Octave-species and key: A study in the historiography of Greek music theory

Eugene Enrico

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OCTAVE-SPECIES AND KEY: A STUDY IN THE
HISTORIOGRAPHY OF GREEK MUSIC THEORY

By

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B. Mus. University of Montana, 1966

Presented in partial fulfillment of the requirements for the degree of

Master of Arts

UNIVERSITY OF MONTANA

1966

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AUG 15 1966

Date
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INTRODUCTION

All that is conjectured today about ancient Greek music theory is based on extremely scanty evidence. There are only eleven relics of Greek music, some of which are fragmentary. The rest of what is known comes mainly from the writings of two theoreticians: Aristoxenos, who wrote his treatise, the *Harmonics*, around 330 B.C., and Ptolemy, who wrote his treatise, also called the *Harmonics*, around 100 A.D. The questions that the relics and the writers suggest, however, far outnumber those that they answer. According to Curt Sachs,

the main trouble is the impossibility of aligning the facts in chronological order: admittedly or otherwise the ancient authors drew knowledge and opinions from sources antedating their own epochs by generations and even centuries and mingled them carelessly with contemporaneous ideas.

This fatal confusion of times, men, countries, and styles has mixed up terminology. Words like *harmonia*, *eidos*, *tonos*, *tropos*, *systema* were anything but clean-cut and are misleading rather than helpful. As a consequence, the historiography of Greek and Roman music has been particularly exposed to misinterpretation.¹

As Sachs has pointed out, the words *harmonia* and *tonos* are especially confusing. The ancient theoreticians used the terms almost interchangeably to denote two different concepts, "key," and "octave-species."

Although most historians have interpreted either or both of the Greek words as a third concept, "mode," Otto Gombosi convincingly suggests that "mode" is a medieval concept denoting an octave segment of a diatonic system which has a final tone and at least one more tonal focus, and that the Greeks probably knew no such modes. Although the vagueness of the sources makes it impossible to prove Gombosi's theory, his definition

of the concept "mode" helps to distinguish it from the concepts "key" and "octave-species" as they will be used in this paper.

The Greek concept of "key" is much like the modern concept in that it is an organization of tonal material with a definite structure and sequence of intervals, and with fixed focal points serving as final tone, keynote, tonic, and the like. Although the compass or ambitus of modern keys is theoretically infinite, the Greek concept of key is coupled with that of the tone system and has a more or less rigidly defined ambitus. The Greek "octave-species" are different octave segments of a diatonic system, such as

\[
\begin{align*}
e & f & g & a & b & c' & d' & e' \\
d & e & f & g & a & b & c' & d' \\
c & d & e & f & g & a & b & c', \text{ etc.}
\end{align*}
\]

It is important that both concepts be carefully defined so that they can be easily identified in the various interpretations of Greek music, even when labeled with different names.\(^2\)

Since before the first century A.D., scholars have suggested interpretations of the concepts key and octave-species, involving the number of keys and species, the organization of the two concepts, the relationship of the keys to one another, of the species to one another, and of the keys to the species, and the equation of both concepts to the "modes." But because of the vagueness of the sources, the interpretations of these scholars have been not only contrasting, but even contradictory. For instance, Cleonides (c. 50 A.D.) discusses a system of thirteen keys, while Aristides Quintilianus (c. 100 A.D.) discusses a system of fifteen.

---

John Wallis in the seventeenth century presents a system of seven keys, each on a different pitch, and each with seven octave-species, totaling forty-nine octave-species. Sir Francis Haskins Eyles Stiles, on the other hand, says, a century later, that there was a total of only seven octave-species and that the seven keys were all on the same pitch but were constructed with different intervals. Bontempi, also in the seventeenth century, says that the octave-species were synonymous with "the Greek modes." But D. B. Monro, in the nineteenth century, says that the keys were synonymous with the "modes." Since Monro, no significantly new interpretations or definitions have been advanced, with the exception of Gombosi's previously mentioned rejection of the concept "mode." Instead, historians have relied primarily upon one or more of the aforementioned opinions.

Unfortunately, the vagueness of the sources makes it impossible to either support or refute any of the interpretations with certainty. Therefore, one may well ask which of the interpretations, if any, is most frequently discussed and/or endorsed by recent music historians and why it has been championed most frequently.

