

inflessioni di voci che fanno i cantanti quando da un tuono passano ad un altro qualunque in una gradazione quasi impercettibile, sì nell'aumento che nella diminuzione dell'acuto e del grave è appunto l'enarmonico, malgrado che talora essi stessi lo ignorino. I violinisti fissano il dito su di una corda, e quindi strisciandolo sulla medesima fino ad un altro tuono fanno lo stesso.

inflections of the voice that singers make when they pass from one note to any another through almost imperceptible gradations, by both raising and lowering the note – those are what we call enharmony, even if they themselves may be unaware of the fact. Violinists do the same thing when they place the finger on a string and then slide it up to another note on the same string.

This fashion then extended until it was even identified with a definite name: the “*maniera smorfiosa*” (i.e. the “mincing” style) of the Italians. In a letter published in the *Allgemeine musikalische Zeitung* in 1811, Antonio Salieri confirms that it was adopted even by singers, and condemned it roundly:

For some time an effeminate and laughable manner of playing their instruments has crept in with various weak solo violinists, which the Italians call the *maniera smorfiosa*, stemming from an abuse of sliding the finger up and down the string. This feeble and childish mannerism has, like an infectious disease, spread to some orchestral players and, what is most ridiculous, not merely to our courageous violinists, but also to violists and even double-bass players. Because a tolerated evil always gets worse, such a mannerism, particularly in a full orchestra, must necessarily change a harmonious body into a collection of whining children and miaowing cats. [...] From now on, it is forbidden to employ players or singers who adhere to this method either in the Court Theatres or in the Music Society of the City of Vienna.¹⁰⁹

Clive Brown observes that this shifting is implied by the type of fingering then in use for chromatic notes, illustrated by Leopold Mozart and described above (Section C.3.1).¹¹⁰

Nicolò Paganini (1782-1840) is also known to have still made use of it.¹¹¹ About him contemporaries remembered “that enharmonic chromatic scale of many octaves, and that he was accustomed to sliding on a string, a passage described as the *maniera smorfiosa* of the Italians; called horrible cat-music”.¹¹² From a contemporary witness, we also learn that the *cantabile* on the [fourth] string was performed by him in the same manner adopted earlier by Mestrino (Fig. C.5.1), which – contrary to the opin-

¹⁰⁹ Quoted from Brown C. 1988: 18, and Zaslav 1997: 569. “Artificial miaowing” which in 1807-08 the *Allgemeine musikalische Zeitung* had reprimanded in the performances of the young Spohr, and which, as early as 1805 was satirically cited in other German papers of the time as a style to be condemned (Brown C. 1999: 559, 564-5).

¹¹⁰ Brown C. 1999: 560; this author had already observed that even many of the fingerings by Ferdinand David (1810-73) “have a potential for portamento” (Brown 1994: 130).

¹¹¹ Stowell 1992: 127 (see e.g. the glissando employed on his *variazioni* on Rossini’s *Moses*).

¹¹² Polko 1892: 91 (“quella enarmonica scala cromatica a più ottave, e ch’egli usava scivolare su una corda, un passaggio qualificato per *maniera smorfiosa* degli Italiani, chiamata un’orribile musica di gatti”).

ion indicated above – made a great impression on the audience; the same source adds that even the famous soprano Giovanni Battista Velluti (1781-1861), active on the stage up to 1830, used the same kind of “grace”.¹¹³

Slide or portamento. [...] On the violin it is simply produced by sliding up the finger in close contact with the string, during an even-drawn bow. [...] The portamento, or carriage of the voice, as the Italians term it, is an easy mode of sliding from one tone to another. Hence second-rate singers find it a convenient method of encountering those notes which lie at remote and awkward distances. In some voices it is so fixed by habit, that two bars cannot be sung without it. [...] When used with discretion, it adds much to the force of expression; and in Madame Caradori, it was a grace both tender and agreeable.

The violinist Paganini, the present wonder of the world, plays an entire cantabile upon one string, sliding through all the intervals with a single finger, – the effect of which is so plaintive and desolate, as to move his audience to tears. Velluti, the first singer-master of the age, uses this grace with incomparable beauty; in his voice it imparts a tenderness not to be described.

Sentimental ‘salon style’, which had also extended to the cello: “Cellists such as Alexander Batta and J.F. Mendes, who were especially popular with female Parisian audiences, were frequently castigated by ‘refined’ male listeners for their emulation of the popular tenor Giovanni Battista Rubini (1794-1854)”, whose style included “portamento ‘sobs’”.¹¹⁴ Such an excessive use of portamento was also peculiar of the late-19th- and early-20th-century violinists, and roused Carl Flesch’s criticisms.¹¹⁵ This fashion is confirmed by most early-20th-century recordings and by British orchestras’ performance-style of the 1920s.¹¹⁶

C.6. Pythagorean and ‘expressive-functional’ intonation

C.6.1. *First mentions in France and Italy.* Towards the middle of the 18th century the modern tonal-harmonic approach of the system had begun to impose its needs also on intonation: the power of attraction of the tonic on the leading tone and of the sixth degree on the minor 7th had for example ensured that these two semitones, from being ‘large’ (as they had been in the syntonic-meantone system) were reduced to being ‘small’. In the division of the tone the sharp therefore became sharper than the enharmonically equivalent flat.

Already in the last quarter of the preceding century, Christiaan Huygens had offered us a first isolated testimony to the new tonal sensibility by declaring that he pre-

¹¹³ Gardiner 1832: 165.

¹¹⁴ Walden 1999: 192.

¹¹⁵ Stowell 1992: 128.

¹¹⁶ Philip 1994: 200-01 (a habit discouraged, or at least refined, in the late 20th century).

ferred – as a leading-tone interval used melodically – the minor semitone to the large:¹¹⁷

En jouant en E majeur il est bon de faire les cadences E-E $\flat$ -E, qui ont quelque chose de plus tendre et plus plaintif, que E-D $\sharp$ -E quand la feinte est adjoutée au clavier. Mais dans des accords, surtout à la dernière note d'une cadence ou la basse est B, le D $\sharp$ vaut mieux.

