THE ARIADNE MUSICA AND THE
WELL-TEMPERED CLAVIER:
A STUDY OF THE STATUS OF
EQUAL TEMPERAMENT IN THE
EARLY EIGHTEENTH CENTURY

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CHAPTER I
INTRODUCTION

Western musicians have considered the harmonic series as a source of musical pitches and intervals. The intervals of the harmonic series are, however, not compatible one with another. In the sixth century B.C. Pythagoras derived the diatonic tones of the greater perfect system from tuning a series of pure fifths—a process which caused the major thirds to be sharper than pure major thirds. This system of tuning was rejected by Aristoxenus who gave priority not to harmonic ratios but, rather, to the judgment of the human ear. An agreement between the opposing poles represented by Pythagoras and Aristoxenus was the aim of Ptolemy who advocated systems—one of which corresponds with just intonation—whose intervals were derived from superparticular ratios. Agreement between harmonic ratios and the judgment of the human ear has continued as one of the basic aims of tuning theory and practice. However, tuning systems are not judged in isolation but, rather, in direct conjunction with current musical practices, and thus

a tuning system acceptable for one practice may be found unacceptable for another.

A tuning system that works for the monophonic performance of diatonic melodies of limited range may be entirely unusable for polyphonic music. For example, the harshness of the Pythagorean major third would be more apparent in the simultaneous sounding of the tones of the interval than in their melodic use. Thus, Pythagorean tuning could be used for the performance of plainsong and might even be acceptable for the early polyphonic music in which thirds were considered dissonant intervals. By the sixteenth century, thirds were accepted as consonant intervals. This change in the status of thirds would require change in the tuning systems employed.

Composition in the church modes required few flats and sharps. The scales of the church modes consist of only 'white key' tones with each mode possessing an individual arrangement of intervals contained within a specific range. 'Black key' tones, particularly B-flat and F-sharp, began to be employed in modal music for purposes of avoiding the 'diabolus in musica.' Transposition of the church modes was limited. Meantone temperament—in which, due to the purity of its major thirds, only two flats and three sharps were available—would easily accommodate the performance of modal music.
Meantone temperament continued to be acceptable as the major and minor modes began to replace the church modes, for composers employed only those keys requiring few flats and sharps. As composers became interested in a broad range of keys, meantone temperament became unaccept-able. A keyboard instrument tuned in meantone temperament could be played only in those keys in which the instrument was tuned and to the closely related keys. The number of available keys was increased appreciably by the use of ir-regular temperaments—i.e., temperaments in which most, but not all, keys were available.

Eighteenth-century musicians were aware that the availability of all the major and minor keys could only be made possible through the use of equal temperament. They were still too familiar with the pure intervals of meantone temperament to be immediately satisfied with the 'impure' intervals of equal temperament. Despite its lack of pure intervals, equal temperament was eventually adopted. Bach's Well-Tempered Clavier—a 1722 compilation of preludes and fugues in all twenty-four keys in ascending chromatic arrangement—has frequently been used to symbolize the acceptance of equal temperament. The employment of equal temperament was, however, resisted by many eighteenth-century musicians—particularly organists and organ builders. Submitted as an example of the opposition to equal temperament is a statement made by Robert Smith, a mid-eighteenth-century composer at Trinity College, who,
according to William Sumner, described equal temperament as "That inharmonious system of twelve hemitones which produces a harmony extremely coarse and disagreeable."²

The deficiencies of equal temperament continued to be recognized in the nineteenth century. Hermann Helmholtz included in Chapter Sixteen of his book On the Sensations of Tone a subsection titled "Disadvantages of Tempered Intonation."³ The composer Saint-Saëns (1835-1921) made the following comments:

With the day that the 'temperament' in tuning had brought about the synomyousness of flats and sharps, and allowed the free use of all tonalities, the spirit of the keyboard entered the world; that spirit has become a devastating tyrant of music by propagating the heretical enharmonic system. Practically all modern music has sprung from that heresy; it has been too fecund to deplore it; but a heresy it remains, nevertheless, destined to disappear on a probably distant and fatal day, as a result of the same evolution that gave it birth.⁴

Twentieth-century oppositions to equal temperament are made apparent every time a performer of an instrument on


which pitch is not 'fixed,' as it is on the piano, plays pure thirds or fifths. An interesting 'compliment' is paid to equal temperament by Joseph Yasser who writes the following:

The opinion is voiced from time to time that Equal Temperament spoils the musical ear, which becomes disaccustomed to acoustically pure intervals, so that its receptivity weakens. Others go still further and assert that the artificial deviations of Equal Temperament hinder the normal development of the human ear and, in a certain sense, even clog the wheels of normal development of the musical art. The author however, is inclined to take the opposite view in these matters and believes that the practice of Equal Temperament not only does not spoil but refines the musical ear which is compelled to develop its adaptability and thus increases its range of physiologically detectable tones and sonorities in general. Equal Temperament serves the ear as a useful stumbling block, which broadens and enriches its experience, just as in ordinary life obstacles (and not their absence) add to our experience, thereby teaching us how to live.5

While oppositions to equal temperament still exist, they are few in number and meek in character when compared with those originating from the eighteenth century. This was indeed the time in music history during which controversies concerning temperament reached their most crucial point. The association of Bach's Well-Tempered Clavier and J. K. F. Fischer's Ariadne musica—a slightly earlier collection of small preludes and fugues in twenty different keys—with the employment and acceptance of equal temperament is the subject of this study.

CHAPTER II
FISCHER'S ARIADNE MUSICA

The Ariadne musica is a collection of twenty short preludes and fugues composed by Johann Kaspar Ferdinand Fischer (d. 1746[?])\(^1\) - a composer who held the position of Kapellmeister to the Markgraf Ludwig of Baden. Five ricercares are appended to this collection. The original date of publication, as cited by Johann Walther, is 1702.\(^2\) J. R. Milne, in an article in Grove’s Dictionary of Music and Musicians, adds that the collection was published as Opus 4 and republished in 1715 without an opus number.\(^3\) In his Geschichte der Orgel- und Klaviermusik bis 1700, Willi Apel states that the only preserved copy of the


collection is dated 1715. Ernst Gerber's mention of a 1710 edition appears to be in error.

The title page of the 1715 edition reads as follows:

Ioannis Caspari Ferdinandi Fischer/
Serenissimi Principis Ludovici Marchionis
Badensis/ olim Capellae Magistri/ ARIADNE
MUSICA/ Neo-Organoeolum/ Per Viginti
Praeludia, totidem Fugas atque Quinque
Ricer-/ caras Super totidem Sacrorum anni
Temporum Ecclesiasticas/ Cantilenas è
difficultatum labryintho educens,/
Opus praestantissimum ultimumque/
Magistri aequo ac Discipulis virtute
et utilitate maxime commendandum/
August. Vindelicorum, prostat apud
Josephum Frid. Leopoldum/ Anno 1715.

Fischer's title is a reference to the legend of Theseus and Ariadne which comes to us from Greek mythology—a reference explained by Fischer himself in the 1715 edition. In the legend, the sixteen-year old Theseus, along with thirteen other young men and women, was sent from Athens to Crete as part of an annual sacrifice. The sacrificial victims were to be put in a labyrinth and left to be killed by half-man, half-bull creature called Minotaur. Ariadne,


7. Ibid., 76.
the daughter of the king of Crete, became impressed with the bravery of Thesus and decided to help him. When the victims were led to the labyrinth, Ariadne gave Thesus a sword and a ball of wool—one end of which was to be fastened to the entrance and the rest to be unwound as he walked through the labyrinth. As the ball of wool was intended to lead Thesus out of the Crete labyrinth, the Ariadne musica was "... intended as a guide to lead young organists through the then modern keys, both major and minor."\(^8\)

The collection, considered to be for the organ, consists of a prelude and a fugue in each of nineteen major and minor keys plus a prelude and a fugue in the Phrygian mode. As described by Hans David, the paired preludes and fugues of the collection are arranged in

\[\ldots\] a chromatic ascent of tonics, starting from c and using each of the seven diatonic degrees of the c scale as a tonic for two pieces, one in minor and one in major, and each of the five chromatic degrees as a tonic for a single piece in either major or minor.\(^9\)

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The complete arrangement is as follows:

1. C major
2. C-sharp minor
3. D minor
4. D major
5. E-flat major
6. E Phrygian
7. E minor
8. E major
9. F minor
10. F major
11. F-sharp minor
12. G minor
13. G major
14. A-flat major
15. A minor
16. A major
17. B-flat major
18. B minor
19. B major
20. C minor

As may be observed, when both major and minor keys are employed, the minor key appears first. It may also be observed that C major and C minor are not paired, but, rather, begin and conclude the collection, respectively.

Some of the key signatures used by Fischer are not those that we today employ. A-flat major is the only major key for which a modern key signature is not employed. (Three flats are in the signature.) The key signatures of D minor and A minor do not have any flats or sharps. The signature for G minor has one flat; C minor, two flats; and F minor, three flats. E minor has two sharps in its signature and B minor has three. Both F-sharp and C-sharp minor have four sharps in their signatures. As may be observed, the signatures of the minor keys, with the exception of A and C-sharp minor, are lacking one flat (i.e., the minor keys with flats in their signatures are lacking the flat for the sixth degree of the scale, and the minor keys with sharps in their signatures have an additional sharp which is for the sixth degree of the scale). According to Matthew Shirlaw
The exclusion from the key-signature of the flat necessary for the sixth degree of a minor scale was in conformity with the traditional practice in respect of the Dorian Mode, where a Minor Sixth-B♭ was required in order to avoid the tritone, f-b♭, but which was not written.¹⁰

The comments of Rameau in his 1722 Traité de l'Harmonie concern key signatures allow a closer look at the signatures as they were used in the early eighteenth century. Rameau writes as follows:

Just as there is only one major key whose signature contains no sharps or flats, there should also be only one minor key with this characteristic. Our French musicians, however, do not proceed in this way, for in the minor mode they do not differentiate the key of Re from that of La. As a result, since either of these keys may be taken as a model, sometimes the tonic note is called Re, and sometimes it is called La.¹¹

Rameau continues by stating the practices of Alexandre Frere, author of a 1706 publication titled Transpositions de musique réduites au naturel par le secours de la Modulation.

Instead of placing the flat after the clef in the minor key of Re, designating that the sixth is minor as it always should be in the minor mode, he [Frere] wishes on the contrary to add a sharp to the signs ordinarily found after the clef in these minor


keys. This sharp would then designate a major sixth, thus destroying the order of the minor modulation. There was some foundation for this, since Frere's idea was to call each tonic note of the transposed minor mode by the same name. Had he given the same consideration to the key of La that he showed to Re, however, instead of destroying this natural order he would have kept it.12

From this explanation we may discover the reason for Fischer not adding a sharp to the key signature of A minor. The appearance of no flats or sharps in the signature may also be a reflection upon the practice of indicating whether a key was major or minor solely by notating the quality of the third above the tonic. The key signatures of C-sharp minor and A-flat major may be explained by the fact that the key signatures of the minor keys contain no more than three flats or four sharps, and those of the major keys no more than three flats or five sharps.