Each of the following chapters will explain the interpretation of one of the previously mentioned scholars along with a discussion of twentieth century historians who have referred to the interpretation. The historians include Otto Gombosi, a Hungarian musicologist now at the University of Chicago, who has done valuable research into the music theory of antiquity and the early middle ages; Isobel Henderson, a tutor in Ancient History and a Fellow of Somerville College, Oxford, who is author of "Ancient Greek Music" in the New Oxford History of Music; Gustave Reese, an American musicologist at New York University who is
author of the outstanding monograph *Music in the Middle Ages*; Curt Sachs, a German musicologist and authority on ancient music who was at New York University from 1939 until his death in 1959; Matthew Shirlaw, a Scottish composer, keyboard instructor, and theorist at the University of Edinburgh; Reginald Pepys Winnington-Ingram, professor of Greek language and literature in the University of London and director of the Institute of Classical Studies since 1964; and Harry Ellis Wooldridge, an English musical scholar of medieval music who was Slade professor of fine arts at Oxford before his death in 1917. These historians have been chosen because they all present thorough and scholarly discussions of the two terms.

Unfortunately, because of the verbal confusion in the ancient writings, even some of these historians have used the confusing terms *tonos* and *harmonia* and the inappropriate term "mode" as labels for the precise concepts "key" and "octave-species". In the following pages, whenever the original terminology is inappropriate or confusing, the labels have not been held sacred, and the more precise terms "key" and "octave-species" have been substituted and enclosed in brackets.
CHAPTER I

THE INTERPRETATION OF CLEONIDES

One of the first scholars to discuss the octave-species and keys of ancient Greek music was himself a Greek. His treatise, the *Eisagoge*, appeared in a Latin translation by Georgius Valla printed in Venice in 1497. Therefore Renaissance musicians used Cleonides as one of their principal sources of information about ancient Greek music. Because he does not mention the *Hyperaeolian* and *Hyperlydian* in his discussion of the keys, the French translator Ruelle concludes that he lived before the time of Aristides Quintilianus who probably lived in the first century A.D., and who first mentioned the two additions to the Aristoxenian system. Since this also indicates that he lived before the time of Ptolemys (second century A.D.), it is not surprising that his treatise discusses only the writings of Aristoxenos and acts as a compensation for that part of the Aristoxenian writing which has been lost.3

In the *Eisagoge*, Cleonides discusses both the octave-species and the keys. To fully understand his explanation of the octave-species, however, one must first understand the Greater Perfect System or systema teleion. First described by Euclid in the fourth century B.C., the Greater Perfect System consists of a double octave usually written from a' to A: \[\text{\textcopyright}^{3/2} \text{\textcopyright}^{3} \text{\textcopyright}^{3} \text{\textcopyright}^{3}\]. Although the double octave a' to A is usually chosen since the intervals of the Greater Perfect System can be notated without flats or sharps, most scholars now agree that the actual pitch of the

---

Greater Perfect System was about a minor third lower: f'\# to F\#. These two octaves are organized into tetrachords called hyperbolaion, diezeugmenon, meson, and hypaton, with the exception of the lowest A, which is called the proslambanomenos, and is not included in any tetrachord. The notes of the system within the tetrachords are named:

Figure 1. The Greater Perfect System

diezeugmenon

a' Nete Hyperbolaion

g' Paranete Hyperbolaion

f' Trite Hyperbolaion

e' Nete Diezeugmenon

d' Paranete Diezeugmenon

c' Trite Diezeugmenon

b Paramese

a Mese

g Lichanos Meson

f Parhypate Meson

hypaton

e Hypate Meson

d Lichanos Hypaton

c Parhypate Hypaton

B Hypate Hypaton

A Proslambanomenos

It should be noted that with the exception of the meson and the diezeugmenon, each pair of tetrachords is conjunct. 4

4Sachs, op. cit., pp. 222-223.
Cleonides describes the octave-species as segments of the Greater Perfect System. Because semantics are especially important to this study, Cleonides himself continues the explanation:

Of the diapason there are seven species. The first...is that in which the tone is at the top; it extends from the hypate hypaton to paramese and was called the Mixolydian by the ancients.
The second...is that in which the tone is second from the top; it extends from the parhypate hypaton to trite diezeugmenon and was called the Lydian.
The third...is that in which the tone is third from the top; it extends from the lichanos hypaton to parnete diezeugmenon and was called the Phrygian.
The fourth...is that in which the tone is fourth from the top; it extends from the hypate meson to nete diezeugmenon and was called Dorian.
The fifth...is that in which the tone is fifth from the top; it extends from the parhypate meson to trite hyperbolaion and was called Hypolydian.
The sixth...is that in which the tone is sixth from the top; it extends from the lichanos meson to parnete hyperbolaion and was called Hypophrygian.
The seventh...is that in which the tone is at the bottom; it extends from the mese to nete hyperbolaion or from the proslambanomenos to mese and was called common or Locrian or Hypodorian.5