When playing in E major it is recommended to play the cadences E-E $\flat$ -E, since they sound more tender and plaintive than E-D $\sharp$ -E, [which is played] when the [relative] black key [= D $\sharp$] is added on the keyboard. But in chords, above all in the last note of a cadence of which the bass is B, the D $\sharp$ is preferable.

The Dutch physicist had also pointed out that on common organs and harpsichords tuned with the quarter-comma (harmonic extension E $\flat$ -G $\sharp$), the key of E minor, compared to that of D minor,

a quelque chose de plus plaintif et de plus tendre, à cause des cadences qui se font par ces demitons mineurs, et aussi quelque chose de triste à cause de quelques consonances qui en deviennent un peu fausses, et de ce qu'on y employe le triton au lieu de la fausse quinte.

sounds a little more plaintive and tender, on account of the cadences that are played with these minor semitones, and also a little sad on account of certain consonances that become a little false, and of the fact the tritone is used instead of the diminished 5th [i.e. E $\flat$ -A instead of C $\sharp$ -G].

Only a few years later (1698) Georg Muffat also expressed a similar opinion, complaining about the fact that violinists did not play the leading notes high enough.¹¹⁸

But it is only in 1760 that we can record the first real codification of this preference. For in that year the fingerings prescribed by Delusse for the flute produce sharps that are sharper than flats.¹¹⁹ As regards singers and violinists, the switching of the two semitones is mentioned ten years later by Abbé Roussier. Although this practice was not generalized (and would not be for a long time) he adds:¹²⁰

J'ai rencontré en ma vie plusieurs personnes à qui leurs maîtres, à ce que ces personnes me disoient, leurs avoient toujours re-

In my lifetime I have met many people who, from what they told me, had always been recommended by their teachers to

¹¹⁷ Huygens 1940: 74 (from the manuscript *Les divers modes*, post 1672). Alexander Silbiger observes that this preference seems to be manifest as early as the Renaissance, since "Vicentino presents a series of cadence formulas in which the seventh degree is raised by an enharmonic diesis (Libro III, Cap. L, fol. 66v), and introduces similar cadences in several of his enharmonic compositions (e.g., 'Musica prisca caput', mm. 31-32, 35-36). However, unlike modern musicians, he was not willing to sacrifice the purity of the vertical sonority caused by the raised leading tone; he solved the problem by moving the entire chord up an enharmonic diesis" (Vicentino 1990: 7).

¹¹⁸ Haynes 1991: 359, 367 (from the *Florilegium secundum*, Passau, 1698).

¹¹⁹ According to Sechet 1975: 10.

¹²⁰ Roussier 1770: 164-5.

commandé de fortifier un peu les dièses, en les élevant, et de radoucir dans la même proportion les bémols, en les baissant. sharpen a little the sharps, by raising them, and to sweeten the flats in the same proportion, by lowering them.

This obviously reflected on the major 3rd, which from being syntonic (5:4) was widened by a comma and became Pythagorean (81:64):¹²¹

la tierce de 64 à 81, que nos modernes ont toujours soin de représenter comme très-discordante, dans leurs écrits, est précisément celle qu'ils chantent eux-mêmes, lorsqu'ils quittent la plume; du moins est-il vrai que c'est celle qu'on chante communément [...] que c'est celle que nous font entendre les instrumens libres, tels que le violon, le violoncelle, &c, lorsque ces instrumens sont entre les mains de ceux qui ne consultent que l'oreille (Entre plusieurs virtuoses que je pourrais citer, je ne nommerai ici que M. DUPORT, pour le violoncelle, à Paris, et M. VACHON pour le violon).

the third of 64:81, which our moderns in their writings have always taken pains to represent as very dissonant, is precisely that they themselves play when they lay down the pen; at the very least it is true that it is that which is commonly sung [...] that it is that which we hear on the free instruments, such as the violin, cello, etc. when these instruments are in the hands of one who only consults his own ear. Among the many virtuosos that I could mention, I shall here merely mention the name of Monsieur DUPORT for the cello in Paris and Monsieur VACHON for the violin.)

Roussier's remarks, however, should be regarded with some suspicion, coming as they do from a partisan (and a rather fanatical one at that) of the Pythagorean intonation 'of the ancient Greeks'. But fortunately, independent confirmation is given by Anton Bemetzrieder, music theorist of Diderot's circle and a supporter of equal temperament, who only six years later was to observe:¹²²

Franchissons la barrière de notre musicien observateur, et examinons un peu les sons que les virtuoses ont introduits dans l'octave.

Let us break down the barrier of our musician-observer [who had ideally divided the octave into 12 equal semitones] and take a look at the notes that the virtuosos have introduced into the octave.

Le petit excès ou le demi-ton n'est plus le seul intervalle qui sépare la sensible de la tonique; la sixte mineure est souvent plus près de la quinte; la seconde n'est pas toujours également éloignée de la tonique et de la tierce; la quarte est tantôt plus près de la tierce, et tantôt elle en est plus éloignée.

The small excess or the semitone is no longer the only interval that separates the leading tone from the tonic; the minor 6th is often closer to the 5th; the 2nd is not always equally distant from the tonic and the 3rd; the 4th is sometimes close to the 3rd, sometimes more distant.

Le virtuose hausse le "dièse", tantôt beau-

¹²¹ Roussier 1770: 213-4; Barbieri 1987a: 167. Until 1987, the official date attesting this inversion was believed to be 1797, the year in which Campagnoli published his violin method, according to Boyden 1951: 212. The forerunners of the new intonation were therefore the violinist Pierre Vachon (1731-1803) and the cellist Jean-Pierre Duport (1741-1818).

¹²² Bemetzrieder 1776: XXIII-XXIV.

coup, et tantôt peu; il baisse plus ou moins les notes "bémols"; il joue la même note "bémol" différemment, suivant qu'elle est sixte mineure ou tonique; le même "dièse" différemment, suivant qu'il est sensible, tierce majeure ou tonique: il exerce le même empire sur les notes naturelles; le si de la seconde corde du violon, qui s'accorde avec le mi de la chantedelle, ne contente plus l'oreille sensible et exercée dans l'accord de sixte, qu'il fait avec le re de la troisième corde vuide.