The sixth Prelude and Fugue are composed in E Phrygian. In both the prelude and the fugue the accidentals F-sharp and G-sharp are employed. D-sharp, the leading tone to E, is not employed. R. O. Morris writes, in *Contrapuntal Technique in the Sixteenth Century*, that

*The E mode (the Phrygian) remained distinct from the others, because it did not admit of a perfect cadence, as the note D#*

did not exist. The Phrygian cadence was formed by the bass, or lowest part, whilst the upper part ascended by a tone to the octave above.\textsuperscript{13}

The final cadences of the sixth Prelude and Fugue subscribe to this cadential formula--no other piece in the collection does so. The accidentals F-sharp and G-sharp are employed as non-harmonic tones and in chords of secondary function. G-sharp is also employed at cadence points, internal and final--an influence of the preference for cadencing with a major rather than with a minor third or triad. One C-sharp--functioning as a member of a chord of secondary function--appears in the fugue.

An explanation of the appearance of E Phrygian and its treatment may be discovered in compositions which come near to being contemporaneous with the \textit{Ariadne}--i.e., the French organ music of the seventeenth century. With the French organ mass, especially, there was discussion concerning the application of the organ tones to the church modes. The finals of the modes and the tones were not necessarily the same; rather, the finals of the organ tones were determined by the range of the chant and the range of the choir performing the chant. Two composer-organists involved in this determination were Jean Denis and, more importantly, Guillaume Gabriel Nivers.

According to Almonte C. Howell, Nivers shows that the eight church modes

... may be reduced to four according to their finals, and to two according to whether they contain a major or a minor third above the final. The first four are thus minor, the last four major. It is interesting that he [Nivers] notes this point, for ... the composers were harmonizing the first four very similarly to our minor keys, and the last four very similarly to our majors.¹⁴

E minor is one of the keys which Nivers associates with the organ tones (the titles of the compositions acknowledge the tone rather than the key). For tones I and II the 'true' E minor tonality is generally employed, however, for tone IV, E minor is treated in a different manner. Howell's summary of the organ tones includes the following:

Tone IV: concludes on E in all musical sources as prescribed by Nivers and Denis. The cadence, however, is always Phrygian, and the key itself closer to a minor cadencing on its dominant; it is never written as true e minor with a perfect cadence.¹⁵

A few unusual time signatures--by today's standards--appear in the collection. Eighteen preludes and fifteen fugures are in 'common time' (designated as 'C'). This


¹⁵. Ibid., 149-50.
time signature indicates, as it does today, that there are four quarter notes per measure. The time signature $\frac{1}{4}$ and the combined time signatures $C_4^3$, $C_4^1$ and $C_4^2$ are also employed.

Fugues 8 and 9 are marked 'alla breve' and employ the signature $\frac{1}{4}$. These are the only two of the twenty fugues in the collection in which soggetto themes are used. In these fugues, the half note—rather than the quarter note—is the main temporal division and is probably considerably faster than the half note under the signature $C$. The signs $C$ and $\frac{1}{4}$ do not, however, necessarily have exact proportional significance in the latter part of the seventeenth century.

Christopher Simpson, in Chapter Six, titled "Of the Antient Moods or Measures of Notes," of his 1667 publication A Compendium of Practical Musick, explains the four 'moods'. Included in this explanation is the following:

The fourth Mood they named Imperfect of the Less, which we now call the Common Mood, the other three being laid aside as useless. The sign of this Mood is a Semicircle, Thus, $\frac{1}{4}$ sometimes with a dash or Stroke through it thus $\frac{1}{4}$. 16

In Chapter Eleven, titled "Of Diminution," Simpson states that one sign of diminution

... is the Turning of the sign of the Mood back-ward thus ♩ (being still in use) which requires each Note to be play'd or sung twice so quick as when it stands the usual way. Also a dash or stroke through the sign of the Mood thus ℗ is properly a sign of Diminution; though many dash it so without any such Intention. 17

According to Howell, Nivers used the signs with a different meaning. He referred to C and ℗ as 'signe maieur' and 'signe mineur,' respectively, with the former indicating 4/4 time and the later 4/2 time. 18 Brossard, in his 1703 *Dictionnaire de musique*, states that the Italians call ℗.

... Tempo alla breve, because in earlier times all the notes were diminished under this signature by half their value; but now it indicates that the bar should be beaten in two steady beats, or in four extremely quick beats, ... And when the words Da Capella, and alla breve are seen with this signature, this indicates two very quick beats. 19

This interpretation of the combination of ℗ and 'alla breve' is the most appropriate one for Fugues 8 and 9 of the *Ariadne*.

17. Ibid., 35.


Prelude 13 and Fugues 10 and 12 employ the combined time signature $C_4^3$; Prelude 16, the signature $C_4^6$; and Fugue 7, the signature $C_6^1$. According to Willi Apel, combined signatures

... actually combine two meanings, the older proportional meaning with the more recent metrical one. Thus the sign $C_4^3$... means that (a) each measure contains six quarter notes, and (b) these six notes are equal in duration to the four notes of the preceding section.  

In the case of the Fischer collection, the combined signatures probably indicate a proportional tempo relationship between the pairs involved. In each pair of prelude and fugue in which one piece employs a combined time signature, the other piece employs common time.

Prelude 15 is unique in that it employs tempo designations. The prelude, initially marked 'Presto,' employs the designation 'Adagio' in measure five. 'Presto,' returns in measure six and remains until the final one and one-half measures, marked 'Adagio.' According to Prout and Donington, in an article in Grove's Dictionary of Music and Musicians, 'adagio' is derived from the Italian 'ad agio' meaning 'at ease' or 'leisurely.' It is later stated in

the same article that "In the 17th century *adagio* denoted a distinctly less slow pace than it did later."\(^{21}\) Donington cites Purcell as having written, in his *Sonnata's of III Parts* of 1683, that

> Adagio and Grave . . . import nothing but a very slow movement; *Presto Largo*, *Poco Largo*, or *Largo* by itself, a middle movement.\(^{22}\)

Brossard, in 1703, places 'Largo' as the slowest tempo which is followed by 'Adagio Adagio' and 'Adagio' ('Comfortably').\(^{23}\) 'Presto,' according to Brossard, means, FAST. That is to say the speed must be pressed on, by making the beats very short.\(^{24}\)

A look at Prelude 15 shows that 'Adagio' is used in those measures in which there are dotted eighth-sixteenth-note rhythms, which immediately precede important cadences—a dominant cadence in measure six and the final tonic cadence. The term 'adagio,' therefore, may be interpreted as a slowing of the tempo in preparation for the cadences, and not as a drastic tempo change from very fast to very slow.

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\(^{22}\) Cited in Donington, *Interpretation*, 322.

\(^{23}\) Translated in Donington, *Interpretation*, 322.

\(^{24}\) Ibid.
The Preludes and Fugues

For each of the nineteen keys there is a prelude paired with a fugue. There are no thematic connections between the paired preludes and fugues. The most obvious characteristic of the individual pieces is their brevity. Seven measures is the total length of the shortest prelude (Prelude 10) as well as the shortest fugue (Fugue 15). The longest prelude (Prelude 20) is comprised of twenty-five measures and the longest fugue (Fugue 8) fifty measures.

A prelude is a composition intended as an introduction or as a preparation for something else. The prelude is historically significant, for it is the earliest type of composition idiomatic for the keyboard, i.e., it does not have its origins in vocal music. Hermann Keller, as translated by Leigh Gerdine, informs us that

The earliest form of the instrumental prelude is the player's improvisatory tuning of his instrument . . . In the sixteenth century these introductions took more definite forms, were written down, and were called præambulum or intonatio. They were not given independent musical significance. Only after 1600 do we see how various forms of preludes were developed in suitable and different categories of music.
... Only one thing is still lacking in the seventeenth century: the self-contained duality of prelude and fugue. 25

Willi Apel, in the Harvard Dictionary of Music, writes that

The combination of the prelude with a fugue that became classic with Bach can be traced to organ preludes of the early 17th century, which, after a section in free style, continue and close with a short fugal section. 26

The fugue did not become an independent type of composition until after the early years of the Baroque era. According to Grout, pieces of the ricercar type, i.e., pieces in continuous imitative counterpoint, called by various names such as ricercar, fantasia, fancy, capriccio, fuga and verset, later coalesce into the fugue. 27 General characteristics of the early fugue--and of the Fischer fugues--are continuous entries with very brief episodes, and a simple tonal design consisting of only one or two quick modulations into keys other than the tonic.


The preludes and fugues of the *Ariadne* are self-contained, though paired. For the most part, the preludes do not employ the chords and passage-work characteristic of the earliest preludes. There are, however, a few preludes in the collection of an improvisatory nature. Featured in the preludes are pedal point and imitation.

Pedal point is employed in each of the twenty preludes. Prelude 3 (Example 1) is built entirely upon pedal points in I-V-I progression. The final tonic pedal of this progression is omitted in Preludes 1 (Example 2), 10, 12, 13 and 17. In each of the latter four preludes, a brief interruption during which no pedal is employed occurs between the two pedals. In Prelude 4 the progression is expanded to I-V/V (measures 6-8)-V. Preludes 6 and 8 have tonic pedals in their opening measures. While Preludes 11 and 18 each employ a tonic pedal in the opening measures and a dominant pedal in the measures preceding the final cadence, Preludes 14 and 19 modify this use of pedal point with the addition of a dominant pedal in some of the intermediary measures, and Prelude 16 with the addition of pedals on the dominant of the dominant as well as on the dominant. Prelude 5 in E-flat major (Example 3) employs a tonic pedal in the opening measures, a dominant pedal in the measures preceding the final cadence and, in the intermediary measures, a pedal on the mediant (the dominant of its relative major). Four
Example 1. Prelude 3.
Example 2. Prelude 1.
Example 3. Prelude 5.
preludes composed in minor keys—Preludes 2, 7, 9 and 20—employ tonic pedals in their opening measures and later employ pedals on the dominants of their respective relative minor keys. Prelude 7 also employs a dominant pedal before its final cadence, and Prelude 9 a pedal on the dominant of the dominant in addition to a dominant pedal before its final cadence. The twenty-five measure Prelude 20—representing the most elaborate employment of pedal point in the collection—has the following pedal points:

\[
\text{I \hspace{0.5cm} V/V \hspace{0.5cm} V/III \hspace{0.5cm} I \hspace{0.5cm} vii/V \hspace{0.5cm} V \hspace{0.5cm} I} \\
\text{meas. 1-6 \hspace{0.5cm} 9-11 \hspace{0.5cm} 14-16 \hspace{0.5cm} 17-18 \hspace{0.5cm} 20 \hspace{0.5cm} 21-22 \hspace{0.5cm} 23-25}
\]

Prelude 15 is the only prelude that does not employ pedal point in its opening measures. Measures six through ten of this prelude employ a dominant pedal, and measures eleven through fourteen a concluding tonic pedal.

