Sloane 1210 and *DRc* 11).

Rests were inconsistently notated early in the century; by the latter half, despite the allegation by several English theorists, including Hanboys, that rests could be altered or imperfected, the forms of rests followed French practice: semibreve hanging from a staff-line, minim placed on a line. There is one important exception: a rest intersecting a line, in effect a semibreve plus a minim rest, was often used for the perfect semibreve. Even in a major-prolation piece an imperfect semibreve rest was often shown by the normal semibreve rest, whereas in French notation it would be shown by two minim rests (as it sometimes was in England, too).

Fig.40



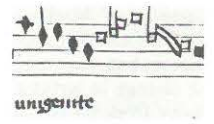
Other English peculiarities, mostly with theoretical and musical documentation, included the *brevis erecta* (fig.40*a*) to indicate chromatic alteration, the swallow-tailed note (fig.40*b*) to indicate rhythmic alteration (also serving to elongate the first of a pair of semibreves – it appears to be a successor to the downward-stemmed semibreve), and the use of the stepwise descending form of the semibreve–semibreve ligature (fig.40*c*) to indicate rhythmic alteration of the second note.

It is clear from the variety of notational practice in musical sources, as well as from the treatise of Hanboys, that at this period there was no single English notation but, rather, diverse English notations. Hanboys cited some individual notational practices of which he disapproved. One of these accords with a surviving musical composition which is adjacent in its source to an example of approved practice.

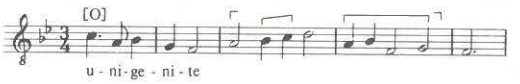
French influence was not felt until some time after the middle of the century. It is clearly present in the pro-Vitrian English treatise *Quatuor principalia* of 1351 or later, as well as in some imported French motets, all of which are in imperfect time and major prolation. The dot of addition makes no appearance in England (nor is there any substitute for it, as in Italy) until the very end of the century when the French influence was most fully assimilated, just before the Old Hall manuscript (*GB-Lbm* Add.57950) was compiled. *Quatuor principalia* condemned some uses of the more notably eccentric auxiliary signs in England, but at the same time achieved some startling fusions of English and French practice. Imperfect breves started to appear in English sources around that time, often in trochaic alternation with semibreves. *Quatuor principalia* declared the major semibreve (presumably of the English tradition) to have the same value as an imperfect breve and to be written like it. Thus it is not known whether these English breves were thought of as imperfected breves or major semibreves (evidence of parallel passages favours semibreves). Minims, with upward stems, began to appear around that time, occasionally in combination with unstemmed minims and in conjunction with *signa rotunda* which are in fact made redundant by the stems and did not long survive them.

See also SOURCES, MS, §VI; OLD HALL MS; WORCESTER POLYPHONY.

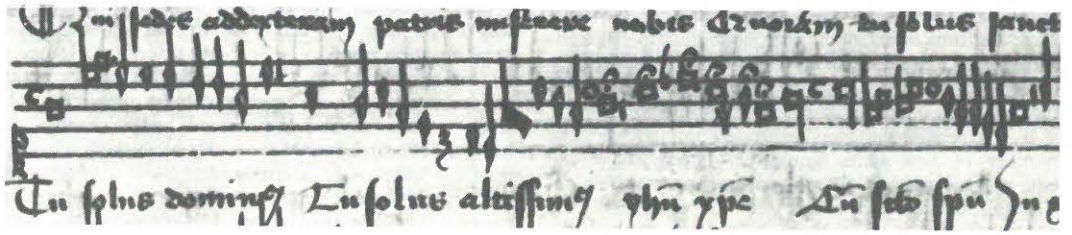
(*vii*) *15th-century notation.* In England around 1400 there existed notational practices as complex as those in southern France; these can be seen in the Old Hall repertory. There are canonic and isorhythmic pieces that involve advanced notational features, and virtuoso essays in syncopation and complex proportional usage. The full resources of continental coloration were available: that is, in addition to normal black-full notes there were black-void, red-full and red-void; and two pieces in the Old Hall repertory use blue-full notes. The normal coding of colour for proportions in English pieces was black-void 2 : 1, red-full 3 : 2, red-void 3 : 1. These colorations could be further modified by the use of numerals and signatures. They made possible the conceiving of rhythmic patterns that could otherwise have been notated in only the most clumsy or inadequate way. It was this, rather than innate conservatism, that led the English to retain some use of black-full notation, alongside black-void, after most continental scribes had abandoned black-full about 1430.