The intonation described by Bemetzrieder, though clearly of a Pythagorean type, has however a strong "expressive" or "functional" component.¹²³ For, ironically alluding to Roussier, who unfailingly harked back to the virtues of the ancient Greeks, he adds:¹²⁴

Suivons pourtant l'usage, et voyons si nous pourrons, sans le secours de la Grece, traiter de la double famille des "dièses" et des "bémols".

En réduisant à sept le nombre infini des sons intermédiaires entre l'ut et le ré, et après avoir consulté l'expérience, je dis:

1°. Les trois premiers et les plus proches de l'ut, s'appellent forcément ré-bémols, et demandent, comme sixtes mineures ou comme quarts, à retourner à l'ut.

2°. Les trois derniers et les plus proches de ré, s'appellent forcément ut-dièse, et demandent, comme sensibles ou comme secondes, d'aller au ré.

3°. Le quatrième, qui fait justement le milieu entre l'ut et le ré, s'appelle, comme on veut, ré-bémol ou ut-dièse, et va à l'ut ou au ré.

[...] Le virtuose, dans les *solo*, rend divinement ces délicieuses nuances; il n'est pas nécessaire de lui en donner des avis: la nature, en donnant des organes infiniment flexibles, enseigne tout.

The opposition between the two theorists very soon aroused one those *querelles* (albeit a minor one) that were so widely cherished in the 18th-century French musical scene: Vandermonde began by claiming that the first to have become aware of the

Sometimes the virtuoso raises the sharp more, sometimes less; he lowers the flats more or less; he plays the same flat note differently according to whether it is a minor 6th or a tonic; the same sharp differently according to whether it is a leading note, major 3rd or tonic. It is the same with the natural notes: the B of the second string on the violin, tuned to the E of the first string, no longer satisfies the sensitive and skilled ear in the chord of the 6th, made with the open D-string.

Let us therefore follow the practice, and let us see if we can – without the assistance of Greece – discuss the double family of the sharps and flats.

After reducing to seven the infinite number of intermediate notes between C and D, and after consulting experience, I say:

1°. The first three, those closest to C, are necessarily called D flat and require, as minor 6ths or as 4ths, to return to C.

2°. The last three, those closest to D, are necessarily called C sharp and require, as leading tones or as seconds, to rise to D.

3°. The fourth, positioned exactly halfway between C and D, is called, as one prefers, D flat or C sharp and can resolve on either C or D.

[...] The virtuoso, in his 'solos', renders these delightful nuances divinely; it is not necessary to give him advice: nature, having gifted him with infinitely flexible organs, suggests everything to him.

new type of intonation had been Bemetzrieder, whereas Dupuy later ascribed its paternity to Roussier. As for Roussier, with the strict Pythagoreanism of the 'new Greek', he also criticized the tempered approach that had inspired his adversary. The polemic seemed to lose its virulence only in 1781, when Bemetzrieder left Paris to settle for good in London.¹²⁵

Around 1774-8 the switching of sharp and flat by singers was explicitly mentioned also by Jean-Jacques Rousseau, who had probably picked up echoes of the polemic:¹²⁶

Ceci, je le sais bien, est directement contraire aux calculs établis et à l'opinion commune, qui donne le nom de semi-ton mineur au passage d'une note à son dièse ou à son bémol, et de semi-ton majeur au passage d'une note au bémol supérieur ou au dièse inférieur. Mais dans ces dénominations on a eu plus d'égard à la différence du degré qu'au vrai rapport de l'intervalle, comme s'en convaincra bientôt tout homme qui aura de l'oreille et de la bonne-foi".

That, I know well, is completely contrary to the calculations in use and to the common opinion, which calls a minor semitone the passage of a note to its sharp or its flat, and a major semitone the passage of a note to the higher flat or lower sharp. But in these namings more attention has been given to the difference of degree than to the true ratio of the interval, as anyone equipped with a good ear and good faith will be immediately convinced.

Regarding Italy, Antonio Eximeno had already said the following in 1775:¹²⁷

Qualor la voce umana passa per un semitono dalla settima maggiore all'ottava di un tono, quasiché rinforza quella settima, e rende quel semitono alquanto minore di quello che sia sul cembalo. Al contrario qualor discende per un nuovo semitono, come spesso accade nell'espressione patetica, quasiché si rilassa, e rende quel semitono più languido, e alquanto maggiore di quello che sia sul cembalo.

If the human voice should move by a semitone [a sharp] from the major seventh to the octave of a key, it strengthens that seventh a little and makes the interval somewhat smaller than what it would be on the harpsichord. If, on the contrary, it descends by a different semitone [a flat], as often happens in the expression of pathos, it relaxes a little and makes that semitone more languid and a little bigger [as an interval referred to the upper note] that it would be on the harpsichord.

He adds that the keyboard instruments did not have such flexibility of intonation and were instead unsuited to rendering the new *cantabile* style.¹²⁸ In 1791 Francesco

¹²⁵ Cfr. [La Borde] 1781: this small collection of *Mémoires* contains some *Observations* by Alexandre-Théophile Vandermonde (p. 39 ff., in which the discovery is attributed to Bemetzrieder), followed by *Remarques de M. l'Abbé Roussier sur les Observations de M. Vandermonde* (p. 42 ff., in which Roussier claims to have been the first to have drawn attention to the fact in 1770). Roussier's claims were to be confirmed by Dupuy 1781.

¹²⁶ Rousseau 1995: 464. Passage already cited in Zaslaw 1979: 54.

¹²⁷ Eximeno 1775: 75.

¹²⁸ Eximeno 1775: 79 ("lo stile che si chiama 'cantabile'").

¹²³ Terms introduced by Chesnut 1977: 256, 271.

¹²⁴ Bemetzrieder 1776: XXVI-XXIX. See also Bemetzrieder [1808]: 6 (Pythagorean scale).