Imitation of one theme throughout the entirety of a prelude is found in Preludes 3 (see Example 1, page 21) and 6. Preludes 13 and 17 employ brief ascending and descending scale passages in imitation. The imitative beginnings of Preludes 1 (see Example 2, page 22), 7, 8, 10 and 14 are followed by the use of new material. From the themes of Preludes 9, 11 and 19—which employ imitation of the theme in their opening measures—are extracted motives which are exploited for the remainder of each prelude. Imitation of more than one motive occurs
in Preludes 2, 16 and 20. Prelude 5 (see Example 3, page 23) begins homophonically, but soon becomes imitative. Preludes 4, 12, 15 and 18 are improvisatory in character.

All of the Ariadne fugues are four-voiced. The brevity of the fugues causes most of them not to have episodes. (A clear example of a fugue without an episode is Fugue 1.) The episodes that do appear have an average length of one measure. In Fugues 5 (Example 4), 6, 7, 12 and 13, the soprano voice enters first with the remaining voices entering in descending order. In Fugue 8—the only fugue in which the bass voice enters first—the voices enter in ascending order. In Fugue 16, the soprano voice does not enter with the subject until the bass and alto voices have each made two entrances. The soprano voice does, however, appear in the first measure of the fugue with the counter-subject. In the sixteen measure Fugue 18 (Example 5), the bass voice does not enter with the subject until measure thirteen. A fourth voice—not always in the bass—is occasionally added before measure thirteen.

Pedal point—so prominently displayed in the preludes—is sparsely employed in the fugues. In six fugues—Fugues 5, 8, 9, 11, 18 and 19—a one-to-two measure dominant pedal precedes the final cadence. Fugues 14 and 15 each employ a concluding tonic pedal in octaves—causing temporary enrichment of the texture.
Example 4. Fugue 5.
Example 5. Fugue 18.
Fugues 3, 4, 10, 11, 16 and 18 each have a counter-subject. The counter-subject of Fugue 16 (Example 6) is introduced along with the subject.


The counter-subject of Fugue 11 (Example 7) is a melodic inversion of the subject. Inversion of the subject occurs in Fugue 19 (Example 8) and inversion of the counter-subject occurs in Fugue 4. In Fugues 1, 2, 9, and 12 the first answer begins before the conclusion of the subject. The remaining fugues employing stretto are Fugues 5 (see Example 4, page 26), 6, 7, 8, 13, 14, 15, 16, 17 and 19.

The fugal subject--its construction and its relationship with the answer--illustrates the establishment
of tonality. The writing of the fugal subject and its answer in order that tonality may be defined and maintained is a concern of Nivers, in his rules on the construction of the fugue found in the 1667 *Traité de la composition*. Nivers' rules were retained by later theorists—among them Charles Masson, who, in his 1699 *Nouveau traité des règles pour la composition de la musique*, gives rules very similar to those of Nivers. These two men are apparently the earliest to write down precise rules for the composition of the tonal answer—an answer in which the boundaries of the determined tonality are not exceeded at the expense of altering some of the intervals in the subject. Although the tonal answer has its origins in the fifteenth century, it did not come into consistent use until the late seventeenth century. In eleven of the *Ariadne* fugues, the first answer is tonal. All of these fugues, save one (Fugue 20), employ subjects which begin on the dominant. Fugue 6 is the only other fugue in the collection in which the subject begins on the fifth degree of the scale. The answers conform to a rule given by Nivers which states that

> If the Subject (that is to say, the first part which begins the Fugue) opens with the final, the second part should open with the dominant, and on the other
hand, if the one begins with the dominant, the other should begin with the final. 28

Due to their brevity, the preludes and fugues of the Ariadne are not very active harmonically. Quick modulations are made to the dominant and, in those compositions in minor keys, to the relative major. Each of the preludes and fugues in minor keys cadences either with a tierce de Picardie (Prelude 12, G minor) or a unison.

The Ricercares

Appended to the Ariadne are five ricercares, which are associated with the ecclesiastical calendar,

1. Ricercar pro Tempore Adventus
2. Ricercar pro Festis Natalitys
3. Ricercar pro Tempore Quadragesimae
4. Ricercar pro Festis Paschalibus
5. Ricercar pro Festis Pentecostalibus

Each ricercar is an imitative piece based on the opening phrase of a chorale appropriate to the season. The soggetto themes are taken from the following chorales:

1. Ave Maria klare
2. Der Tag ist so freundenreich
3. Da Jesus an dem Creutze stund
4. Crist ist erstanden
5. Kom Heiliger Geist mit deiner genad

Mention should be made of the fact that Ricercar 4 appears in Volume Forty of the Bach-Gesellschaft edition of Bach's complete works.29 Here it is included in an appendix containing works of doubtful authenticity.


Further information may be found in Wolfgang Schmieder, Thematisch-Systematisches Verzeichnis der Musikalischen Werke von Johann Sebastian Bach (Leipzig: Breitkopf & Härtel, 1950), 461.
CHAPTER III

BACH'S WELL-TEMPERED CLAVIER

Johann Sebastian Bach's 1722 compilation of paired preludes and fugues arranged in an ascending chromatic key scheme through all twenty-four major and minor keys was followed twenty-two years later by a second collection employing a similar arrangement.¹ The two collections have come to be called the Well-Tempered Clavier, Volumes I and II, or 'the forty-eight.' Hans David believes that "... reference to 'the 48' is a bit unfortunate since it suggests that the two books represent two components of one book rather than two separate, though corresponding, works."² For present purposes, our attentions are to be focused on the earlier of the two collections.

The Well-Tempered Clavier, as it appears in the Bach-Gesellschaft edition, has as its major source the Volkmann autograph. This autograph, formerly owned by the nineteenth-century composer Robert Volkmann, is sometimes

referred to as the Wagener autograph--so named for a later owner, Dr. G. Wagener of Berlin. Missing from the autograph are the F-sharp major Fugue and the first six measures of the F-sharp minor Prelude. At the end of the final fugue appears the abbreviation 'S. D. G.' Underneath this is a hasty signature and the date 1732--probably the date it was written.3

In the Bach-Gesellschaft edition, the Volkmann autograph is supplemented with material from a manuscript in the Berlin Royal Library (No. 202).4 In this manuscript, the first pieces up to measure fifty of the F-sharp minor Fugue were restored by Vicarius Müller, a cathedral organist of Brunswick. Müller's restoration appears to have been made according to a good copy. According to a former owner, Professor F. C. Griepenkerl of Brunswick, the manuscript was bequeathed to him by Müller. Griepenkerl regards the manuscript as authentic because, from his account, Müller received the autograph from Wilhelm Friedemann Bach who lived with Müller after his dismissal


4. Ibid., xxv.
from Halle. Schmieder, in his thematic catalogue of the works of Bach, acknowledges the fact that this manuscript had earlier been regarded as an autograph. He, however, disagrees and lists the manuscript as a copy. To the information known about Müller's restoration, Schmieder adds that the manuscript concludes with a chorale prelude, "Ach, was soll ich Sünder machen," in the hand of Wilhelm Friedemann Bach.

There also exists the so-called "Fischhof autograph"--an autograph of dubious authenticity. Previously in the possession of Hauser of Munich, this manuscript was a donation of Professor Fischhof of Vienna to the Royal Library (No. 202g). The title is the same as that of the Volkmann autograph, but the date is missing. At the bottom of the title page appears the name Joh. Chr. Oley Bernberg--either an early owner or the copyist. The reliability of the copy is questionable. In the manuscript, for example, D minor and D major are numbered 5 and 6 instead of 6 and 5; E minor and E major, 9 and 10 instead of 10 and 9; and A minor and A major, 19 and 20 instead of 20 and 19. Schmieder regards the "Fischhof

5. Ibid., xv.


autograph" as a copy rather than as an autograph. 8

The only two actual autographs, according to Schmieder, are the Volkmann autograph and an autograph belonging to Nægeli of Zürich which, in 1913, found itself in the possession of Karl v. Vietinghoff. 9 The Zurich autograph--lacking the D minor prelude--was unknown to the editor of the Bach-Gesellschaft edition of the collection. It was obtained by H. G. Nægeli in 1802 from Anna Caroline Philippine Bach, the daughter of C. P. E. Bach--to whom the autograph originally belonged. (Schmieder questions C. P. E. Bach's ownership.) Nægeli's son sold the autograph to Ott-Usteri of Zürich who owned it until his death in 1872. 10 After this date, the autograph had many owners. Measures in the Zürich autograph which are not in agreement with corresponding measures in the Bach-Gesellschaft 1866 edition of the collection are given in the 1897 supplement of the instrumental works. 11

The title page of the Volkmann autograph of the collection translates as:

9. Ibid., 509.
10. Alfred Dörffel, ed., Instrumentalwerke (Erweitungsband), [1897], Vol. XLV, Pt. 2 of Johann Sebastian Bach's Werke, xlv.
11. Ibid., 235-42.
The Well-Tempered Clavier, or Preludes and Fugues through all the tones and semitones, both as regards the Tertia Major or Ut Re Mi, and as concerns the Tertia Minor or Re Mi Fa. For the Use and Profit of the Musical Youth Desirous of Learning, as well as for the Pastime of those Already Skilled in this Study, drawn up and written by Johann Sebastian Bach, p. t. Capellmeister, to his Serene Highness of the Prince of Anhalt-Cothen, etc., and Director of His Chamber Music, Anno 1722.  

Various opinions of the proper medium of performance exist. Geiringer mentions an "... attempt of Hans Brandts-Buys (Het wohltemperierte Clavier, Arnhem, 1944) to prove that Bach's famous 48 preludes and fugues were all written for the organ." For many years, 'clavier' has been considered synonymous with 'clavichord.' Thus many references to the collection as the Well-Tempered Clavichord may be found. Arnold Dolmetsch, for example, mentions the "... Preludes and Fugues of 'Das wohltemperirte Klavier' (Klavier, i.e., Clavichord) ..."  

Forkel made the assertion that Bach favored the clavichord

12. Translated in David and Mendel, Reader, 85. The abbreviation 'p. t.' stands for pleno titulo (with full title).


to the harpsichord. Arguments against this assertion were made by David and Mendel who write that

... no grounds are known for attributing to him [Bach] any predilection for the instrument. He himself specified a number of his compositions (including the Second Part of the Clavier-Übung, the Goldberg Variations, all sonatas with an obbligato keyboard instrument, and all clavier concertos) as being for harpsichord, and not one as exclusively for the clavichord. Most of his 'clavier' compositions were apparently conceived for either instrument at the player's option. A specific literature for clavichord flourished only in the decades after Johann Sebastian's death; the fact that Philipp Emanuel was one of the protagonists of the instrument may partly explain Forkel's somewhat misleading statements.

