TEMPERAMENTS—HISTORICAL

The technical part of temperament has been dealt with in the entry Tuning. Here we shall examine the tunings historically used on the piano, which were of the following five types (the term "comma" always refers to the syntonic 81:80):

Type 1. Regular mean-tone. The most common form is one that makes each of the eleven fifths starting with E♭ and ending with G♯ smaller than pure by 1/5- or 1/6-comma. In this way the eight major thirds of the chain are slightly sharper than pure. Because of the dissonant "wolf fifth" G♯–E♭ (much larger than pure) and the related wolves of the thirds (less consonant than the Pythagoreans), only keys of up to two or three accidentals in their signatures are serviceable in these tunings.

Type 2a. The "ordinary" French temperament (tempérément ordinaire). This is a development of mean-tone. It distributes the large wolf G♯–E♭ over two or three slightly sharpened fifths (usually F–B♭–E♭–A♭) and makes the less-frequently used major thirds progressively sharper (that is, the further they depart from the central third from which the tuning starts). This central third was generally C–E but could sometimes also have been F–A or B♭–D (to favor certain widely used keys with flats in their signatures, like E♭ major and F minor). In this way not all the twenty-four keys were practicable, but unlike in type 1, each key acquired a character or color of its own.

Type 2b. Again an "ordinary" temperament, like type 2a, but more equalized, allowing one to circulate in all the twenty-four keys. Given that these two ordinary types were always described very vaguely and often included personal variants, they were also referred to as "elastic" or "capricious."

Type 3. Circulating temperaments, first proposed by the Germans, in which only two or three kinds of fifths are employed: pure fifths and fifths flatted by a specified fraction of the comma. In this way no third was less consonant than the Pythagorean. Unlike the type 2 temperaments, these are always quantitatively described and were hence opposed to the "elastic" ones. The tunings of Vallotti, Young, and Kimberger are of this kind. Widely mentioned below is the tuning that today is called "Kimberger II" (fifths D–A–E flatted by 1/2-comma each, F♯–C♯ flatted by 1/11-comma, the rest pure).

Type 4. Equal temperament. Each of the twelve fifths of the circle is narrowed by 1/11-comma. As in type 1, key-coloring is thereby annulled, an aspect that often invited criticism in the Classical and Romantic periods. Sometimes certain temperaments of type 2b were also (wrongly) termed "equal": any doubt about how to distinguish the two is dispelled if the practical instructions for tuning prescribe a chain of twelve fifths closing on the starting note. To type 4 also belongs a recently rediscovered variety of equal temperament, which leaves all the twelve fifths untempered and instead slightly stretches all the octaves.

The adoption of type 4 was favored by the fact that the piano lacks high partials and its tone decays rapidly (reasons that conversely delayed its use on the organ). In this regard Vincenzo Galilei had already observed in 1581 that equal temperament was suited to the lute but not to the harpsichord, because of the latter instrument's much greater richness of timbre.

In general it is worth remembering that until the early nineteenth century, harpsichords and pianos were structurally fragile and needed very frequent tuning, an operation that was necessarily often done by the player himself. As a result, many keyboard tutors included some "rules for tuning," which were usually very vague. In the majority of cases, therefore, the tuning of instruments must have been very far removed from the subtleties described here. For example, Alexander Malcolm (1721) and William Emerson (1776) reported that "most people" tuned all the eleven fifths pure, automatically leaving the comma on the twelfth. Even André Grétry, in his Mémoires of 1789, confessed to having long resorted to this erroneous practice, and observed: "Often I would detach myself from the piano because it disappointed me and did not send back my ideas as I conceived them."

The First Piano Makers: Cristofori and G. Silbermann

In a series of manuscript notes made by Scipione Maffei during a conversation with Bartolomeo Cristofori in 1709–10, we also find information on the tuning Cristofori practiced. It turns out to have been a regular mean-tone with the thirds larger than pure. Though the wolves were commonly considered as unserviceable, Cristofori mentions that they were used by the "good masters" to depict particular states of mind with greater effect. From the testimony of Beneditto Bresciani (1719) and Giovanni Francesco Beccatelli (1726), two writers close to the court environment in
which Cristofori worked, we can deduce that the mean-tone in question was the 1/5-comma (a temperament widely used also in France in the same period).

In Germany, according to Georg Andreas Sorge (1748), Gottfried Silbermann adopted a very similar mean-tone: the 1/5.5-comma, a tuning J. S. Bach is known to have disliked because of the wolf-fifth $G^\#-E^\flat$. In the second half of the century the situation ceased to be so well defined, given that the tunings increasingly tended to be of the circulating type (though often in a somewhat haphazard fashion), and their histories varied from country to country. As we shall see below, equal temperament can be said to have established itself fully in Germany, Austria and France only around 1835–1840, whereas in Great Britain, the United States and Italy it had to wait until as late as 1860–1890.