Galeazzi also realized, with surprise, that for violinists the leading tone-tonic semitone was small instead of large (in contrast with what was prescribed by the just intonation that he upheld):¹²⁹

Riguardo alla settima v'è una osservazione in più da farsi, ed è che quando sale di grado all'ottava si deve far sempre alquanto alterata, e crescente acciò grata riesca, e soddisfaccia pienamente l'orecchio, del che è molto difficile render ragione, poiché se in pratica l'intervallo tra settima ed ottava è di un semitono minimo, in teorica, è un semitono maggiore, né so come conciliar si possa l'una coll'altra.

Concerning the seventh there is one more observation to be made, and it is that when it rises by one step to the octave it must always be made somewhat altered and sharp so that it sounds pleasing and satisfying to the ear; which is very difficult to explain, since if in practice the interval between the seventh and octave is a minimal semitone, in theory it is a major semitone, nor do I know how the one can be reconciled with the other.

A similar conflict between just- and Pythagorean-intonation appears again in 1824, in a document by Karl Grenser on the flute (an author that – throughout the same writing – designated notes by their dual enharmonic functions, implying that the flats should still be played higher than the sharps, by means of the flexible blowing technique, as already seen in Section C.3.2):¹³⁰

The flute must, like the fortepiano, be tuned to equal temperament. Then if a skilled flutist here or there, where it has a good effect; e.g. wants to make a leading note a little higher, or the seventh in a dominant chord a little lower etc., then he has to either find fingerings to bring this about or manage by rolling the mouth-hole in or out and strengthening and weakening the wind.

Shortly after Galeazzi's treatise, Bartolomeo Campagnoli – a concert performer from Italy who had emigrated to Germany (1751-1827) – published his violin method, the first to prescribe a Pythagorean type of intonation explicitly.¹³¹ Regarding the sharps and flats, only in certain cases does he allow them to be united by temperament. His comment on Examples 225 and 226 of his method is categorical (see Fig. C.6.1):¹³²

¹²⁹ Galeazzi 1791: 122.

¹³⁰ Powell 2002: 148-9.

¹³¹ The first surviving version of this method "is a parallel Italian/French edition, printed in Florence sometime between 1808 and 1815" (Duffin 2007: 78). At Leipzig, however, in 1824, Breitkopf & Härtel printed the better-known edition, bearing the title *Nouvelle méthode de la mécanique progressive du jeu du violon* [...] op. 21. The date of the first publication of this work is disputed however. According to Montanari U. 1969: 49, "Fétis quoted from the Bachmann edition (Hannover), in French and German. Probably, the date to be accepted for the first is 1797, and 1803 for the second" ("Fétis cita l'edizione Bachmann (Hannover), in francese e tedesco. Probabilmente si deve accettare, come data della prima, il 1797, della seconda il 1803").

¹³² Campagnoli *Metodo*: 38-9, 129 (plate). This author uses the term "temperament" in the 18th-

FIGURE C.6.1. Campagnoli *Metodo*. See, at the top of the fingerboard, the position of the *temperamento*, halfway between the sharp and the enharmonically equivalent flat. It should be observed that, though the fingerboard strictly follows the Pythagorean division, some of the fingerings of N.º. 226 seem still to adhere to the syntonic-type intonation of Fig. C.3.1 (L. Mozart).

century sense: see for example Lirou 1785: 110 ("l'intervalle entre *la*♭ et *sol*♯, rendu nul et identifié par le *tempérament*"). Serre 1763: 13 had already written that in enharmonic transitions it was necessary to unify the notes of the type *G*♯ and *A*♭ by means of "*temperament*" ("*le tempérament*").

[Es. 225, *Temperamento*] Tavola che rappresenta la giusta distanza e la differenza che si trova tra i tuoni sinonimi meccanicamente accordati sull'organo, pianoforte ed arpa, misurati sulla tastiera del violino; per servirsi del temperamento bisogna porre le dita sulle corde tra le piccole linee. [...] La giusta intonazione non permette d'adottare il temperamento sul violino, che in certi casi: 1°. Per diminuire il movimento delle dita; 2°. Per soddisfare la delicatezza dell'orecchio accompagnando gli altri stromenti; 3°. Per facilitare l'agilità: per esempio incontrando il $\text{la}\flat$ e $[\text{sol}]\sharp$ sulla terza corda, non bisogna ritirare il quarto dito per porre il terzo [cfr. Es. 226], ma si deve tenervi sopra il quarto modificandolo sino al punto che la natura dell'armonia lo richiede.

[Ex. 225, *Temperament*] Table that shows the correct distance and difference that is found between the synonymous notes mechanically tuned on the organ, piano and harp, measured on the violin fingerboard; to make use of temperament one must place the fingers on the strings between the small lines. [...] Correct intonation does not allow one to adopt temperament on the violin, except in certain cases: 1°. To reduce the movement of the fingers; 2°. To satisfy the delicacy of the ear when accompanying other instruments; 3°. To facilitate agility: for example, if one finds $\text{A}\flat$ and $[\text{G}]\sharp$ on the third string, one must not withdraw the fourth finger and put the third [cf. Es. 226], but one must retain the fourth finger, moving it up to the point where the nature of the harmony requires.

We can legitimately conclude, therefore, that in his pieces for solo violin he genuinely intended to differentiate the enharmonically equivalent notes (Ex. C.6.1).¹³³



EXAMPLE C.6.1. Bartolomeo Campagnoli, *Six fugues pour le violon seul*: see the [Pythagorean?] commatic interval $\text{A}\flat/\text{G}\sharp$.

Finally let us pass on to examine the position of Wolfgang Amadeus Mozart. In the lessons he gave Thomas Attwood (1785-7) he conformed to what was contained in Leopold's *Violinschule*, hence supporting the syntonic ratios of the semitones.¹³⁴ As a result Chesnut holds that modern intonation, of an expressive-functional type, "is not appropriate if our goal is to play Mozart's music as he himself wanted it played".¹³⁵ However, we know that Mozart travelled widely in France and Italy precisely during the years when the evidence (reported above) on the new intonation was multiplying, so probably he also applied it, even if only unconsciously.