In an article in a 1925 issue of The Musical Quarterly, Edwin Hughes contends that the collection was intended especially for the clavichord. The synonymity of 'clavier' and 'clavichord' is one reason given by Hughes for his contention. Two other reasons given are:

1. the collection was intended for practice purposes, and
2. the invention of the 'bundfries' clavichord was an incentive to use all of the major and minor keys.


The second reason stated above is based on the erroneous opinion that a gebunden clavichord prohibited the use of equal temperament. If, as stated in the first reason, the pieces were intended solely for practice purposes, then the clavichord would have been the appropriate medium of performance. The preludes and fugues, although composed with some pedagogical intent, cannot be considered merely as practice pieces. For their performance, therefore, the harpsichord is more appropriate than the clavichord.

The term 'clavier,' according to Willi Apel, was

... used in the baroque period as a generic designation for the keyboard instruments such as the harpsichord, clavichord, and organ... Later, it denoted mainly, if not exclusively, the clavichord (K. P. E. Bach).18

A slightly more specific explanation, offered by David and Mendel, reads as follows:

Clavier means keyboard and was also used in Bach's time to designate any keyboard instrument, although usually the reference is particularly to the harpsichord or clavichord, as distinguished from the organ. Later the meaning came to indicate specifically the clavichord, but there is no indication that Bach ever used the word in this sense or that the work was written exclusively for the clavichord.19


There remained some musicians in the late eighteenth century who interpreted 'clavier music' as music playable on any keyboard instrument rather than music composed specifically for one particular keyboard instrument. This is illustrated by two advertisements for the Bach collection which appeared in Moscow in February and August of 1794. They read:

... Bach (Jean Sebastian) 24 preludes & 24 fugues dans tous les tons & semitons, pour le Clavecin l'Orgue ou le Forte-Piano, à l'usage & pour l'étude des plus habiles. Con [nois] seurs & Amateurs, œuvre posthume & rare. Mst. 25. 25 Rbl. [S. 389]

... Bach (Jean Sebastian) 24 preludes & 24 figures, pour le clavecin, les orgues ou le piano forte, a l'usage des plus habiles connoisseurs & amateurs, ouvrage très rare 25 Rbl. [S. 1309]

Some question exists concerning whether or not the collection was intended to be performed in its entirety. Ernst Gerber, in his account of the lessons his father, Heinrich Nicolaus Gerber, had with Bach in 1724, wrote that Bach played the Well-Tempered Clavier

... altogether three times through for him with his unmatchable art, and my father counted these among his happiest hours, when Bach, under the pretext of not feeling in the mood to teach, sat himself at one of his fine instruments and thus turned these hours into minutes.21


Although the exact interpretation of the account is not clear, it is possible to think that Bach played the collection in its entirety upon three occasions for his student. Edwin Hughes parenthetically remarked that "... on occasion he [Bach] would play right through one of the volumes for a circle of friends and pupils." 22 Hughes, however, fails to offer any documentation to support this statement.

Bach's possible performances of the collection in its entirety should be considered as isolated occurrences rather than as indications that he intended the collection to be performed as a whole. The arrangement of the paired preludes and fugues in the Well-Tempered Clavier and, similarly, in the Ariadne musica is extra-musical. Manfred Bukofzer, turning his attention to the arrangement of pieces in instrumental collections according to a specific key scheme, explains that "The order was dictated by pedagogical considerations which gave the collection a logical and didactic, but hardly an aesthetic unity." 23 Therefore, the conclusion can be made that neither the Well-Tempered Clavier nor the Ariadne musica were intended as cyclic unities.

The specific arrangement employed in the *Well-Tempered Clavier* is that of paired preludes and fugues in ascending chromatic movement, beginning with C, through each of the major and minor keys. Unlike in the *Ariadne*, C minor immediately follows C major rather than appearing at the end. Prelude and Fugue 8 are unique, for while the prelude is composed in E-flat minor, the fugue is composed in D-sharp minor. The only other similar employment of enharmonic keys occurs with Prelude and Fugue 17, in A-flat major, and Prelude and Fugue 18, in G-sharp minor.

No incomplete key signatures are employed—i.e., according to the Volkmann autograph. A compound time signature of 24/16 to 'C' is employed in Prelude 15. The use of these two signatures indicates a 3:2 relation, i.e., three sixteenth notes performed against two sixteenth notes.

**The Preludes and Fugues**

The most readily noticeable difference between the preludes and fugues of Fischer's *Ariadne musica* and those of Bach's *Well-Tempered Clavier* is length. The shortest prelude in the *Well-Tempered Clavier* is eighteen measures in length—seven measures fewer than the longest prelude in the *Ariadne*. The longest prelude in the Bach collection has 104 measures. The lengths of the fugues in the *Well-Tempered Clavier* range from between twenty-seven to
115 measures, while those in the *Ariadne* are between fifteen and fifty measures.

The preludes and fugues in the *Well-Tempered Clavier* were, as implied on the title page, intended for pedagogical purposes—for Bach's students and, especially, for his sons. Eleven preludes in the *Well-Tempered Clavier* were originally conceived for Wilhelm Friedemann's *Clavierbüchlein*. The corresponding preludes are:

<table>
<thead>
<tr>
<th>Well-Tempered Clavier</th>
<th>Clavierbüchlein</th>
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<tbody>
<tr>
<td>No. 1</td>
<td>No. 14</td>
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<tr>
<td>2</td>
<td>C minor</td>
</tr>
<tr>
<td>3</td>
<td>C-sharp major</td>
</tr>
<tr>
<td>4</td>
<td>C-sharp minor</td>
</tr>
<tr>
<td>5</td>
<td>D major</td>
</tr>
<tr>
<td>6</td>
<td>D minor</td>
</tr>
<tr>
<td>8</td>
<td>E-flat minor</td>
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<tr>
<td>9</td>
<td>E major</td>
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<tr>
<td>10</td>
<td>E minor</td>
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<td>11</td>
<td>F major</td>
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<td>12</td>
<td>F minor</td>
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Some of the preludes resemble etudes, i.e., they introduce and exploit some fingering or rhythmic pattern which aids in developing the ability of the performer. In Prelude 2, for example, both the right and the left hands are assigned parts requiring the repetitive use of similar fingering patterns. Contrary and parallel motions are both employed in this prelude.
Example 1. Prelude 2, measures 1-2.

Prelude 2, measures 19-20.

As shown in Example 2, alternation of a sixteenth-note pattern against a quarter-note-eighth-note pattern between the two hands is called for in Prelude 3.

Prelude 3, measures 9-12.

In Prelude 5 is required the steady performance of consistent sixteenth notes by the right hand against eighth notes by the left hand. Triplet sixteenth notes against eighth notes is the rhythmic pattern employed in Preludes 6 and 15. Prelude 15—in which the compound signature 24/16 to 'C' is employed—also requires the performance of sixteenth-note patterns in contrary and parallel motion.

Example 3. Prelude 15, measure 1.
Prelude 15, measure 14.

Characteristics of the etude and the solo and accompaniment types of composition are combined in Prelude 10. In measures one through twenty-two, the left hand accompanies the right hand with consistent sixteenth-note patterns for which similar fingerings are required. The remaining measures find sixteenth-note patterns in both hands.

Example 4. Prelude 10, measure 1.

Alternation between the hands of sixteenth-note patterns against eighth-note passages occurs in Prelude 11.

Example 5. Prelude 11, measure 6.

Rhythmic patterns are emphasized in Prelude 13, for which the 12/16 time signature is employed.

Preludes 4, 14, 18, 19 and 23 employ imitation throughout their entireties. As may be observed in Example 7, the theme of Prelude 4 is divided into two motives—the second of which appears in inversion.
The themes of Preludes 18 and 23 also appear in inversion. The theme of Prelude 14 is introduced above the opening tonic pedal. Prelude 19 employs three themes--which are given in Example 8.
Example 8. Prelude 19, measures 1-3.

In prelude 17, the theme is used imitatively in the opening ten measures. Other examples of imitation in this prelude are confined to measures nineteen and twenty, and measures thirty-four through thirty-six. Other preludes in which imitation is used sparingly are Preludes 9, 12 and 20. Prelude 20 employs two melodic patterns--given in Example 9. Only once is a fragment of one of these patterns performed in imitation.

Preludes 1 and 21 resemble improvisations. Preludes 8 and 22 are composed in a style similar to that of solo and accompaniment. The more elaborate Prelude 16 may also be included with Preludes 8 and 22.

Prelude 7 is unique in its composition. The first nine measures of the prelude are improvisatory in character and function as a 'prelude within a prelude.' An elided cadence on the dominant at the beginning of measure ten concludes the 'improvisation' and initiates a four-voiced fugal section. Another elided cadence on the dominant at the beginning of measure twenty-five concludes this section and begins a final forty-six measure fugal section in which two themes are employed. As shown in Example 10, these themes are derived from the first two sections.

Prelude 7, measures 10-11.

Prelude 24 is the only prelude in the collection in binary form. Each section (measures 1-7 and 8-47) is repeated. The prelude has two imitative voices accompanied by a third lower voice. As shown in Example 11, the intervals of the theme of the first section are employed in smaller note values in the second section.


Prelude 24, measures 8-9.
Eighteen preludes in the *Well-Tempered Clavier* employ pedal point. However, pedal point is not used in these preludes to the extent it was in the *Ariadne* preludes. In Bach's collection, Preludes 4, 6, 9, 14 and 15 employ tonic pedals in their opening measures, while Preludes 2, 20 and 24 employ tonic pedals in their concluding measures. Tonic pedals in both the beginning and the concluding measures may be found in Preludes 8 and 16. Preludes 12 and 23 employ tonic pedals in their opening measures and dominant pedals in the measures preceding the final cadences. In both cases, the dominant pedal is briefly interrupted. The twenty-four measure Prelude 22 employs a tonic pedal in its opening measures (concluding with a tonic cadence at the beginning of measure three) and a dominant pedal from measures twenty to the beginning of measure twenty-two. The prelude concludes with a one and one-half measure tonic pedal. A two and one-half measure dominant pedal concluding in the second to final measure occurs in Prelude 13. Near the conclusion of Prelude 10, a one and one-half measure dominant pedal is immediately followed by a submediant chord—resulting in a deceptive cadence. A dominant pedal in measures 27-29 of Prelude 5 (D major) precedes the submediant of the parallel minor key. In measure 32 a passage in this parallel minor key is performed over another dominant
pedal and is followed by a submediant chord in the original key in measure 33. Following a thirty-second-note passage and two diminished seventh chords, the prelude concludes in measure 35 with a perfect authentic cadence.

The concluding twelve measures of Prelude 1 employ dominant-tonic pedals. These twelve measures—functioning as a coda—may be compared with the seven measures of the shortest prelude in the Ariadne. The 'prelude within a prelude' of Prelude 7 may also be considered here. The first three-and-a-half measures of the prelude employ a tonic pedal and the final measures (beginning with measure 8 and cadencing at the beginning of measure 10) employ a dominant pedal. The prelude proper concludes with a three-measure tonic pedal.