On the Iberian Peninsula the information is scant indeed; and, in fact, nothing is known about the practice of Domenico Scarlatti. But we do know that in a manuscript of 1775–1783 Antonio Soler proposed a tuning that he accomplished with the help of a particular type of monechord, called an "Acordante," of which two exemplars were built: one for the Infante of Spain, the other for the duke of Alba. This tuning is a semi-mean-tone, obtained by taking the diatonic notes of the 1/4-comma and dividing its tones into two acoustically equal semitones. Because it eliminated the wolf-fifth $G^\#-E^\flat$, Soler considered it a perfectly circulating temperament, in spite of the fact that each of the two fifths $B^\#-F$ and $B-F^\#$ was about a comma sharp. Since he also added, "I have put this tuning into practice many times, and I think it is the same one that I desired with great fervour many years ago," one might legitimately suspect that the temperament he used when studying with Scarlatti, 1752–1757, was even more unequal.

**Germany and Austria**

Throughout Europe the area of German influence was the readiest to adopt equal temperament. According to Johann Mattheson, in 1725 Andreas Werckmeister had already expressed his approval of it during his last years, 1701–1706. And the large majority of the succeeding theorists—like Johann Georg Neidhardt, in 1706–1724, Mattheson himself, in 1722–1731, Jakob Georg Meckenucher, in 1727, Georg Andreas Sorge, in 1744–1758, and Friedrich Wilhelm Marpurg, in 1756–1776—either expressed a strong inclination towards this solution or even warmly recommended it.

Of the practical instructions based on this tuning, one widely known example was the *Method for tuning claviers, harpsichords and organs... equally pure in all keys* (Anweisung, wie man Claviere, Clavecins, und Orgeln ... in allen zwolf Tonen gleich rein stimmen künne), by Barthold Fritz, first published in 1756 and often reprinted. The second edition, of 1757, carries a dedication to Carl Philipp Emanuel Bach, who had given it his support. C. P. E. Bach’s own practice, however, was not clear. In his *Versuch*—which went through four editions (1753, 1759, 1780, 1787) in the eighteenth century alone—he prescribed removing "from the majority of the fifths their perfect purity, in such a way that the ear hardly notices it and that all the 24 keys could be used;" but strangely, he then pointed out that in this way one obtains "all the 24 keys with the same degree of purity" (with this term, "rein" = pure, he in fact means the uniform impurity of equal temperament), adding that "with this new system of temperament a step forward has been taken." We may only conclude that if his tuning was not actually equal temperament (as Marpurg claimed in 1776), it must have been at least very close. Among the keyboard tutors, even the very popular one by Georg Simon Löhlein mentioned only equal temperament from its third edition (1779) onward.

It is worth noting, however, that until the beginning of the nineteenth century most of the surviving evidence favored the unequal circulating temperaments. From 1756 to 1802, of eleven practical instructions for tuning stringed keyboard instruments, six mentioned only these, one mentioned Kirberger II and equal temperament, and four mentioned just equal temperament. But, unlike in France, none of the rules published in the German area after 1700 prescribes fifths larger than pure. Moreover, all the unequal tunings proposed by the theorists were of type 3. Of these, Kirberger II was the most frequently cited (it is mentioned from 1771 to 1818), though in actual fact it was not widely used. Its reputation can be attributed to the fact that it was strongly publicized by the followers of the author’s writings on harmonic theory and had been illustrated in the various editions of the Pleyel and Dussek method (1797–1805).

If we turn to the evidence directly concerning the composers, we note that: (1) Leopold Mozart (1756) prescribed that a keyboard temperament must ensure that all the twenty-four keys “are bearable to the hearing,” but added nothing else; (2) Johann G. Albrechtsberger—a man highly respected by Wolfgang Amadeus Mozart, whose friend he was and whom he succeeded as assistant Kapellmeister at St Stephen’s cathedral in Vienna—alluded to the “unequal temperament of the organs and other keyboard instruments” (1790); (3) Giuseppe Sarti (1785–1791) accused W. A. Mozart of being a “supporter of the mistaken system that divides the octave into twelve equal semitones,” though failed to support the allegation
with convincing evidence; (4) a similar opinion was expressed by John Broadwood (1811), who asserted that "Haydn, Mozart and other masters of harmony" judged equal temperament to be "the best practical method of tuning keyed stringed instruments"; (5) Joseph Haydn chose the key of C major for the "Fiat Lux" of his Creation (1798) because it was "the most sonorous and clear key there is for all instruments, and especially for the double basses and trumpets" (which seems to contradict John Broadwood's preceding claim); and (6) Martin Vogler, one of Mozart's rivals, illustrated equal temperament in 1776 but in 1802 presented his own "characteristic" temperament, one designed to ensure that each key preserved its own distinctive color. 