C.6.2. The 'harmonic' ('septimal') 6ths and 7ths. The natural tendency to lower the intonation of the flats was probably one of the factors that – in the course of the 18th

¹³³ Campagnoli *Fugues*: 4.

¹³⁴ Mozart W.A. 1965: 6, 8.

¹³⁵ Chesnut 1977: 271. As we saw in fn. 121, when this important article appeared much of the evidence mentioned here had not yet surfaced.

century – favoured the attempts to admit in practice the 7th harmonic, until then considered a 'diabolus in musica'. Among the violinists, the first to declare that he made use of it was Giuseppe Tartini (who employed it in the form of a minor 7th), followed by Michele Stratico, also of the same school. At the same period, the composer Francesco Bianchi tells us that violinists also utilised the 'septimal ratio' (14:9) to play the Neapolitan 6th. The question is dealt with and documented in Section D.4.

C.6.3. 'Expressive' intonation in the 19th century. Although the reference to the Pythagorean intonation become almost mandatory in the course of the new century,¹³⁶ its effective, actual practice must have been considerably conditioned by factors that we could call 'expressive'. For example, Bernhard Romberg – in his famous method for the cello, published in 1840 with the approval of Cherubini, Spontini and other musicians – asserts that the leading tones in minor keys were pitched higher than those in major keys. After prescribing equal temperament (though only for beginners), he then adds:¹³⁷

[p. 20] Il serait également superflu d'enseigner au commencement, à l'écolier, la différence qu'il y a entre un demi-ton produit par un dièze ($\sharp$) qui hausse ou par un bémol ($\flat$) qui baisse la note naturelle. Ces distinctions ne feraient que l'embrouiller. Aussi bien il arrive souvent, comme on verra au chapitre du gout, qu'il faut, pour l'expression, prendre, au moyen d'un dièze, une note un peu plus haut, ou, au moyen d'un bémol, un peu plus bas que le calcul théorique ne l'indique; ce sont les cas où il y a conflit entre la théorie et le sentiment musical. [...]

[p. 20] It will be equally superfluous to teach the pupil right from the beginning the difference between a semitone produced by a diesis ($\sharp$), which raises the natural note, and a flat ($\flat$), which lowers it. These distinctions would do nothing but confuse him. And yet it often happens – as we shall see in the chapter "On taste" – that for expression one must play, for the sharp, a note that is a little higher, or, for the flat a little lower, than those indicated by theoretical calculation. There are cases where theory and musical feeling come into conflict. [...]

[p. 127] [...] cette teinte douce et mélancolique qui est l'attribut du mode mineur. Il faut ajouter à cela que pour renforcer le caractère propre à ce mode, on prend la note sensible un peu plus haut que dans les tons majeurs, et la petite septième un peu plus bas.

[p. 127, from the chapter "On taste"] [...] this sweet and melancholy shading that constitutes the attribute of the minor mode. To this we must add that – to reinforce the specific character of this mode – the leading note is pitched a little sharper, and the minor 7th a little lower, than in the major modes.

Regarding the 'taste' of intonation in Italy, a precious source of information is that of the Roman Filippo Natali, who in 1886 published a series of experimental results obtained with his "diapason differenziale" ("differential tuning-fork"). A first

¹³⁶ See, for example: Fabricius 1832: 152; Bergerre 1833: 385; Romberg [1840]. Even in Hector Berlioz's great treatise on instrumentation, the sharp is sharper than the enharmonically equivalent flat, as already noted by Pole 1879: 147 (about Berlioz, see also below, in the present Section).

¹³⁷ Romberg [1840]: 20, 127.

example of expressive-functional intonation, for the voice, is illustrated in Ex. C.6.2:¹³⁸

In questa melodia troviamo lo stesso semitono più piccolo, cioè quello della settima *si* che ascende all'ottava *do*. Nella quarta battuta in quella settima di tono *si* che scende alla sua quinta diminuita *fa*, la voce si trova sempre con il *fa* calante ed il *si* crescente, da ciò come per sorpresa, scorgiamo che le due note sensibili *si fa* quarta e settima di tono, che sono la radice essenziale delle modulazioni, appoggiano sempre strettamente verso i loro semitoni prossimi e naturali perché più sensibilmente avvisano l'udito del passaggio immediato a cui tendono; mentre nella settima battuta il *si* che ora è la terza della produtente si trova in accordo colla scala temperata; come ancora nella decima e dodicesima battuta tutti i *fa* sono giusti, perché il canto ha modulato nel tono di *fa*.

Quelle differenze di suoni che noi troviamo nella scala modo maggiore, che è basato sopra i cardini della scienza acustica, vengono avvertite in maggior copia nella scala modo minore, scala stabilita sopra il sesto grado della scala maggiore, in cui è ridotta alla tonalità alterando il sesto e settimo grado.



EXAMPLE C.6.2. From unknown composer (Natali 1886: 74-5).

Similar considerations apply to the stringed instruments (Ex. C.6.3):

¹³⁸ Natali 1886: 74-5 (he specifies that the *Salve Regina* in question was by an unknown composer).

Ho fatto eseguire da quattro buoni artisti, e dopo ho analizzato col mio *Diapason* questo breve periodo del secondo tempo del quartetto in *do*, Opera 59 di Beethoven, ed ho rilevato i seguenti spostamenti di suoni dalla scala equabile [...] In quest'esempio sopra esposto, nella quarta battuta, in quella scala discendente in *re* minore che tocca il primo violino e la viola, si trova il *do* diesis settima crescente, e *si* bemolle sesta calante; nella sesta, ottava, nona battuta quella settima *re* diesis crescente che tocca la viola; nella decima battuta quella settima diminuita *fa* calante, che tocca il violoncello e poi il violino nella dodicesima battuta.

I had this brief passage from the second movement of Beethoven's Quartet in C major, Op. 59 played by four good artists and then analyzed with my *Diapason*, and I noted the following adjustments of notes from the equal-tempered scale [...] In this example given above, in the fourth bar, in that descending scale in D minor played by the first violin and viola, there is a C sharp seventh that is sharp and a B flat sixth that is flat; in the sixth, eighth, and ninth bars that seventh D sharp that is sharp, played by the viola; in the tenth bar that diminished seventh F that is flat, played by the cello and then the violin in the twelfth bar.