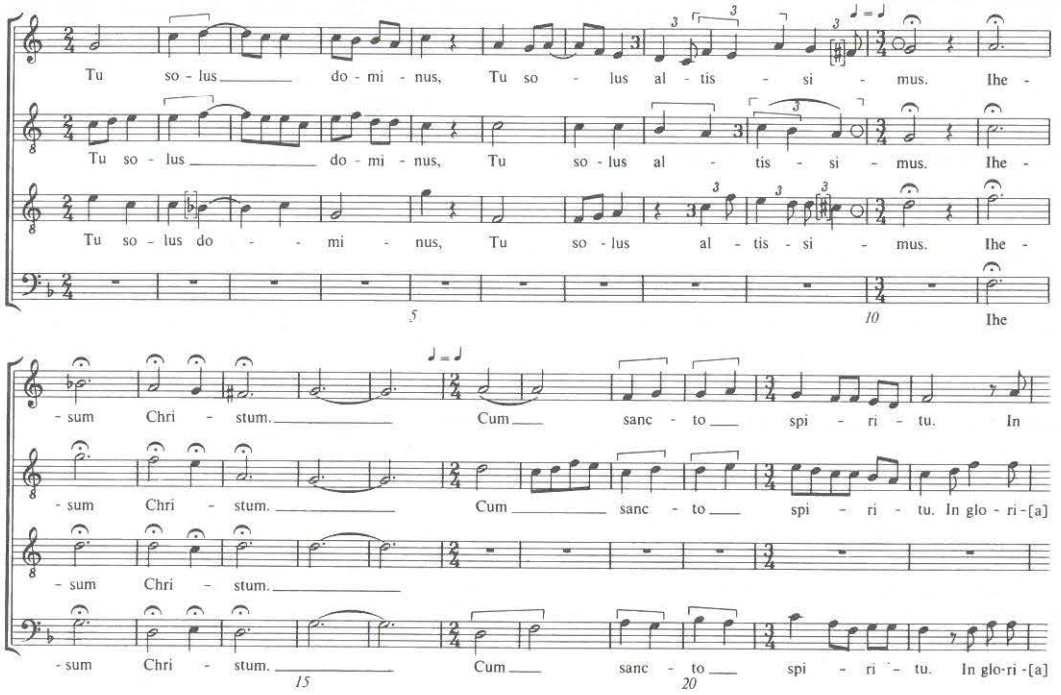
41. Part of the tenor of a Gloria by Dunstable (I-Bu 2216, p.24), with transcription (below)



Coloration was used also to express imperfection: to prevent alteration and perfection in notes that might otherwise be subject to them, rather than to bring about a reduction in all note values. When the notation was principally black-full, the coloration was red or black-void; when black-void, the coloration was normally black-full. The indication of imperfection remained the most common function of coloration throughout the 15th century and into the 16th. Fig.41 shows black-void coloration being used to bring about imperfection and to prevent alteration.



42. Part of top voice of a Gloria by Binchois (I-TRmn 87, ff.26v–27r), with transcription (below) of all four voices



The earliest examples of black-void notation date from about 1400 and are mostly English. The reason for the change is obscure but may perhaps best be accounted for by the change in writing habits associated with the general move from parchment to paper as the main writing surface. It is also true that the greater simplicity of style that dawned with the 15th century did not, except in the continuing English tradition, require the availability of so many colorations for proportions. For the change was much more than a simple reversal of black-full and black-void: as black-void superseded black-full, so the latter came largely to replace red-full and thus red notation came to be abandoned (as in fig.42 – see bars 8–9). Continental compositions using proportions (e.g. those in *GB-Ob* Can. misc.213, from the late 1430s) inclined much more to the use of numerical proportion signs and mensuration signs with graphic or numerical modifications.

The reason for proportional notation lay in what may be called minim equivalence: that is, in French notation, where a change of mensuration occurred, the relationship between the two mensurations was that of minim = minim (this is clearly established at this time by pieces in which mensuration changes in the different parts occur at different points in the composition – it applies in fig.42 between bar 16 and bar 17). Proportional notation was simply a way of overriding that equivalence, and thus of extending the possibilities of the mensural system. It did so for shorter or longer passages by expressing a different note relationship to a preceding passage or to other voices in the composition.