This last consideration was in fact usually the main argument produced in defense of the unequal temperaments; For example, it was still used to justify a rejection of equal temperament in the Dizionario (1826) by Peter (Pietro) Lichtenhal (1780–1835), a Viennese theorist and composer who was very close to the music of Mozart and his family. Even Beethoven, in 1812, gave the following answer to a patron in Edinburgh, who had sent him an "Amoroso" theme in A major for him to develop: "Since this key seemed to me so little natural and so little fitted to the expression Amoroso as to transform it—on the contrary—into Barbaresco, I have treated it in the key suited to it." Though this opinion reminds one of the fearful wolf (which used to lurk especially in the key of A major), it hardly authorizes us to make conjectures about the tuning Beethoven used, especially because it was precisely in those years that nearly all the evidence began to favor equal temperament. Out of eleven practical directions for tuning stringed keyboard instruments published from 1804 to 1839, as many as ten cited equal temperament only, while the eleventh (C. F. G. Thon, 1817) combined it with Kirnberger II, though it also added that many musicians preferred equal (McGeary, 1989). In 1824 a manual written by the Stuttgart piano builders Dieudonné & Schiedmayer declared that the temperament "must be as equal as possible." Johann N. Hummel (1828), one of Mozart's pupils, mentioned only equal temperament, adding that the professional tuners (especially those in Vienna) felt that it also imparted greater durability to the tuning (an idea already expressed on a sheet of instructions attributed to Pascal Taskin, ca. 1789; see below, "France").

The same trend is also confirmed in sources other than the keyboard methods and maintenance manuals. In an article published in the Allgemeine Musikalische Zeitung (1834), C. F. Fabricius stated that "without doubt equal temperament is now fairly widespread, at least on keyboard instruments." Before 1836 Louis Spohr maintained that "the singer should learn intonation from a piano in equal temperament." Carl Czerny (1839) advocated the same tuning for the "fortepiano." Finally, an unsigned article published in 1848 in the Allgemeine Musikalische Zeitung states that Kirnberger II "was never commonly in use, and that for the past forty years equal temperament had superseded all the rest."

France

After upholding the "ordinary" temperament then customary in 1726, in 1737 Jean-Philippe Rameau became converted to equal temperament, which he recommended obtaining by a chain of twelve consecutive fifths. But though in later times Rameau's name was often associated with equal temperament (especially in France), his conversion did not actually have much effect on contemporary practice. In the Principes de clavecin (1756) Marpurg still described an ordinary tuning of type 2a as the current French practice, specifying that the keys began to deteriorate at B major (i.e., when D♯ appears in the tonic) and that the situation degenerated further at C♯ minor owing to the "harmonie détestable" of the dominant chord G♯–B♯–D♯. As we saw in the previous section, in that same year the situation in the German area was very different.

In the next thirty years, however, France does seem to have moved toward the fully circulating ordinary temperaments of type 2b, some of which were very close to a genuine equal temperament. And unlike other nations, the development appears to have been decidedly unified, thanks above all to the centralism that has always characterized the nation. This is attested by various writers: (1) Jean-Baptiste Mercadier (ca. 1784), as a remedy for the difficulties of Rameau's method, proposed to split the chain of fifths into two branches: one ascending (C–C♯), the other descending (C–A♯); at the end one checks the purity of the interval C♯–A♯, which was the wolf, remembering that "if there is a small error the inconvenience is not too great, given that this fifth is not used very often." This method is evidently type 2b, because Mercadier asserted it was "in between an ordinary tuning and equal tuning." His rules were subsequently republished by Antoine Sureau de Meissery in 1793. (2) Jean P. E. Martini (ca. 1792) proposed a "tempérément égal" for the fortepiano; however, this is type 2b, because he said that when one gets to the trial B–D♯, this major third is sharper than the others, and that is how it should be. (The term trial was used in many eighteenth-century English tuning instructions; e.g., in those by Nicolò Pasquati, ca. 1760, one reads: 1st trial, 2d trial, 3d trial. The term means to "check" a particular chord
at the end of a chain of fifths and/or fourths, in order
to ascertain that it is correctly tempered and therefore
does not have an excessive number of dissonant beats.)
Martini claimed that the tuning gave “the same purity
in all the keys,” an incongruity we have already met
with in C. P. E. Bach. (3) Alexandre Lloït (ca. 1797)
used an ordinary tuning of type 2b, since the trial chord
A♭–C–E♭ had to be “passablement bon.” (4) V. F. S.
Rey, L’art de la musique (1799–1806), suggested ordi-
nary tuning, but even closer to equal temperament,
given that of the two prescribed trials, A♭–C and A♭–
E♭, the second had to give a “quinte juste.” (5) Armand
F. N. Blanchet, the harpsichord and piano maker (1797
and 1801) proposed that the fifths from E♭ to G♯ be
all slightly narrow, as should be the trial G♯–B–D♯:
“if this chord is correct, the bearings are well laid.”
About this temperament Claude Montal (1836) was to
say that it “seems equal,” though the description be-
trays features of type 2b. Blanchet added that it already
had been used for twenty-five years and was recom-
manded by (among others) Grétry, Piccinni, Sacchini,
Clementi and the members of the Conservatoire. This
claim is supported by at least two independent sources:
first, André Grétry declared his support of equal tem-
perament on the piano in his Mémoires (1789); second,
Muzio Clementi prescribed the use of all twenty-four
keys in 1801. A similar tuning, it would appear, was
that used by Touratoris, a piano builder working in
Paris around 1810, who also knew Blanchet per-
sonally.