EXAMPLE C.6.3. From Beethoven's Quartet op. 59 (Natali 1886: 81-3).

Moving on to melodic embellishments, Natali observes:

Il bravo violinista nell'eseguire una melodia, quando vuole esprimere una certa grazia, potrà avvedersi che nelle note di ritardo, nelle appoggiature ed anche nei mordenti, le note di passo appoggiano sopra le note reali con un intervallo molto stretto; e tutti i classici melodisti fanno frequente uso di questi ritardi. In Rossini s'incontrano spesso questi motivi carezzevoli. Trascrivo poche battute che trovo nella sinfonia della *Gazza ladra* [Ex. C.6.4].



EXAMPLE C.6.4. From Rossini's *La gazza ladra* (Natali 1886: 83).

Even in the notes of "gruppetti" he detected a strong gravitational attraction from the note around which they rotate (Ex. C.6.5):¹³⁹

Ecco un altro esempio di un periodo intero dell'aria finale della *Sonnambula* per soprano: *Ah! non credea mirarti*.

In questa melodia appassionata di carattere patetico, nella seconda battuta la terza minore "do" è calante; nel secondo quarto della quarta battuta quel *re* diesis, e quel *fa*, note di passo che poggiano sulla quinta *mi*, sono intervalli picciolissimi. Come già rilevammo altrove le note di passo che servono di abbellimento alla frase melodica son sempre intervalli molto stretti sulla nota dell'accordo, e queste note di passo nelle melodie di Bellini

When a good violinist wishes to express a certain grace in playing a melody, he will notice that in suspended notes, appoggiaturas and also mordents, the passing notes lean on the real notes with a very narrow interval; and all the classic melodists make frequent use of these suspensions. Such caressing motifs are frequently encountered in Rossini. Here I transcribe a few bars that I found in the overture to *La gazza ladra* [Ex. C.6.4].

Here is another example of a complete section of the final aria of *La sonnambula* for soprano: *Ah! non credea mirarti*.

In this impassioned melody of a pathetic character, in the second bar the minor third "C" is flat; on the second beat of the fourth bar that D sharp, and that F, passing notes that lean on the fifth E, are very small intervals. As we already noted above, the passing notes that serve to embellish the melodic line are always very narrow intervals on the note of the chord, and these passing notes are found frequently in the melodies of Bellini

¹³⁹ This is also confirmed by Anglas 1919: 205 ("Il semble même que des altérations plus considérables encore soient pratiquées par les meilleurs artistes, surtout dans l'exécution des 'trilles' et des 'gruppetti'").

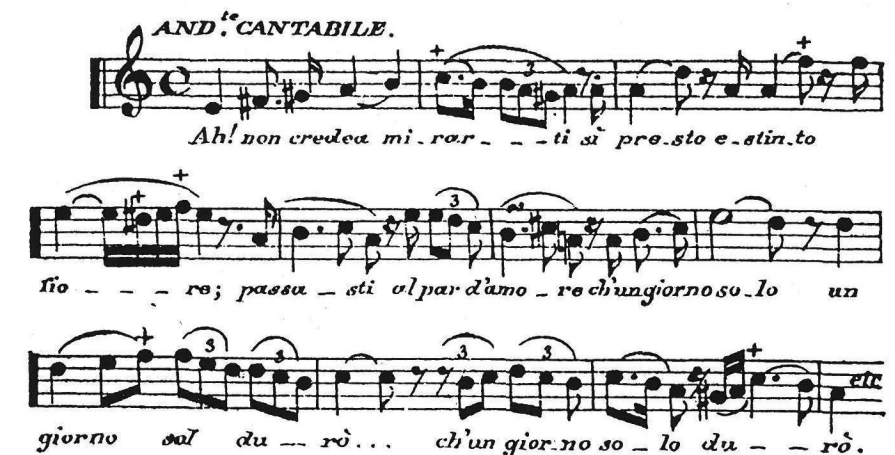
si rinvencono sovente, e danno una grazia particolare alla frase. and they give a particular grace to the phrase.

Nella ottava battuta la nota *fa*, che in questo caso si trova come settima diminuita del basso fondamentale *sol* diesis, è calante; così ancora nella decima battuta torna la terza *do* calante.

Quando l'artista di canto esprime con giusto sentimento il concetto di questa melodia, si rinvencono le sopra descritte differenze di suoni tra la voce e la scala temperata.

In the eighth bar the note F, which is here the diminished seventh of the fundamental bass note G sharp, is flat; and again the flat C returns in the tenth bar.

When the singing artist expresses the concept of the melody with correct feeling, one encounters the above-described differences in notes between the voice and the tempered scale.



EXAMPLE C.6.5. From Bellini's *La Sonnambula* (Natali 1886: 77-8).

The melodic intonation that Natali presents us with – though clearly Pythagorean in approach – is therefore not easily classifiable, given that all the notes (including the diatonic) are altered according to the 'function' that they are required to fulfil. In any case, at least as late as the turn of the new century, the wrangle between syntonic and Pythagorean cannot have been definitively sorted out. In the second half of the century, the disagreement – or perhaps it would be better to say 'ambivalence' – is evident from the following:

- In 1845, a flute designed by W.J. Monzani and manufactured by William Henry Potter provided split keys to allow sharps and flats to be played with different pitches (in this case, remarks Ardal Powell, the sharps are higher than the flats).¹⁴⁰
- In 1848 Delezenne, a supporter of just intonation, writes: "Consult some good

¹⁴⁰ Powell 2002:149.

amateurs who play chamber music and who claim not to confuse the sharp of one note with the flat of the following note. Ask them to play, under your very eyes, first an A $\sharp$ and then a B $\flat$, for example, and you will see that some play the sharp lower than the flat and others exactly the reverse".¹⁴¹ A few years later, referring to Pythagorean intonation only, the same author writes that "some performers raise the sharps so much and lower the flats to such an extent that they are incapable of playing a bearable scale when it contains notes with sharps or flats".¹⁴²