The fugues of the Well-Tempered Clavier are more varied and complex than those of the Ariadne. While all of the Ariadne fugues are four-voiced, only ten of the fugues in the Well-Tempered Clavier are four-voiced. Of the remaining fourteen fugues, eleven have three voices, two have five voices and one has two voices. In none of the four-voiced fugues do the voices enter in ascending or descending order as they did in some of the Ariadne fugues.

Seven fugues in the Well-Tempered Clavier employ pedal point. Of these, Fugues 1, 2, 15 and 20 each conclude with a tonic pedal. A dominant pedal preceding
the final cadence occurs in Preludes 14 and 24. In none of these fugues does the pedal exceed five measures. Only Fugue 4 (C-sharp minor) employs concluding dominant and tonic pedals. In this fugue, a four-measure dominant pedal (G-sharp) and a two-measure dominant pedal are divided by one measure in which an F-double-sharp (the leading tone to G-sharp) is employed as a pedal.

Of the twenty-four fugues, seven have subjects which begin with the dominant degree of its particular key. (Eleven of the Ariadne fugues begin thusly.) In fifteen of the Bach fugues the first answer is tonal. Both of the five-voiced fugues employ soggetto themes, thus, their themes are similar to those of the Fischer ricer-cares. One of these five-voiced fugues (Fugue 4) employs three subjects—which are given in Example 13.

Example 12. Fugue 4, measures 1-4.
Fugue 4, measures 35-40.

Fugue 4, measures 49-50.

Fugues 2, 6, 7, 10, 11, 13, 14, 15, 16, 20 and 24 each have one countersubject, and Fugues 3, 12, 18 and 21 each have two countersubjects. Such devices as stretto
(employed in nine fugues, including Fugues 1, 11 and 22) and inversion of the subject (in, for example, Fugues 14, 15 and 23) are employed in the fugues. The three-voiced Fugue 8 employs augmentation and inversion of the subject as well as stretto. Inversion of the subject and the countersubject may be observed in Fugue 6. In Fugues 9 and 19 the first answers enter before the conclusions of the subjects. Unlike the Ariadne fugues, in which episodes are few and brief, all but one of the Bach fugues employ episodes. Fugue 1 is the exception. The episodes in Fugues 4 and 11, though present, are brief.

The preludes and fugues of the Well-Tempered Clavier are more active and complex harmonically than those of the Ariadne. (Consideration of the differences of the lengths of the preludes and fugues in the two collections must be made here.) Modulation is employed with more frequency within the individual pieces (the A-flat major Fugue 17, for example, modulates through E-flat major, F minor, B-flat minor and D-flat major). The increased harmonic activity is represented by the increased employment of added accidentals, which, in many cases, causes enharmonic tones to occur within an individual prelude or fugue. (In the A minor Prelude 20, for example, the enharmonic tones D-sharp and E-flat, and A-sharp and B-flat are employed.) In no one prelude or fugue of the Ariadne do enharmonic
tones appear. In the Well-Tempered Clavier pieces composed in minor keys conclude with major thirds or triads. The one exception is Fugue 18 in G-sharp minor. Although Prelude 18 concludes with a G-sharp major triad and although the sharpened mediant is employed near the final cadence of the fugue, Fugue 18 concludes with a G-sharp minor triad.

Fischer's Ariadne musica and Bach's Well-Tempered Clavier are similar only in their employment of paired preludes and fugues composed in a large number of keys and arranged according to an ascending key scheme. There is no direct proof that Bach knew the Ariadne musica. C. P. E. Bach, in a letter to Forkel, stated that his father had heard and studied the works of Fischer, Froberger, Kerl, Pachelbel, Frescobaldi, Strunck, Buxtehude, Reincken, Bruhns and Bohm. 24 Similarities of some of the subjects employed in the Ariadne fugues with subjects employed by Bach in the Well-Tempered Clavier are pointed out by A. E. F. Dickinson, 25 Hermann Keller 26 and Willi


The individual pieces in the *Well-Tempered Clavier* are of an unquestionably greater scale than those in the *Ariadne musica*. The statement is made by David and Mendel that, in general, Bach's works were conceived on a larger scale than any previous corresponding works. This generalization is dramatically and specifically illustrated by the comparison of the length, variety and complexity of the preludes and fugues in the *Well-Tempered Clavier* with that of the preludes and fugues in the *Ariadne musica*.

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CHAPTER IV
TEMPERAMENT IN THE BAROQUE ERA

The most widely employed temperament in the seventeenth and early eighteenth centuries was meantone temperament—the earliest description of which is contained in Pietro Aaron's Thoscanello de la Musica, first published in 1523, revised (with a supplement added) in 1529 and reprinted in 1539 and 1562. As translated by Peter Bergquist, Aaron's description, found in Chapter Forty-one, titled "About the Temperament and Manner of Tuning the Instrument," partially reads as follows:

If you want to tune and temper your instrument, you must first consider the note or position called C fa ut, using whatever intonation you please. When you have decided this, take the octave above C fa ut and make it always just. Then the major third above, E la mi, wants to be sonorous and just, that is, as pure as possible. When this is done, take the fifth in the middle, G sol re ut, and make it a little flat.  

The description continues. However, the main features of the system—pure thirds and flattened fifths—are contained in these few sentences. Aaron does not specifically state how much the fifths should be flattened. The required amount is, however, one-fourth of the syntonic comma, i.e., one-fourth of the distance between a just major third and a Pythagorean major third (i.e., a third derived from four pure fifths). Therefore, in a temperament in which pure major thirds are required the comma is to be divided among the four fifths so that they may be equally flattened.

The term 'meantone' is derived from a feature of the system through which the major and minor whole tones of just intonation are abolished. In just intonation, all of the intervals, formed with a fundamental upon which a scale is built, are determined by the ratios of the harmonic series. If, for instance, a scale is built upon C (256 c.p.s.), then D (in ratio 9:8) would equal 288 c.p.s. and E (in ratio 5:4) would equal 320 c.p.s. If, then, a scale is built upon this D, E (in ratio 9:8) would equal 324 c.p.s. In the C scale, therefore, the interval C-D is a major whole tone and D-E is a minor whole tone. (The interval of the minor whole tone, derived from the harmonic series, is in ratio 10:9.) In meantone temperament, however, a whole tone is no longer
major or minor, but, instead, exactly one-half of the major third (i.e., slightly flatter than 9:8 and slightly sharper than 10:9). In our C scale, then, the interval C-D would be the same as the interval D-E.

The pure major third is the all-important feature of this temperament, and it is this pure major third which prohibits the existence of enharmonic tones, and, therefore, free modulation through all keys. If, for example, G-sharp is determined as a pure major third above E, which, in turn, is a pure major third above C, then G-sharp cannot be used as A-flat, a pure major third below C. In this example, with the C designated as 256 c.p.s., the G-sharp equals 400 c.p.s. and the A-flat equals 409.6 c.p.s. This frequency difference is a very noticeable discrepancy.

The unpleasant sounds produced by such enharmonic use of non-enharmonic tones came to be called 'wolves.' According to Roger North, in his essay "The Tuning of Clavichord Instruments,"

Some very good tuners will help a little by robbing Peter to pay Paul, as by making #G over sharp. But then E, a more usuall note, will suffer in its 3rd, which will hurt the musick in A key, and for that reason they call that note [G#] the wolf, which may neither be held, nor let goe.2

John Wilson, in a footnote to North's statements, explains that

The phrase 'to have a wolf by the ears' (so that one is both unable to hold it and afraid to let it go) occurs in ancient Greek authors and in many later ones. Among musicians, Schlick in 1511 mentioned 'the discords which the organ-maker calls wolves', and most writers have assumed that the word was adopted because of mistuned intervals which might (with some imagination) be said to sound like wolves. North's remark suggests an alternative usage, in which G♯ is a 'wolf' because it puts the tuner in a dilemma, not because of any supposed 'howling' of the false fifth G♯-E♭.  

The chromatic tones usually tuned were F-sharp, C-sharp, G-sharp, B-flat and E-flat. The use of these flats and sharps rather than G-flat, D-flat, A-flat, A-sharp and D-sharp indicates influences of modality. The first chromatic tone to come into use—in order to avoid the 'diabolus in musica'—was B-flat. Explanations for the existence of the other chromatic tones are given by A. Madeley Richardson in his book The Mediaeval Modes. Richardson explains that the B-flat made possible the transposition of modes down a fifth—a process which resulted in the appearance of another tritone.

3. Ibid., 211fn.
It here presented itself between B-flat and E, and its avoidance was secured by lowering the E and thus introducing an E flat, in the same manner as the original B flat. 4

Richardson also explains that the minor third was not used at cadence points "... since it was regarded as of a discordant nature. This idea is supported by the phenomenon of the chord of nature, which never supplies a minor third from the generator ...," 5 that is to say that no partial in the harmonic series forms a minor third with the fundamental. A final chord in the Dorian, Phrygian or Aeolian mode, therefore, had to have its third either omitted or sharpened. The sharpening of the third brought about the use of F-sharp, G-sharp and C-sharp, respectively. F-sharp has also been explained from the standpoint of avoidance of the tritone, for "... this purpose could as well be effected by sharpening the F as by flattening the B." 6 The availability of F-sharp, C-sharp,


5. Ibid., 50.

G-sharp, B-flat and E-flat, with no enharmonic tones, made possible the following keys in meantone temperament:

<table>
<thead>
<tr>
<th>Major</th>
<th>Minor</th>
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<tbody>
<tr>
<td>C</td>
<td>A</td>
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<tr>
<td>G</td>
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<tr>
<td>D</td>
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<tr>
<td>A</td>
<td>D</td>
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<tr>
<td>F</td>
<td></td>
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<tr>
<td>B-flat</td>
<td>G</td>
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Sometimes non-harmonic tones and keys other than those considered 'good' in meantone temperament were employed for the special effects which their dissonance produced. Franklin S. Miller, in his 1974 dissertation, writes that there existed

... a good number of keyboard works which deliberately used a mean-tone temperament and simultaneously exploited the shocking sonorities resulting therefrom when non-enharmonic sounds were introduced. The most famous examples (all keyboard works) are the final, chromatic variation of Samuel Scheidt's 'Da Jesus an dem Kreuze stund', Sweelinck's 'Chromatic Fantasie', and the fifth variation of Bach's Partita on 'Gott, du frommer Gott'. In the case of the two works built on chorale tunes, the prescribed effects can be explained as a means of underlining the text to be found in the corresponding verses— an 'affect' brought about by the tuning of the instrument.7

John Wilson similarly wrote that

... Rameau, before he had transferred his allegiance to Equal Temperament, spoke of F minor and B♭ minor as being proper for 'Chants lugubres'. Burney too, though he regretted the out-of-tunedness of F minor on the organ 'as it is usually tempered', thought that in some cases 'these crude chords may add to the melancholy cast of the composition'.