Confirmation that Blanchet intended a tuning very
close to equal comes from a Méthode la plus facile
pour accorder les clavecins et forte-piano (Paris, ca.
1789), printed on a single sheet of paper and prescrib-
ing an equal temperament correctly obtained by a chain
of twelve slightly sharp consecutive fourths, beginning
and ending on A (compared to the beats of fifths, those
of fourths are slightly faster and hence easier to count).
Though anonymous, these instructions can be at-
tributed to Pascal Taskin, since they are followed by some
barfaced publicity for the fortepianos made in his
famous workshop in Paris, in the Rue de la Verrerie.
Blanchet (1763–1818) had been brought up and trained
by Taskin himself, who in turn had been François E.
Blanchet’s chief winemaker and had taken over his
workshop after his death (1766). In these instructions
it was also claimed that with this temperament the tuning
lasted longer, “because, since the various semitones
are perfectly equal, the strings must be equally
stretched” (an observation that is correct only if the
bridge follows a strictly logarithmic curve). In the
same period (1786–1806) Pierre Joubert de La Salette
also advocated an equal temperament achieved by a
chain of twelve consecutive fourths (which, however,
he surprisingly instructed to be tuned “pure”; a state-
ment that was harshly criticized already in his own
day, but which could be partly justified if what he
meant was to exploit the string inharmonicity, which
would have automatically made them slightly sharp).
The tunings of the ordinary type, however, must
have remained popular at least until about 1820. This
is attested to only by an anonymous Méthode pour
accorder le piano forte (Paris, ca. 1800–1825, chez
Janet et Cotelle), which accused equal temperament of
being “hard,” but also by the following writers: Ga-
briel-Antoine Delorto (1791), René-Just Haüy
(1806), Jean-Baptiste Biot (1816) and Jérôme-Joseph
de Monigny (1818). In 1823 de Monigny, however,
converted to equal temperament: a sign that some-
thing was changing in those years. In 1825 Matrot was
to present his “Diapasonarama,” a series of twelve equal-
tempered tuning-forks (increased to sixteen in 1828).
Some time before 1836 Delporte put on the market a
mechanical device for tuning pianos automatically
in the same way. In 1834 the well-known tuner Clau-
des Montal and his pupil “Giorgio di Roma” (Gior-
gio Armellino) gave their decisive support to an equal
temperament accomplished by a chain of twelve con-
secutive fifths. The handbooks published by these two
writers (Montal’s was to be reprinted in an expanded
form in 1836) contain dedications to Gioacchino Rossini,
which the composer acknowledged. In fact 1836 can be
indicated as the date of the official introduction of
equal temperament to Paris, since it was then that Mon-
tal not only qualified himself as “tuner to the most
celebrated piano professors of the Conservatoire and
various public institutions” but also tuner of the pianos
of the Pleyel firm. Again in 1836 Aristide Cavillé-
Coll, the greatest of the French organ-builders, adopted
the same tuning and received from Johann H. Scheible-
berg a series of tuning forks that enabled him to apply
equal tuning with Teutonic precision. A French source
of 1867 (L’acoustique, by R. Radau) informs us that the
difficulty of building the series of tuning forks to form
such an unfamiliar tonomètre at first alarmed the Paris
piano builders: “Only Monsieur [Charles-François]
Wölfl had the patience of making himself one, in
order to better tune his pianos.” Outside Paris, tempera-
ments following the procedures of type 2b were still
mentioned in 1837: see the “accord du piano” of
Georges-Louis-A. Onslow, a composer operating in
Clermont-Ferrand.