- Around 1843-55, Hector Berlioz condemned the English concertina, still tuned in meantone temperament (with split keys for the D $\sharp$ /E $\flat$ and G $\sharp$ /A $\flat$), because this kind of intonation was "fully contrary to the practice of musicians". He affirmed that the violinists – in solo performances, when playing the leading tones – intoned the sharps higher than those of the equal temperament, while, in the minor 7ths and 9ths, the flats were played by them lower than those of the equal temperament, so that, accompanying the violinists with the concertina, he ironically advises to exchange sharps with flats.¹⁴³
- Two French physicists, Cornu and Mercadier, in 1869 performed an experimental test and arrived at the conclusion that the Pythagorean intonation and the just-meantone – which in theory seem to rule out one another – were both in practice compatible: the former was preferred melodically, the latter harmonically.¹⁴⁴
- On the contrary, still in Paris and according to the tests carried out around 1870 by Georges Guérout, the just intonation was preferred also melodically (Sec-

¹⁴¹ Delezenne 1848: 31 ("Adressez-vous à des amateurs distingués qui jouent la musique de chambre et qui disent ne pas confondre le dièse d'une note avec le bémol de la note suivante. Priez-les de faire sous vos yeux successivement la $\sharp$ et si $\flat$, par exemple, et vous verrez que les uns font le dièse plus grave que le bémol et les autres précisément le contraire").

¹⁴² Delezenne 1855: 14 ("quelques praticiens montent si haut les dièses et descendent si bas les bémols qu'ils sont incapables d'exécuter une gamme supportable quand elle contient quelques notes diésées ou bémolisées").

¹⁴³ Berlioz 2003: 466-8; Id. 2002: 305-11 (on the English concertina see also Section B.5.6, fn. 138). An indirect confirmation of Berlioz's assertions is offered by a letter written by Moritz Hauptmann in 1836. Referring to the tempered tuning of the piano, he observes: "It is a matter of easy calculation, that in respect of C, C sharp is lower than D flat; but if I use C sharp as leading note, and D flat as minor ninth, my first note is far ahead of the other; consequently, it is not the slight deviation of temperament which baulks and disturbs the violinist" (but instead the rigidity of the piano's tuning). Hauptmann concludes by noting, with some indignation, that Louis Spohr had a very different opinion: "Now I come to the temperament of the voice! Do you know that Spohr maintains, that the singer should learn intonation from a piano in equal temperament? – ! – ? – ; – ; what marks of admiration can I use?" (Hauptmann 1892: 150, Hauptmann to Hauser, Cassel, 20.2.1836). This opinion is confirmed by Spohr himself in his *Violin School*: "By just intonation I mean that which is according to equal temperament; for modern music no other exists"; he also adds: "If you raise D a semitone, or lower E a semitone, the two notes will coincide" (quoted in Goddard 1901-02: 64).

¹⁴⁴ Cornu & Mercadier 1869.

tion B.5.5). Guerout's findings are in perfect agreement with Helmholtz's.¹⁴⁵

- Towards the end of the century the Reverend John A. Zahm, a professor of physics, made tests with the Hungarian violinist Ede Reményi (1828-1898), checking the performance with a harmonium tuned in just intonation: "the results arrived at were identical with those obtained by Delezenne and Helmholtz".¹⁴⁶ He also observes:

The good violinists and violoncellists, when unaccompanied by equally tempered instruments, execute pieces of music written for harmony, in pure intonation, is well known. This accounts for the remarkable purity and fullness of tone that characterize the playing of such artists as Reményi, Joachim, Popper, Wilhelmj, and Ole Bull. In listening to such performances, one can always hear distinctly the *Tartini*, or beat-tones, that add such richness and volume to violin music. [...] Reményi tells me that when he is not accompanied by a keyed instrument, he instinctively plays in pure intonation, and that he *feels* the difference between notes like D $\sharp$ and E $\flat$, or G $\sharp$ and A $\flat$, for instance, of which equal temperament can take no account.

Only starting from the new century did the neo-Pythagorean tendency begin to be widely reported: (1) see the surveys made in 1987 of certain recordings of the early 20th century;¹⁴⁷ (2) also a 1937 test by the acoustician P.C. Greene, involving analyses of a total of eleven unaccompanied performances by six professional violinists, gave results statistically in agreement with the last-mentioned intonation;¹⁴⁸ (3) in 1949 another acoustician, J.F. Nickerson, reached the same conclusions; furthermore, after measuring the sizes of the intervals in six performances of the Emperor Quartet by Haydn, he found that Pythagorean intonation was on the average also adopted in ensemble music.¹⁴⁹ Only around the 1970s, following the Early Music revival and then only by specialist performers, 'just-meantone' intonation once again began to be applied. One of the first treatises to provide instructions on how to realize it, on both unfretted string instruments and equally-tempered 'baroque' woodwinds (by means of special fingerings), was that by Claudio Di Veroli.¹⁵⁰

¹⁴⁵ Helmholtz 1885: 325 had occasion to demonstrate experimentally that the major 3rds of the scales played by Joseph Joachim – who tuned his violin in pure 5ths – were perfectly just. This is curious, since the famous violinist – like his teacher Moritz Hauptmann – upheld the Pythagorean intonation of sharps and flats (Pole 1879: 147-9).

¹⁴⁶ Zahm 1892: 441-3 (with reference to just intonation).

¹⁴⁷ Jackson 1997: 148.

¹⁴⁸ Greene 1937. See also Fik 1995: 91.

¹⁴⁹ Fik 1995: 91. The Pythagorean intonation was also confirmed in performances by Soviet violinists, according to the tests made by A.V. Rabinovitch (1932) and N.A. Garbuzov (1955) (Fik 1995: 93-4). Still towards the end of the previous century, on the contrary, when playing in a string quartet, performers preferred pure intonation: in this regard, in 1876 the Genoese music historian Cornelio Desimoni mentioned the contrast between the piano's equal temperament and the "armonia pura del quartetto o simili stromenti ad arco" (Tarrini 1987: 59).

¹⁵⁰ Di Veroli 1978: 215-23.