The appearance of keys requiring more than two flats or three sharps also does not necessarily indicate a change from meantone temperament, but, rather, the retuning of certain chromatic tones. Retuning the chromatic tones was not an uncommon occurrence at the time with which we are concerned. An early example of the necessity for retuning is left to us by Giovanni Paolo Cima, a sixteenth-to-seventeenth century organist, in his 1606 Partite de Ricercari & Canzoni alla Francese.

The main body of the publication contains seven ricercars and sixteen canzonas for keyboard. However, added to this material as a lengthy appendix, is a discussion of how to retune a keyboard instrument in order to transpose to any key.

Included to illustrate the discussion is a musical example titled "Essempio 1," in D minor, which is transposed eleven times, each time a semitone higher. Each transposition

8. Wilson, Roger North, 211fn.

has accompanying instructions on how to retune the instrument. Cima's explanation of the purpose of his work, as translated by Clare G. Rayner, is as follows:

Knowing how important it is for Organists to know how to play on any tone and interval of our instrument i.e., to transpose for the convenience of singers in their concerti, it seemed to me praiseworthy to undertake to publish a method which will make this practice of transposition easy. . . . And in order to learn this art, you will be given, O Studious Reader, these twelve examples, which, starting from the first, ascend (as you can see) always by semitone, now major, now minor. . . . And in order to avoid the harshness which you would hear in going through all the semitones, tune the instrument in the manner indicated at the head of each example, taking care not to play flats or sharps where they are not marked, even if there are three or four notes in the same space or on the same line. . . .

In his examples, Cima never writes any chromatic tones except F-sharp, C-sharp, G-sharp, B-flat and E-flat. In the F minor Essempio 4, for instance, Cima employs B-flat, E-flat, G-sharp and C-sharp rather than B-flat, E-flat, A-flat and D-flat. The process of retuning chromatic tones makes available keys that would otherwise not be available in meantone temperament. However, the number of available keys does not increase because those keys requiring the originally tuned chromatic tones are no longer usable.

The availability of flats and sharps in addition to those five ordinarily tuned in meantone temperament was made possible by the use of split keys on some instruments, especially organs. Most often the keys E-flat and G-sharp were split in order that D-sharp and A-flat might be available. Sibyl Marcuse, in *A Survey of Musical Instruments*, mentions an organ described by Schlick (1511) twelve years after its completion which "... had been built with 'double semitones' in both manual and pedal."

An Italian harpsichord pictured in Zarlino's *Instituzioni harmoniche* is described by Frank Hubbard, in *Three Centuries of Harpsichord Making*, as an instrument

... in which all the sharps are split and extra keys are provided between E and F, and B and C, giving nineteen divisions to the octave ... 

Probably the most famous example of an organ with split keys is the Temple organ built by 'Father' Bernard Smith in the 1680's. According to W. L. Sumner, a manuscript found in the Inner Temple Library includes the statement that


The Organ in the Temple hath quarter notes, which no organ in England hath, and can play any tune, as for instance, ye tune of ye 119 Psalm, and severall other services set by excellent musicians, which no other organ will do.13

In a footnote, Sumner writes that 'ye tune of ye 119 Psalm' is E minor, thus requiring a D-sharp. Opposition to split keys was voiced by Roger North who wrote:

Some experiments have bin made, by more additionall pipes which they call Quarter Notes, to gain a perfection of tune; but over and besides the increase of charge and incumbrance in the fabrick (sufficient discouragement), they find it will not by any means be obtained exactly to answer all the scales as may be required. Therefore the nicety is dropt, and the masters are contented.14

With the growing desire for freedom in key choice and for unlimited modulation, meantone temperament became unacceptable to some musicians. These musicians sought to establish the use of a temperament in which all keys are equally available—i.e., equal temperament. The idea of equal temperament was not new. According to J. Murray Barbour, a temperament with equal semitones and flat fifths was suggested in the third century B.C. by Aristoxenus.15 The earliest tuning rules which may be interpreted


14. Wilson, Roger North, 212.

as equal temperament are given by Giovanni Maria Lan-
franco in his 1533 *Scintille de musica*.\(^{16}\) Theories of
equal temperament appear in many writings of the six-
teenth and seventeenth centuries, and one of the most
famous of these is Marin Mersenne's 1636 *Harmonie univers-
elle*.

Equal temperament was accepted for fretted string
instruments early in the sixteenth century. Because of
the frets, all semitones had to be equal in order to avoid
false fifths and octaves. Barbour provides tables and a
detailed discussion concerning the problems involved in
the meantone tuning of the lute.\(^ {17}\) After an examination
of a large sample of sixteenth-century lute music, Bar-
bour concludes "... that it seems very probable that
lutes and viols did employ equal temperament from an
early time, perhaps from the beginning of the sixteenth
century."\(^ {18}\) Mark Lindley provides further evidence ex-
tracted from an anonymous essay found among papers be-
longing to Isaac Newton and presently catalogued at the

\(^{16}\) J. Murray Barbour, *Tuning and Temperament: A Histor-
ical Survey*, 2nd ed. (East Lansing, Mich.: Michigan
State College Press, 1953), 45.

\(^{17}\) Ibid., 184-86.

\(^{18}\) Ibid., 188.
Cambridge University Library. The author of the essay, who is advocating the use of just intonation for fretted string instruments, recognizes that the change from equal temperament to just intonation cannot be easily accomplished because

to play upon a new tuning when a man has been all his lifetime accustomed to another that is different from it, is a difficulty that will sacrifice all the rational interests of musick to a practical resentment.\(^\text{19}\)

Although equal temperament makes possible modulation through all major and minor keys, the attainment of such modulatory freedom is accomplished at the expense of the slightly false tuning of every interval except the octave. The fifths are diminished and the major thirds are sharpened. The thirds, however, are not as sharp as the Pythagorean thirds. The fifths are not as flat as the fifths of meantone temperament. In equal temperament all tones may be used enharmonically and all twenty-four major and minor keys are available.

In spite of the new key resources which equal temperament offered, there was opposition to this temperament from those accustomed with the harmoniousness of the 'good' keys of meantone temperament. (This harmoniousness was a product of the pure major thirds.) The use of equal

\(^{19}\) Cited in Mark Lindley, "Instructions for the clavier diversely tempered," *Early Music* V/1 (January 1977), 18.
temperament in organs was more strongly opposed than its use in stringed keyed instruments due to the nature of mutation and mixture stops. The tonal character of these stops resulted from the blending of pitches derived from separate pipes tuned to pure intervals other than the octave. If these stops were employed on an organ tuned to equal temperament, the simultaneity of the tempered intervals of the unison pipes and the untempered intervals of the mixtures produced harsh sounds considered objectionable by many musicians. One organ builder who persistently refused to use equal temperament in his organs was Gottfried Silbermann. In the words of Ernst Flade, Silbermann refused

... because to him the old practice seemed to have offered better musical advantages. Silbermann did not want to sacrifice the virtues of an old reliable method in favor of the still doubtful advantages of the new one. With the old temperament there was one wolf, certainly a bad one; with the new one, on the other hand, there was a 'whole nestful' of young wolves and, in addition, all kinds of buzzy and scratchy noises, especially with the narrowly scaled stops.20

That opposition to equal temperament maintained strength for some time is illustrated by the rather late employment of a mechanism known as the transposing keyboard--a

mechanism which produced results equivalent to those accomplished by split keys. An example of a transposing instrument is found in the Foundling Hospital in London. This organ, built in 1768, featured a special mechanism which, when put into use, made available the chromatic tones not ordinarily tuned. Sumner writes that

On the left hand of the player were three knobs, one for each manual, working in horizontal slots and controlling the notes C♯, D♯, D# and E♭. Similarly there were three knobs on the player's right controlling the notes G♯, A♯, A# and B♭. Each of the six slots had three places of rest. The central (or normal) position 'set' the pipes for C♯, E♭, G♯ and B♭. By moving the left-hand knobs to the extreme left D♯ was substituted for E♭, whilst by moving it to the extreme right D♭ was substituted for C♯. In the same way, by moving one of the knobs on the right hand G♯ would become A♭, or B♭ could become A#.21

Thus far only two temperaments—meantone and equal—have been discussed, however, other temperaments were also practiced. These additional temperaments may be classified as either regular or irregular tuning systems—systems, defined in the nineteenth century, in which all fifths or all fifths but one are the same size, or in which the fifths are of various sizes, respectively. In each of the regular tuning systems the fifth is flattened by varying fractions of the syntonic comma. Possibly the

most well-known of these temperaments is that employed by Gottfried Silbermann in which the fifth is flattened by one-sixth of the syntonic comma, causing the major third to be slightly sharp. Praises of the Silbermann temperament were accompanied by some condemnations—the greatest of which appeared in Georg Andreas Sorge's 1748 _Gespräch zwischen einem Musico theoretico und einem Studioso musices_ in which Sorge states that

> In a word, Silbermann's system of temperament cannot be maintained under the conditions of present-day practice. ... It is therefore to be wished that that superior man Silbermann, who has acquired so much honor and fame, as well as a good bit of money, with his excellent art, should change his mind about temperament, improve his otherwise beautiful and well-constructed organs in respect to temperament, and thus add to his fame the very important portion which is still lacking to it. ... 22

George Sargent, in a 1968 issue of _Clavier_, writes that in the one-sixth comma meantone temperament it was

> ... possible for the five chromatics to be used as their enharmonic equivalents with results that are merely painful rather than excruciating. ... 23


Barbour believes that

Silbermann's temperament of 1/6 comma for the fifths is the most significant for us, because he represents the more conservative practice during the time of Bach and Handel. In his temperament the thirds are slightly sharp, but the wolves are almost as ravenous as in the Aron 1/4 comma system.24

Of the irregular tuning systems, Mark Lindley writes that they

... played an important role in the development of harmonic style and modulation during the late-17th and 18th centuries. In France they seem to have emerged during the 17th century via a misunderstanding of instructions for a regular meantone tuning, whereby two 5ths B♭-B♭-F were tempered larger than pure rather than smaller. (The misunderstanding evidently pivoted on Mersenne's ambiguous statement that B♭ should be tuned 'strong' to F and likewise E♭ to B♭.)25

Another modification of meantone temperament, in fact the one considered by Barbour to be the simplest, is that in which the 'wolf' fifth of meantone temperament is divided

... equally between the fifths C♯-G# and G# (A♭)-E♭... . This is the modification generally, but erroneously, ascribed to Schlick, and, according to Ellis, still in use in England in the early nineteenth century.26

26. Barbour, Tuning and Temperament, 133.
Among the irregular systems of tuning are those temperaments which have come to be called 'good' or 'circulating.' In the words of Barbour

... the whole intent of having a 'circulating' temperament, of having the octave 'well tempered,' was to have greater consonance in the keys most used than in those more remote.27

One of the most well-known personalities associated with 'circulating' temperaments is Andreas Werckmeister (1645-1706), who has long been mistakenly considered as an advocate of equal temperament. For example, Schweitzer writes in his Bach biography that Werckmeister "... divided the octave into 12 equal semitones, none of which was quite true."28