Great Britain and United States

Unlike France and, above all, the areas of German
influence, Great Britain put up a strong resistance to
equal temperament (which was viewed as a novelty
from the Continent, and from Germany in particular).
Nicolò Pasqualli’s method (Edinburgh, ca. 1760) still prescribed a regular mean-tone with a compass from $E^b$ to $G^\#$. Though not specified as such, it was probably a $5\over23$-comma (≈ $1\over4.6$-comma), a variety of mean-tone then “in common use” in Great Britain according to Robert Smith (1749 and 1759) and John Southern (1812). One of its features was that the fifths and major thirds over the same fundamental note had almost the same beat frequency. The use of such tunings is confirmed by the continued use of split keys in Great Britain (a custom abandoned in Italy at the end of the seventeenth century and never even used in France). Still preserved today is a piano by Johann Christoph Zumpe of 1766 with all the accidental keys from $E^b$ to $a^\#$ split into their sharps and enharmonically equivalent flats. Other instruments were equipped with key-boards of the normal type, but with the possibility of shifting the eleven-fifths compass by hand-operated stops; see, for example, the harpsichord Kirkman made to plans by Robert Smith; or the famous organ installed at the Foundling Hospital in London in 1768, again inspired by the theories of Smith, who had died only a few months earlier. On this second instrument the player could opt for any one of the three harmonic compasses (using a chain of consecutive fifths): $E^b$–$B^\#$–$F^\#$–$C^\#$ and so on to $C^\#$–$G^\#$ (the common one), $F^\#$–$C$–$G$–$D$– and so on to $D^\#$–$A^\#$, and $D^b$–$A^b$–$E^b$–$B^b$– and so on to $B$–$F^\#$. By the end of the century Smith’s idea was extended to pianos, which used more convenient pedal levers and adopted solutions similar to those being applied to harps in the same period. On this subject, we particularly cite Charles Clagett’s Royal Teliocordon (1790–1791), a device that could also be applied to grand pianos (by using two extra pedals, the normal range $E^b$–$G^\#$ could be supplemented with five further sharps or five further flats): William Hawkes’s piano of 1808 ($1\over6$-comma mean-tone, with the possibility of switching all five chromatic notes into either sharps or flats with just one pedal); and David Loschmann’s even more complex piano of 1809 ($1\over4$-comma mean-tone, with twenty-four sounds per octave, controlled by six pedals).

But let us return to the instruments of the normal type. To overcome the inconveniences of mean-tone, around 1770 John Casper Heck in (The Art of Playing the Harpsichord) suggested adopting equal temperament, vainly as it turned out. He claimed that it would enable one to play in the “key of C or in the key of $A^b$, and the imperfection generally complain’d of” would be removed. To come across the first temperament of the “ordinary” type we have to wait until around 1787, when Domenico Corri published his Complete Musical Grammar (in Edinburgh, where the Italian musician had settled in 1771). Corri prescribed the use of all twenty-four keys, but the common prac-

tice of his day must have been very different. In fact, Tiberius Cavallo, an Anglo-Neapolitan physicist, declared in 1788 that fourteen keys at most could be used on the English harpsichords of his day: the “best” were the major and minor keys with up to three flats or two sharps, “less agreeable” were those with up to four flats or three to four sharps, the rest were “quite intolerable.” Again in 1796, Augustus F. C. Kollmann claimed that, when playing alone, the “organ and the other key instruments should be unequally tempered, though not so much as some tuners do, as to produce chords which are really offensive.”

The use of genuinely circulating temperaments is recorded only in the year 1800, when Thomas Young proposed a tuning that charts “the actual practice of the best instrument makers.” It turns out to be an “ordinary” temperament of type $2b$: the fifths $C$–$G$–$D$–$A$–$E$ narrowed by about $1\over5.3$-comma, the fifths $E$–$B$–$F^\#$ and $B^b$–$F$–$C$ like those of equal temperament, the rest pure.