If the relationship was expressed numerically, the number of new units would be placed above the equivalent number of old units in the form of a fraction. The unit referred to in such a fraction was normally the minim, though it could be the semibreve of the same kind. Thus the '3' in fig.42, which implies 3 over 2, indicates the occurrence of three minims in the time of the previous two. The half-circle with vertical bar (often called 'cut C' by modern writers: fig.43*a*) indicated what

Fig.43

(a) ¢ (b) ⌽ (c) ↄ

was known as 'diminution': that is, the performance of a passage faster than normal, by a specified ratio. Sometimes diminution occurred in the exact ratio of 2 : 1, in which case it was called *dimidietas*; in other cases it did not. Anonymous XII (*CS*, iii, 484) reported that with the circle with vertical bar ('cut O': fig.43*b*) one third of all values was taken away. Later in the century these 'cut' mensuration signs came to be used as a conventional signal for imprecise diminution which enabled longer note values to be written. This was a way of avoiding an otherwise inevitable flood of short note values, with their less easily legible stems. The reversed half-circle (fig.43*c*) sometimes carried the function of duple diminution when placed after a passage governed by the half-circle. However, when it occurred after a passage with a triple dimension to its mensuration (circle or half-circle with dot) it indicated a proportion of 4 : 3 (see Hamm, 1964; *see also* PROPORTIONS). The principle of equating notes of different denominations by means of a stated ratio became a well-established practice in the music of Ockeghem's generation, when numerically modified mensuration signs could shift the

Fig.44

C	O	C	O	C2	O2	C3	O3
				2	3	2	3
2	3	2	3	2	2	3	3
2	2	3	3				

basic set of relationships in the way shown in fig.44.

But apart from the cultivation of proportions in a few works by a small number of composers, the trend of the late 15th century was towards notational simplification. It is significant that, at just the same time, the late 15th century and the early 16th, cases arose of a simplified notation using only one note shape and repeating it at the same pitch to make up any note of greater value, or using only a short vertical stroke in the same way. Such a notation was presumably designed for singers who could not cope with the complexities of the mensural system, especially with imperfection and alteration. It was in the early 16th century that note values in mensural notation came to be precisely determined by their appearance regardless of context, rather than by their denomination as long, breve, semibreve or minim in a given context (the step that Franco had achieved) – at least, that became true of the essential working of notation, for imprecision and considerations of context in practice continue to feature in notation right up to the present day. However, around 1500 musicians increasingly often placed a dot after a note that was to be perfect, even where earlier practice would not have required one. The practice of alteration gradually decayed. An intermediate stage before notators felt free to place an imperfect breve before a perfect one was the use of the coloured (black-full) breve where previously an altered semibreve would have been used.

See also SOURCES, MS, § IX, 2–11.

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4. MENSURAL NOTATION FROM 1500.

(*i*) *General.* The simplified void notation of the late 15th century and the 16th, used throughout Europe for the international polyphonic repertory, was, like the medieval systems from which it developed, a singer's notation. It was not well suited to notating more than a single melodic line, especially when associated with printing by movable type. In succeeding centuries, especially after the rise of the thoroughbass, however, theory and teaching were increasingly controlled by instrumentalists such as keyboard players, and the staff notation used for the bulk of the repertory was influenced by instrumental requirements, adopting many features that permitted it to express increasingly complex information. Conversely, keyboard tablature began to decline. The instrumental features adopted included, in the 16th and 17th centuries, the bar-line, beam and slur, permitting the clear grouping of notes for rhythmic and other purposes; the standardization of clefs, facilitating the sight-reading of even fairly complex textures; and the reintroduction of the score, which had been dropped in French notation in the 13th century. In the 16th, 17th and 18th centuries, the demi-semiquaver and the hemidemisemiquaver were added to the vocabulary of note values; keyboard notation adopted, when necessary for the sake of clarity, a score layout with more than two staves to the system, not previously used except in the partitura. In the 19th century, the vocabulary of signs for dynamics, accents and articulation was greatly extended; some novel features, which became basic to 20th century practice, were introduced by Beethoven, Schumann and Liszt.

Thus notation continued to develop after the 16th century. Yet a cleavage gradually developed between notational theory and notational practice; professional musicians often came to treat theory as elementary and in consequence to expound it merely within the sphere of musical rudiments or incidentally in treatises on performance. This situation began to change only in the second half of the 19th century. Meanwhile, however, proposals for reform had been made, from the 17th century onwards, by those seeking a universal musical notation. Even though most proposed reforms were impracticable and were adopted by no-one but their inventors, as a whole they strikingly illustrate the desire of Western notators for a notation independent of any single musical style. Even a system as economical and adequate as Tonic Sol-fa was not adopted for the bulk of diatonic music: its limitation in practice to a single style was felt as a fatal flaw, as similar limitations had never been present in medieval notational systems. That did not prevent its use for the benefit of the musically uneducated: and Tonic Sol-fa merely exemplifies the numerous novel notational systems for vocal music devised from the 16th century onwards for this purpose. These systems are often unconcerned with theoretical abstractions, and thus resemble instrumental tablatures. Most of them were based on popular solmization practice, and many provide the same information in more than one way.

A turning-point in notational practice seems to have occurred in the second half of the 19th century in consequence of the harmonic and rhythmic theory of the period (Moritz Hauptmann, Hugo Riemann and Mathis