Werckmeister, indeed active in the temperament controversies, produced three writings on this subject. The earliest of the three was the "Musicae Mathematicae Hodges Curiosus," published in 1686 with a second edition in 1698. The second was the "Musikalische Temperatur," published in 1691, and the third the "Hypomnemata musica oder musikalisches Memorial," published in 1697. An enlarged edition of the third work appeared in 1698 and

27. Ibid., 157.

there were also two other editions, one undated and one
dated 1715. The subject of temperament also appeared in
the appendix of Werckmeister's 1698 thorough-bass treatise
titled

Die nothwendigsten Anmerckungen und
Regeln und der Bassus continuus oder
General-Bass wohl konne tractiret
werden, und ein jeder, so nur wenig
Wissenschaft von der Music und Clavier
hat, denselben vor sich erlernen konne,
&c. ('The most necessary notes and rules
as to how a Bassus Continuus or Thorough-
Bass, may be treated, and how any one
who has but little knowledge of Music
and keyed instruments may learn it for
himself', &c.) . . . 29

According to F. T. Arnold, the temperament here described

. . . is a form of unequal temperament
in which all the major Thirds are
slightly sharp (especially #g and #d),
while most of the Fifths are slightly
flat. 30

Werckmeister devised three temperaments which he termed
'correct.' In the first and third the comma is divided
into four parts. In the first the comma is "... di-
vided equally among the four fifths C-G, G-D, D-A, and
B-F#," 31 while in the third "... five fifths (D-A, A-E,

29. F. T. Arnold, The Art of Accompaniment from a
Thorough-Bass as Practiced in the XVIIth & XVIIIth

30. Ibid., 204fn.

F♯-C♯, C♯-G♯, and F-C) are flattened by 1/4 comma, and one fifth, G♯-D♯, is raised by the same amount. 32 (This third temperament is the one described in the thorough-bass treatise.) The second, in which the comma is divided into three parts, "... contains five fifths flat by 1/3 comma, two fifths sharp by 1/3 comma, and only five perfect fifths. ... This is the poorest of the three temperaments Werckmeister called 'correct.' 33 The term 'wohltemerirte' is employed by Werckmeister in his "Musica Hodegus Curiosus." Included in this work is a description—an inaccurate description—of equal temperament supposedly written by a theologian who based his findings on the holy scriptures. Following the description, Werckmeister writes the following:

I have hitherto not been able to approve of this idea [of equal temperament], because I would rather have the diatonic keys purer, so that the genus that is most used would be the purer. 34

Obviously, 'well-tempered,' as used by Werckmeister, is not synonymous with 'equally tempered,' but represents

32. Ibid.
33. Ibid., 159.
a temperament in which those keys requiring many flats and sharps are not as consonant as those requiring few flats and sharps.
CHAPTER V

BACH AND TEMPERAMENT

Bach, as Werckmeister before him, has been considered an advocate of equal temperament. Questions concerning Bach's reported advocacy will here be explored. Comments concerning Bach and temperament of particular interest are those originating from the generation preceding Bach.

In Bach's obituary—reportedly written by Carl Philipp Emanuel Bach with the help of Johann Friedrich Agricola (a pupil of the elder Bach), and published in Mizler's Musikalische Bibliothek—is found the opinion that

In tuning of harpsichords he [Bach] achieved so correct and pure a temperament that all the tonalities sounded pure and agreeable. He knew of no tonalities, because of impure intonation, one must avoid.¹

Bach's 'pure temperament' is referred to again in 1782 by Johann Samuel Petri in the introduction to the second edition of his Anleitung zur praktischen Musik. In the

course of this introduction—which functions as a brief history of music—Petri conveys the following opinion:

If the composers previously mentioned had not made a pure temperament necessary enough, then the Leipzig Bach, with his deeply thoughtful and unexpected passages into hitherto wholly unused keys, made it quite indispensable. For now it was seen that the best keyboard instruments were unusable on account of their impure tuning; even the beautiful organs by Silbermann were wrongly tuned.  

The term 'pure temperament' is, in itself, a contradiction, for if a tuning system is tempered then it is no longer 'pure.' From its use in context, the term presumably represents a temperament in which all keys are available.

Bach's initial biographer, Johann Nicolaus Forkel, makes no use of the term 'equal temperament.' Forkel's reference to Bach's tuning system is made in association with the composer's reforms of fingering practices. In Bach's day and in preceding times, the thumb was seldom used by performers of keyboard instruments. Fingering practices in which the thumb did not have an active role were usable for the performance of music composed in keys requiring few flats and sharps, however, changes in musical practices inevitably caused changes in fingering.

2. Excerpt from (Johann Samuel) Petri's 1782 Anleitung zur praktischen Musik translated in David and Mendel, Reader, 452.
practices. In 1753, Carl Philipp Emanuel Bach commented on this subject of fingering as follows:

My late father told me about having heard great men in his youth who did not use the thumb except when it was necessary for large stretches. Since he lived at a time in which there gradually took place a quite remarkable change in musical taste, he was obliged to think out a much more complete use of the fingers, and especially to use the thumb (which apart from other uses is quite indispensable especially in the difficult keys) in such manner as Nature, as it were, wishes to see it used. Thus it was raised suddenly from its former idleness to the position of the principal finger.3

Forkel's association of Bach's fingering reforms to changing musical practices partially reads:

Before his [Bach's] time and in his younger years, it was usual to play rather harmony than melody, and not in all the 24 major and minor keys. As the clavichord was still gebunden, which means that several keys struck a single string, it could not be perfectly tuned, people played therefore only in those keys which could be tuned with the most purity. Through these circumstances it happened that even the greatest performers of that time did not use the thumb till it was absolutely necessary in stretches. Now when Bach began to unite melody and harmony so that even his middle parts did not merely accompany, but had a melody of their own, when he extended the use of the keys, . . . .

3. Translated in David and Mendel, Reader, 254.
and learned to tune his instrument so that it could be played upon in all the 24 keys, he was at the same time obliged to contrive another mode of fingering, better adapted to his new methods, and particularly to use the thumb in a manner different from that hitherto employed. 4

A late nineteenth-century Bach biographer, Philipp Spitta, makes a similar association and comments that the composer's reforms of fingering practices were

... indispensable to Bach, if for this reason only: that he was accustomed to play on equal temperament, and could therefore avail himself indifferently of all twenty-four keys. 5

Bach left no tuning rules. However, in 1776, Friedrich Marpurg quoted J. P. Kirnberger as having commented that while he was under Bach's instruction, he was told to "... tune all the major thirds sharp ... ." 6

This statement has become, for some, documentation that

4. Johann Nicolaus Forkel, On Johann Sebastian Bach's Life, Genius, and Works (1802), trans. A. C. F. Kollmann [?] (1820), reprinted in David and Mendel, Reader, 309. Forkel's mistaken opinion that a gebunden clavichord could not be tuned in equal temperament is acknowledged in a footnote by David and Mendel.


6. Translated in David and Mendel, Reader, 261.
Bach did, indeed, employ equal temperament. Spitta, for instance, writes that Bach was the

... master of the method of tuning which is now universally followed. It is express-
ly stated that he took all the major thirds sharp ... .

Similarly, Helmholtz writes that Bach employed equal tem-
perament

... for the clavichord (clavier), as we must conclude from Marpurg's report of Kirnberger's assertion that when he was a pupil of the older Bach he had been made to tune all the major thirds too sharp.

Sharp major thirds do not, however, necessarily indicate equal temperament. For instance, Silbermann—an ardent opponent of equal temperament—employed sharp major thirds in his tuning system. It is not, therefore, the presence of sharp major thirds that indicates equal temperament, but the degree of their sharpness.

The statement has been made that while Bach may have advocated the use of equal temperament on stringed key-
board instruments, he may not have advocated its use on

7. Spitta, Bach, II, 42.

8. Hermann L. F. Helmholtz, On the Sensations of Tone as a Physiological Basis for the Theory of Music, 2nd ed., rev., trans. from 4th German ed. (1877) and ed. Alex-
organs. N. Lindsay Norden, in an article in The Musical Quarterly, writes that

There is no record that Bach ever played on an organ in equal temperament, although he recommended such temperament for keyboard stringed-instruments. . . . 9

The conclusion that "... Bach could not have used the meantone tuning for the organ"10 is made by J. Murray Barbour, who, after studying 148 Bach organ works, finds that of these

. . . only 15 lie completely within the E-flat-G-sharp compass, 12 of these being chorale preludes in the Orgelbüchlein. Only one in ten would be playable on the conventionally tuned organ, or only one in thirty-four if we exclude the Orgelbüchlein! 11

(Mention should here be made of a modulatory piece titled "Kleines harmonisches Labyrinth"12 which appears in the Bach-Gesellschaft edition as a work whose authenticity is not guaranteed. Dubious authorship of this piece is


11. Ibid., 81. By the phrase 'E-flat-G-sharp compass,' Barbour is referring to the limitations of meantone temperament to keys requiring no more than two flats or three sharps.

also suggested by Spitta,13 and Apel, in the Harvard Dictionary of Music, offers Heinichen as the possible composer.14 Franklin S. Miller writes that another piece mistakenly assigned to Bach is one composed by Heinichen and included in his Der Generalbass in der Composition with the title "Fantasie durch alle Tonarten gehend." As explained by Miller, the piece, though incorrectly titled, ". . . , does begin in A minor and modulates through twenty-two of the twenty-four major and minor tonalities, . . . ."15 According to Spitta, this piece is assigned to Bach in a manuscript in the Royal Library at Berlin.16

Meantone and equal temperaments were not the only temperaments practiced in the eighteenth century. Bach

13. Spitta, Bach, II, 43.


was acquainted with the Silbermann temperament, for he is reported to have played on two of Silbermann's organs—one at the Sophien-Kirche (1731)\textsuperscript{17} in Dresden and the other at the Frauen-Kirche (1736)\textsuperscript{18} also in Dresden. According to Ernst Flade, Bach, at the time of his performance at the Frauen-Kirche, is said to have patted him [Silbermann] on the back and said: 'Your organs are excellent. You are rightly called Silbermann, for your organs have a silver tone and thundering basses. Just keep on.'\textsuperscript{19}

Conflicts arise between Bach's presumed satisfaction with the Silbermann organs and the comment by Petri that in comparison with Bach's 'pure temperament' the organs of Silbermann were 'wrongly tuned.' No mention of tuning is made in the report of the 1746 examination of the organ of St. Wenceslas' Church in Naumberg signed by both Bach and Silbermann.\textsuperscript{20} In the 1716 report of the examination of the organ of the Church of Our Lady at Halle filed jointly by Johann Kuhnau, C. F. Rolle (organist at Quedlinburg) and Bach is found the suggestion to the organ builder Christoff Cuncius, "... to adopt the system of

\begin{enumerate}
\item[17.] David and Mendel, \textit{Reader}, 226fn.
\item[18.] \textit{Ibid.}, 151fn.
\item[19.] Translated in David and Mendel, \textit{Reader}, 289-90.
\item[20.] 1746 organ report translated in David and Mendel, \textit{Reader}, 174.
\end{enumerate}
passably good temperament ... "21 ("... passable, guten Temperatur ... "22). It is not unreasonable to think that Bach, in an effort to make more keys available than were available in strict meantone tuning, deviated from this temperament, but not so much that the thirds which he tuned were so far from being 'pure' that they were objectionable when a mixture stop was put into use.