As regards the use of Kirberger II, the contemporary sources suggest that it was never widely used in Great Britain. In 1806 Charles Stanhope pronounced the dissonance of the two fifths $D$–$A$–$E$ (flattened by $1\over2$-comma each) to be unbearable, and instead proposed flattening the three fifths $G$–$D$–$A$–$E$ by $1\over3$-comma each. In its “Correspondance d’Angleterre,” the Magazine Encyclopédique (vol. 3, 1807) reported: “Certain skilled musicians have adopted the new method of tuning the fortepiano invented by Lord Stanhope, and it is likely that it will become fashionable, despite the lively criticism it has aroused.” That temperaments of the circulating type had become established in Great Britain by the start of the nineteenth century, in one way or another, is attested by two further considerations: Muzio Clementi’s claim (1801) that the piano-forte must be “capable of satisfying the ear in every key,” and the fact that the forty-eight preludes and fugues of Bach’s Well-Tempered Clavier were published in Great Britain some time before 1808 and then again in 1810–1813. In 1819 John Farey confirmed that the unequal temperaments then in use had reduced “the wolf to total destruction” (though Joshua Done still reported the existence of sharp fifths in 1837). Farey, a geologist by profession, was one of the most authoritative participants in the many debates on temperament that appeared in the Philosophical Magazine in the period 1806–1817. Unlike similar contributions in the other nations, these articles that proposed tunings were nearly always accompanied by tables listing the beat frequencies, calculated using Robert Smith’s formulas (1749), which were reprinted in various later publications (but were known at the time by the English alone, it would seem).
Regarding equal temperament, we know that in 1806, out of “16 or 18 of the most eminent musicians in England” consulted by Stanhope, only half supported it. Only in 1830 could one assert that “on the pianoforte the most prevalent practice is to divide the scale of the instrument as nearly as possible into 12 equal semitones” (article by Henry Liston, one of the strongest supporters of just intonation). The actual method used was that adopted in France at the end of the eighteenth century (type 2b). Procedures of this type had already been proposed in 1809 by John Hodgson (who illustrated equal temperament under the pseudonym of “Musicus ignoramus”), and were then repeated first by the pianist Jean Jousses (1832, in a book dedicated to W. F. Collard, one of the most important English piano-manufacturers), then by James A. Hamilton (who, still in 1844, made the customary observation about the final trial $G^\#-E^b$; “this fifth will be a little, if at all, inferior to the rest”).

As Alexander J. Ellis (1885) reported, equal temperament for pianos, “though previously used by individuals, did not become a trade usage till 1844,” when it was adopted by Alfred Hipkins, tuner for Walter Broadwood. Two years later Broadwood instructed him to teach it to all the firm’s other tuners (the only other tuning known to have been used by the various Broadwoods dates back to the second half of the eighteenth century and appears to have been a semi-mean-tone very like that used by Antonio Soler in the very same period; see above). By no means, however, does this imply that equal temperament met with universal approval (see the Encyclopaedia Metropolitana, 1849). Again in an article published in Nature in 1882–1883, C. B. Clarke wrote: “The best plan of tuning a piano for vulgar music and vulgar players is that now ordinarily practiced by the tuners. . . . but if the piano is to be used equally in all keys (or even frequently in 4 or 5 flats, 5 or 6 sharps) the best plan is to tune it in 12 mathematically equal semitones.” From what Ellis says, again in 1885, the equal temperament used by the tuners of Moore & Moore was accomplished by the familiar “ordinary” procedure, with a final check on $G^\#-E^b$. And according to Ellis’s own findings, even the Broadwood tuners, who did use the modern method of the chain of twelve consecutive fifths and fourths in the middle C octave ($C^1-C^5$), made maximum errors of four cents at best, eleven at worst. Even earlier, equal temperament seems never to have been correctly applied, as already pointed out by Young (1800) and later by Jousses (1832): “The best equally tempered instruments are still unequally tempered, and, what is worse, oftentimes in [the] wrong places”; in other words (Jousses would appear to be saying), when it did not follow the procedures of type 2b, which at least left such errors in the less frequently used keys.

Finally, regarding the United States (East Coast), we know that Thomas Jefferson, who had a good technical knowledge of the maintenance of his pianos and other keyboard instruments, around 1783 was likely to have employed the mean-tone described by Nicolò Pasqualli. In 1834 William S. Porter used a temperament similar to that described by Young. In New York and Boston, in the years 1850–1856, preferences were expressed in favor of both the old unequal temperaments of the English type (James Hewins) and others that tended more towards equality (Hodges). In 1866 Henry D. Nicholson claimed that in America, equal temperament was universally adopted. However, J. Cree Fisher, a professional tuner in Philadelphia, could still write in 1907: “It is only within the last half century that the system of equal temperament has been universally adopted, and some tuners, even now, will try to favor the flat keys because they are used more by the mass of players who play little but popular music, which is mostly written in keys having flats in the signature.”

Italy

Since Italy was still a collection of different states (see Italy—Piano Industry), even in the field of tuning we notice marked differences, not only between north and south, but also within the north, between the area of Venetian influence (under Austrian rule from 1797 to 1859–1866) and the remaining states. We shall also see that equal temperament was to become established in the Kingdom of Naples around 1880–1890, about a generation later than in the north.