Nonetheless, purely emotional factors and matters of habit must have once differentiated the intonation of enharmonically equivalent keys, such as F# and Gb major (which in the Pythagorean system, with regard to the respective tonics, are instead governed by the same relative ratios). In a test made in 1862, one that today would be called of the 'double-blind' technique, a Swiss physicist reports on the following curious experiment:¹⁵¹

Nous avons une fois demandé à un musicien dont la délicatesse de l'oreille est bien connue, de jouer un air en *ut* majeur; puis nous l'avons prié de jouer le même air en prenant pour tonique la note qui se trouve sur le piano entre le *fa* et le *sol* naturels. L'air exécuté, nous lui demandâmes dans quel ton il venait de jouer. — En *fa*#, répondit-il, sans hésiter. — Nous lui dîmes qu'il avait joué en *sol*b. Non, reprit-il, c'est trop éclatant, c'est du *fa*#, et non du *sol*b. Tenez, continua-t-il, voici du *sol*b majeur, et il joua le même air, sans sortir du ton, mais en introduisant quelques modifications qui donnèrent de suite à l'air une certaine douceur, quelque chose qui, à mon oreille, semblait se rapprocher d'un ton mineur.

This is indirectly explained in a passage by Modeste Grétry (1789):¹⁵²

En procédant par 'dièses' ou par 'bémols' les gammes ont-elles différents caractères? Oui, sans doute, puisque c'est procéder par 'quintes' ou par 'quartes'. Quel musicien n'a pas remarqué que le 'dièse' un peu forcé, et le 'bémol' un peu foible, contentent l'oreille, et que le contraire est insupportable?

Besides, these practices are justified by a deeply-rooted conviction of musicians that is already recorded around 1774 in the *Traité du violon* by Théodore-Jean Tarade: "Many people believe that the flats always give minor keys and the sharps major keys: this is an error".¹⁵³

¹⁵¹ Prevost 1862: 21.

¹⁵² Grétry 1789: 361.

¹⁵³ Tarade c1774: 24 ("Beaucoup de personnes s'imaginent que les bémols en général donnent toujours des tons mineurs et les dièses des tons majeurs, c'est une erreur").

Once we asked a musician whose ear was very sensitive to play a tune in C major; then we asked for the same tune in the key whose tonic lies between F and G natural on the piano. That completed, we asked him in what key he had just played. "In F#", he said without hesitation. We said that he had played in Gb. "No" he replied "it is too brilliant, it is F# and not Gb. Wait" he continued "here is Gb major": and he played the same tune without changing the tonic, but introducing several modifications that gave the piece a certain sweetness, which to my ears seemed to bring it closer to a minor mode.

If one proceeds by sharps or by flats, do the keys have different characters? Yes, without doubt, since it is a matter of proceeding by fifths or by fourths. What musician has not noticed that a slightly sharp sharp and a slightly flat flat satisfies the ear, whereas the opposite is unbearable?

C.7. Ensemble music and 'tempered' intonation

In Section C.2 we saw that violin intonation was of the just or meantone type at least until the 18th century and that that would also apply when the strings were a part of a 'concerto' (mixed consort, i.e. band). In 1609, for example, Adriano Banchieri claims to have succeeded in reconciling the different tunings of the various instrument families in a mass for four choirs performed in Verona two years earlier. Among the instruments were violins, viols of various types, two harpsichords, 'big' organ, lutes, *chitarroni*, and trombones. The instructions he provided required that the individual strings of the plucked and bowed instruments – violins included – be tuned in unison with the corresponding keys of the organ or harpsichord (for which he illustrates a tuning of the regular meantone type, extending from Eb to G#). There is therefore no doubt, though there is no explicit confirmation to that effect, that the open 5ths of the violins were also automatically tempered (Fig. C.7.1). Besides, this is the practice followed by many modern early-music consorts.¹⁵⁴

The situation changes radically in the 18th century, and not only for the reasons given in the preceding section (concerning 'expressive-functional' intonation). During this century the widening of the tonal spectrum and the proliferation (especially among Italian composers) of enharmonic transitions, led to the unification of the two semitones (large and small) around a mean value. On this subject we will return below.¹⁵⁵

We have seen that in 1843-55 Berlioz reported that violinists, playing solo pieces, intoned the sharps higher than the enharmonically equivalent flats, adding however that most of them abstained from doing so in concerted music, so as not to create clashes with other instruments.¹⁵⁶ This practice, however, did not necessarily lead to a

¹⁵⁴ Banchieri 1609: 51-5; Id. 1611: 97-8. For other problems, again relating to the co-existence of strings with the various families of the Baroque 'concerto', see Barbieri 1990c.

¹⁵⁵ It is worth noting that as late as the mid 18th century only Quantz 1752: 248 was to continue to claim that wind and string instruments must genuinely perform the quarter tone even in enharmonic transitions. In passages of the type F-Ab / E-G# he in fact prescribes that the violinist should "retirer le doigt un peu sur le dièse qui suit le b mol; autrement la tierce majeure [E-G#] seroit trop haute contre la partie fondamentale". Similar instructions apply also to the transverse flute, oboe and "tous les instrumens, excepté au clavecin, où l'on ne peut pas effectuer des sous-demi tons, et lequel pour cette raison doit avoir une bonne température, afin qu'on puisse souffrir l'un et l'autre de ces tons". Identical considerations were repeated in the German edition printed posthumously and near the threshold of the 19th century (Quantz 1789: 244).

Romberg [1840]: 134, on the other hand, prescribes: "Relativement aux sons enharmoniques [he provides the ex. D#/Eb], je dois faire remarquer encore que, soit qu'on passe d'une note bémolisée à une dièzée, ou d'une note dièzée à une note bémolisée, on fera toujours mieux de laisser le doigt dans sa position que de la changer".

¹⁵⁶ Berlioz 2003: 468 ("L'immense majorité des musiciens s'en abstient instinctivement dans les ensembles harmoniques. D'où il résulte que les sons prétendus inconciliables par les acousticiens [i.e. sharps and flats] se concilient parfaitement dans la pratique musicale").