Understandably, many of the comments made concerning Bach and temperament are based upon the use of the twenty-four keys in the Well-Tempered Clavier. Charles Sanford Terry, in his biography of Bach, considers the collection as Bach's

... conclusive contribution to the controversy raging round the tuning of the clavichord, which this collection of preludes and fugues in every key, major and minor, settled in favour of equal temperament, against the traditional preference to tune a few keys perfectly and neglect the others in which accurate intonation could not be obtained.23

Terry's opinion is reiterated in his book The Music of Bach:

21. 1716 organ report translated in David and Mendel, Reader, 73.


An Introduction in which he writes that

Bach's purpose in composing the Well-Tempered Clavier was to demonstrate the practicability of 'equal temperament' by providing pieces in every key, major and minor, for the clavier tuned on that principle. 24

Barbour brings to our attention that the proper German phrase for equal temperament is

... die gleichschwebende Temperatur, the equally beating temperament. Since the verb temperieren is frequently used with the broader meaning of 'to tune' rather than 'to temper', Bach's title might be paraphrased, The Well-Tuned Clavier. 25

Continuing, Barbour acknowledges the work of Simon Stevin, a Flemish mathematician, who, more than one hundred years before Bach's 1722 compilation of preludes and fugues,

... referred to een welgestelde Clavecengel, a well-tuned harpsichord, as proof that semitones are equal. He did not imply that 'well-tuned' and 'equally tempered' were synonymous terms, but rather that a careful tuning would result in equal temperament. Bach's great French contemporary, Rameau, expressed a similar thought: if one were to follow his practical tuning rules, the harpsichord would be well tuned, i.e., tuned equally.26


26. Ibid., 67-68.
Here may be taken into account George Sargent's comments that in the tuning of one-sixth comma meantone temperament (Silbermann's temperament)

The letter of the law . . . would involve considerable beat counting (for example, something like 6.924 beats-per-second in tuning E to middle C). . . . The spirit of the law would be to discover just how wide a third can be stretched before it loses all the benefits of its pure sound, and then to adjust the size of the fifth accordingly to yield for equally-dissonant fifths between the notes of the third selected.27

This is not to imply that one tuning is one-sixth comma meantone and the other only an approximation of it. Similarly, even if Bach, in the words of C. P. E. Bach, "... 'was never a friend of dry mathematical stuff,'"28 this is not to say that he could not have employed equal temperament. Mattheson, in his 1731 Grosse General-Bass-Schule, wrote that

It is not the very aim and chief concern of music that the twelve half-tones be of equal size; rather, it is that they all strike the ear sweetly, pleasingly, and clearly, each in its own way, whether large or small. If equally divided intervals do this, then all the better--


so long as the goal is attained. Hereabouts, we are not as yet aware that this is the case—nor in England, France, and Italy.

Meanwhile the scala which we already find occasionally on our harpsichords, though it may not be so perfect as we might wish, can still pass and be tolerably accepted by the ear in all twenty-four tonalities. 29

It is true that Bach frequently composed in those keys requiring few flats and sharps in their signatures.

In the words of Barbour

Except for the Well-Tempered Clavier, Bach's choice of keys for the clavier is restricted. In fact, as far as tonalities in clavier music go, he is very much the child of his age, an age in which Heinichen said: "Nowadays, we play but rarely B major and A-flat major, and pieces are never set in F-sharp major or C-sharp major." Mattheson, too, giving figured-bass exercises in all twenty-four keys, said that he had never previously seen a piece in E-flat (or D-sharp) minor, and that G-sharp (or A-flat) minor, and E-flat and A-flat major were very rare, although B-flat minor was more familiar. This choice of keys was not dictated solely by restrictions imposed by the meantone temperament; for B-flat minor would be very unsatisfactory in it, and so would B major and other keys that Mattheson said were not uncommon. 30


Barbour's paraphrasing of Mattheson's comments are clarified by the translation of Mattheson's explanations of the keys in his twenty-four 'Test-Pieces.' Taken in the order presented by Barbour, the keys are explained as follows:

**E-flat (or D-sharp) minor**

**Fourteenth Test-Piece**

I quite readily admit that in my time I have seen no piece written in this key, but to him who wants to know it I shall manifestly prove that there is no chord or no progression here which is so rare that it cannot be found frequently and daily in other pieces.31

**G-sharp (or A-flat) minor**

**Sixteenth Test-Piece**

Here appears a short example in the minor key of G-sharp (or A-flat minor) which should certainly loom large enough before many a one who has never seen--much less played--such a piece.32

**E-flat major**

**Eleventh Test-Piece**

To most people, the beautiful, majestic key of D-sharp is still not quite right for head or fist, though very many pieces appear in it. Why this? Our Toccaten and Praeludia, have nothing in D-sharp among them; our fugues for the [church] year still less;

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no chorale is ever set in D-sharp, that is to say, from the beginning; our organs and harpsichords do not all have the proper tuning—especially is the first of these lacking in this respect. Finally, our bellows treader do not tread in this key. Nevertheless, I have wanted to see whether or not something good can be made in the honest key of D-sharp and see it worked well.33

A-flat major
Twelfth Test-Piece

In order that the supposed rarity of A-flat major will terrify no one or bring a halt to his labor, I have devised the bass as simply and easily as possible . . . .34

B-flat minor
Fifteenth Test-Piece

It is a key in use, indeed, and it is better known than the preceding one [E-flat (or D-sharp) minor], though I doubt if this makes the example any easier.35

B major
Twenty-first Test-Piece

B major is otherwise a key which is used quite often, but it does have modulations which cannot possibly be handled if one is not firmly grounded in the other, less-used tonalities.36

33. Ibid., II, 48-49. The test piece is notated in E-flat major. In a footnote, Reddick states that "Despite the presence of E-flat in the vocabulary, Es, Mattheson and others of the time adhered to this key as D-sharp, Dis."

34. Ibid., II, 53.

35. Ibid., II, 68.

36. Ibid., II, 91.
Of those keys not mentioned by Barbour, is F-sharp minor which is referred to as a "... somewhat capricious key ..."\(^{37}\) In the explanation for the Twenty-third Test-Piece in C-sharp minor, Mattheson writes that

> Though it would seem difficult to find many pieces in the key of C-sharp minor, such a key appears often in F-sharp minor and major, in A major, E major, and in other common modes; who, then, objects to writing in this key?\(^{38}\) C-sharp major, the key of the final Test Piece, is described by Mattheson as one "... which might seem far too difficult to many a person who is to improvise on it or, as one says, to play it sight unseen."\(^{39}\)

Two examples of Bach's use of remote keys in clavier works, given by Barbour, are

> ... the second Passepied of his so-called Overture in French Style, which might better be called Partita in B minor. The first Passepied is of course in B minor, and the trio uses the tonic major, B major, a very common practice. The other example is a second Minuet in E-flat minor, from a Suite in E-flat major (not one of the French Suites).\(^{40}\)

We may recall that Preludes 3 and 8 in the Well-Tempered Clavier, composed in C-sharp major and E-flat minor,

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respectively, originally appeared (in the same keys) in Wilhelm Friedemann's *Clavierbüchlein*. From his study of Bach's clavier works, Barbour concludes that

... only 22 of 183 pieces examined lie entirely within the E-flat-G-sharp compass, 8 of these in the Little Preludes. That means that about one in eight could have been played on the clavier as commonly tuned, or about one in twelve if we exclude the Little Preludes. But 54 more do not exceed in compass a circle of fifths, and might have been played in a flat or sharp meantone tuning, ... Thus more than one-third of Bach's clavier works did not need a 'well-tempered' clavier for their effective rendition, and the proportion is still higher if we reflect that often the more remote accidentals occur simply as passing notes or in seventh chords or other dissonant combinations where careful tuning is less important than in sustained triads.41

From the information provided, we may assume with some assurance that Bach did not use meantone temperament. The infrequent use of the keys requiring many flats or sharps by Bach may indicate that in his temperament these keys were somewhat disagreeable in comparison with those requiring few flats or sharps, i.e., C-sharp major would not be as 'in tune' as C major. The opinion offered by David and Mendel that Bach "... probably was in favor of reasonably equal temperament on the organ

as well as on the clavier⁴² best explains this temperament in which some inequality of consonance, or dissonance, existed among the twenty-four keys.

⁴². David and Mendel, Reader, 290.
CHAPTER VI

CONCLUSIONS

Fischer's *Ariadne musica*—first published in 1702—and Bach's *Well-Tempered Clavier*—compiled in 1722—are both collections of paired preludes and fugues composed in major and minor keys in ascending arrangement. The collections appeared at the time during which the discussion of temperament reached its peak. While both collections are related to this discussion, their associations with it differ.

The title of the Fischer collection makes no reference to temperament. Rather, *Ariadne musica* refers to the heroine of a Greek legend who offers to her beloved a guide through a dangerous labyrinth. This collection was intended as a guide through the 'labyrinth' of keys with which keyboard performers would encounter. The keys employed by Fischer were the keys used by composers of his generation, including keys requiring more flats and sharps than the keys most used in previous generations. The organization of Fischer's *Ariadne musica*, therefore, was primarily determined by pedagogical considerations.
On the other hand, the title of the Bach collection is a direct reference to temperament and to the specific type of temperament intended. The collection consists of preludes and fugues in all twenty-four major and minor keys arranged in ascending chromatic order. Within the individual pieces of the collection, most especially within the fugues, occurs generous use of modulation, including modulation to remote keys. Thus, the *Well-Tempered Clavier* is an endorsement of the idea of equal temperament, and a demonstration of its feasibility and of the unique advantages which its employment provides.
BIBLIOGRAPHY

Books


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BIBLIOGRAPHY (Cont'd)


BIBLIOGRAPHY (Cont'd)


**Articles**


BIBLIOGRAPHY (Cont'd)


Unpublished Materials

BIBLIOGRAPHY (Cont'd)


Editions of Music


BIBLIOGRAPHY (Cont'd)

Naumann, Ernst, ed. Orgelwerke (Dritter Band), [1891],
Vol. XXXVIII of Johann Sebastian Bach's Werke, 46
vols. (Leipzig, 1851-99), reprint ed. Ann Arbor,

______. Orgelwerke (Vierter Band), [1893], Vol. XL of
Johann Sebastian Bach's Werke, 46 vols. (Leipzig,
1851-99), reprint ed. Ann Arbor, Mich.: J. W. Ed-
wards, 1947.

Werra, Ernst V., ed. Johann Kaspar Ferdinand Fischer
Saemtliche Werke fuer Klavier und Orgel (Leipzig,
[1901]), reprint ed. New York: Broude Brothers