Our most detailed information comes from the area of Venetian influence. Giordano Ricciati (from 1762) and Alessandro Barca (ca. 1800) mentioned the gradual establishment of a particular kind of ordinary temperament (different from the French ordinaire): with the fifths $F-C-G-D-A-B$ narrowed a trifle more than 1/6-comma each, the fifths $B-F^\#-C^\#-G^\#$ and $E^b-B^b-F$ like those of equal temperament, and a wolf $G^\#-E^b$ of less than 1/2-comma. A tuning of this kind is confirmed in a late-eighteenth-century manuscript from the Biblioteca Comunale of Bassano del Grappa, near Vicenza. And we can also infer that it was still used around 1830 from an anonymous Trattato teorico e pratico del sistema armonico, preserved in the Biblioteca Marciana of Venice. This work reported that the keys with three sharps or four flats in their signatures began to be defective and that those with more accidentals (e.g., B major and G$^\#$ minor) were so poor as to be serviceable only in transitory modulations. The now-famous Vallotti temperament (fifths from F to B narrowed by 1/6-comma, the other six practically pure) was clearly a development of that described by Ric-
cati, but was actually little known in his day, according to Barca (Francesco Antonio Vallotti died in 1780 and his manuscript was not published until 1950). Nonetheless, a tuning for *cembalo* very close to Vallotti’s was described in 1794 by Luigi Malerbi, a musician working in Lugo di Romagna (near Ravenna). Such tuning must have been used on the spinet in the Malerbi household, on which the young Rossini practiced daily from 1802 to 1804. A tuning serviceable in all the twenty-four keys, though each with its individual character, was also prescribed in the *Rogole armoniche* of Vincenzo Manfredini (published in Venice, 1797). As for equal temperament, Riccati declared that it was disapproved “by all tuners” and added that he had never come across a keyboard instrument tuned in this manner (this was as late as 1790). Though explicit evidence is lacking, it must have become established on Veneto pianos only in the decade 1850–1860 or shortly before, given that a type of equal temperament, using the procedures of type 2b, was used on the most important organs installed in the region at that time.

The French “ordinary” tuning appears never to have been used in the Veneto (a reference by Giuseppe Pizzati in 1782 is purely speculative). Instead it was recorded in Piedmont and Lombardy (Carlo Gervasoni, 1800) and Bologna (instructions attached to a spinet now in the Museo degli Strumenti Musicali in Rome, dated 1778). Gervasoni’s tuning prescribed the use of all the twenty-four keys and has many analogies with that of Domenico Corri (see above, under “Great Britain”). The general situation, however, was summarized in 1816 by Bonifazio Asiol, director of the Conservatorio di Milan until 1814, who claimed that only a “small number of good tuners of the clavicembalo” (a term then used to refer to the piano) tuned in such a way that all twenty-four keys could be used.

As regards Kirnberger II, the traces of its influence in Italy are limited to certain characteristic tuning procedures: (1) that of beginning operations with the fifth D♭–A♭; and (2) that of using the note A to divide the ninth D–E into two equal fifths. They are found both in the instructions on the above-cited Bolognese spinet (1778) and in one of the tunings described by Gervasoni (1800) and Asiol (1816). It must be added, however, that both writers modified Kirnberger II profoundly and “capriciously.” Asiol transformed it practically into an equal temperament, while Gervasoni made it revert toward the ordinary temperament of the French type. Gervasoni begins his operations with a D♭–A♭, which he called “allegro” (i.e., sharp), an instruction we also find in an earlier letter by Metastasio dated “Vienna, 15 April 1770” (since Kirnberger II dates to 1771, this suggests that the tunings circulating in the Austrian capital in 1770

were derived from Kirnberger I, of 1766, which concentrated the comma within just one fifth, D–A. As a reaction to the arbitrariness of the “capricious” practices of the age, Kirnberger I was substantially proposed, even as late as 1834, by two Bolognese writers, Luigi Tagliavini and Filippo Schiassi (fifths D–A and E♭–B♭ narrowed by 1- and 1/11-comma respectively, the rest pure). Despite its unquestioned harshness, due to the fifth D–A tempered by a whole comma, it was adopted by (among others) “some of the most skilled Bolognese tuners” of those years, including Antonino Tedolini, who also used it for a concert given by the Austrian pianist Franz Schöberlechner, a pupil of Hummel.

The only person to recommend equal temperament in northern Italy was Asiol (1816 and 1827), but his views on the matter probably exerted no influence at all on the Conservatorio of Milan, which he directed until 1814, because they date from 1816. By that time he had retired to his native Correggio (near Reggio Emilia), where he stayed until his death in 1832. It is reasonable to assume that his opinions influenced the two music schools he founded during his last years, in Reggio Emilia and Correggio itself. The only certain information concerning Milan is that Eugenio Patornini, tuner of the Conservatorio, was tuning the pianos equally in 1859; while Americo Bärberi in 1861 confirmed that equal temperament was by then established in Milan (though for pianos only). The situation in Genoa must have been similar. In 1861 Severino Bruni, who had been a professional tuner in the city for twenty-two years, claimed to have solved his problems by converting to equal temperament: “For as long as I kept to the previous system [i.e., the unequal temperaments] I was always slow, uncertain and bothered by the criticisms of my tunings.”

In Naples, on the other hand, a circulating temperament of type 3, a little more unequal than Vallotti, was still being used in 1868, for in that year Giacomo Ferdinando Sievers, head of one of the city’s largest piano manufacturing firms, reported that his tuner Andrea Bonomo and his assistants had been using the following tuning for some thirty years: the five fifths from C to B narrowed by about 1/4-comma, the remaining seven pure (the five fifths and the corresponding major thirds over the same fundamental note were thus beating at almost the same rate, as we also found in the English mean-tone described above, see above). In 1880 Luigi Mascielli added that the method described by Sievers was still “almost universally used in Naples” and that it provoked strong criticism from pianists on tour in the city. Equal temperament, together with the pianos of Erard and Pleyel, was even-
tually imported after 1880, following the collapse of the Neapolitan piano factories and the beginning of Pasquale Curci’s activities (see Italy—Piano Industry). But even in Italy, as we noted earlier in the United States (J. C. Fischer, 1907), equal temperament was often carried out in such a way as to make the keys with flats in their signatures sweeter than those with sharps (Vittorio Lebrecht, Naples, 1882).

Piano with Orchestral Instruments

Adriano Banchieri (1609) had already drawn attention to the fact that the pure fifths of the violin’s open strings clash with the corresponding heavily-tempered fifths of the keyboard instruments when playing in consort. His solution to the problem, that of tuning the open strings of the violins, violas and violoni in unison with the corresponding notes of the keyboard continuo instruments, was still counseled by Johann Joachim Quantz in 1752. In subsequent years, however, following the decline of the practice of thoroughbass and the greatly increasing use of the more “transposed keys,” a change in the practice was needed. Various writers (mostly English, including those who preferred unequal tunings for the piano alone) began to recommend equal temperament when the piano played with a string quartet or orchestra. Here we may mention Friedrich W. Marpurg (1776), William Jones (1781), Tiberius Cavallo (1788), August F. C. Kollmann (1796), John Marsh (1809), Jean Jousse (1832), an anonymous writer in the Penny Cyclopaedia (1842), and the American James Hewins (1856). In 1877 the Flight’s Practical Tuner claimed that “piano-fortes and organs, used for the concert-room, are tuned by equal temperament.” All of this suggests, therefore, that such a similar tuning was used when, for example, Kollmann’s Piano Concerto op. 8 (1804) was first performed in London by his fifteen-year-old son George Augustus.

If, on the other hand, the former types of unequal temperament were used on the piano, the problems arising from clashes with the string quartet’s pure fifths (open strings C–G–D–A–E) were much greater. For example, the anonymous Trattato teorico e pratico (ca. 1830), cited above under “Italy,” said that for this very reason the key of E major was “defective in instrumental consorts” (evidently when C was chosen as a reference pitch-note). The problem was completely solved by a method now occasionally used, referred to as “equal temperament by pure fifths”; it was rediscovered about 1959–1974 by Mieczyslaw Kolinski and Serge Cordier, but was already known in the nineteenth century as the “Pleyel method.” Its slightly sharp “physiological” octaves are also in perfect agreement with the problems of string inharmonicity and ear nonlinearity, both aspects already noticed in the mid eighteenth century (J. C. Petit and Michel Corrette).

Finally, it is well worth remembering that the above comments apply to the orchestral strings, but not to wind instruments, which were pitched in specific keys before Theobald Böhm’s reform. For example, the Pleyel & Dussek piano method (from ca. 1800) offers not only Kimberger II but also an unequal tuning specifically designed for accompanying such wind instruments, and in an article published in the Gazzetta di Venezia in 1830 we read that “while [equal temperament] can be adapted to string instruments, that can never happen with the complicated wind.”

See also Tuning

PATRIZIO BARBIERI
 Translated by Hugh Ward-Perkins

Bibliography


Devie, Dominique. Le tempérament musical... Béziers: Société de Musicoologie de Languedoc, 1990.


TENSION RESONATOR

It is well understood in structural engineering that a downward force applied to an arched member will par-