This explanation is quite lucid with the exception of the phrase: "in which the tone is second/third, fourth, etc. from the top." By this Cleonides must mean that each of the species includes only seven notes, and that when he says, for instance, that the Lydian extends from the parhypate hypaton to trite diezeugmenon, he literally means to, and therefore does not include the trite diezeugmenon. Cleonides' phrase illustrates the confusing use of terminology typical of ancient writings. Although here, by "tone" Cleonides means "keynote," he later uses "tone" to mean "key." Since the key-note of the Greater Perfect System is that

---

5 Strunk, op. cit., pp. 41-42.
of the proslambanomenos, the ἰς ἐκαθορισμένος, and the ὑπερβολαίων (the note A in the explanation of the Greater Perfect System), the "tone" is at the top in the Mixolydian species, the "tone" is second from the top in the Lydian species, and so on.

Cleonides also outlines a system of keys which he calls τόνοι or tones. He says, "We use the word 'tone' to mean the region of the voice whenever we speak of Dorian, of Phrygian, or Lydian, or any of the other tones." He adds that the notes within each tone are identified by the same names as the notes of the Greater Perfect System, and

According to Aristoxenos there are thirteen tones: Hypermixolydian, also called Hyperphrygian; Two Mixolydians, a higher and a lower, of which the higher is also called Hyperiastian, the lower Hyperdorian; Two Lydians, a higher and a lower, of which the lower is also called Aeolian; Two Phrygians, a higher and a lower, of which the lower is also called Tastian; One Dorian; Two Hypolydians, a higher and a lower, the latter also called Hypoaolian; Two Hypophrygians, of which the lower is also called Hypoiastian; Hypodorian.

Of these the highest is the Hypermixolydian, the lowest the Hypodorian. From the highest to the lowest, the distance between consecutive tones is a semitone. The Hypermixolydian is a diapason above the Hypodorian.

This system of keys can most easily be understood with a diagram. If the lowest tone, the Hypodorian, is placed at A, to correspond with the lowest note of the Greater Perfect System, the tones may be represented by modern key signatures, here accompanied by their key-notes.

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6Ibid., p. 44.
In summary, Cleonides presents a system of thirteen keys, one on each semitone with an added octave. He also discusses seven octave-species using the same names as seven of the keys. He mentions the octave-species and the keys separately in his treatise, and explains no connection between the two concepts.

One of the twentieth century historians who mentions the concepts of octave-species and key as explained by Cleonides is H. E. Wooldridge. He presents the same set of species but then goes on to explain that the seven species "had been applied not only to the diatonic but also to the enharmonic scale...." This statement can be understood after a brief explanation of the Greek genera.

The genera are three in number: the diatonic, the chromatic, and the enharmonic. Each of the genera is a set of intervals used to

fill a tetrachord. The diatonic genus consists of tetrachords made up of two whole steps and a half step from top to bottom. The Greater Perfect System, as illustrated above, exhibits tetrachords of the diatonic genus. The chromatic genus consists of tetrachords made up of a minor third and two successive half steps from top to bottom. The enharmonic genus consists of tetrachords made up of a major third and two consecutive quarter tones from top to bottom. In any of the keys one can construct tetrachords or combinations of tetrachords of the three genera:

Figure 3. The Three Genera in the Hypodorian Key

Diaton.  

Chrom.  

Enhar.  

(where "X" before a note means to raise it 1/4 tone)

Notice that only the two inner notes of each tetrachord change: the first and last notes of each tetrachord remain fixed.

When Wooldridge says that there are seven species of the enharmonic scale as well as the diatonic, he implies that the chromatic scale has species as well. In any genus the species are seven in number.

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and will consist of one octave segments of the two octave scale, each one starting one note above the previous one, regardless of the interval.

Wooldridge calls the keys "schemes of transposition" which afforded a method, closely analogous to our own, by means of which all scales might be raised or lowered by any pitch at pleasure; the scale of E for example might be taken on F, F#, G & c., or on D#, D, C#, & c., the system proceeding upwards or downwards by semitones. This change was not effected empirically, but by means of a definite supposed transposition of the whole of the Greater Perfect System to the pitch required, to any semitone, that is to say, contained in the compass of the octave scale; since therefore the octave divided into semitones contained thirteen possible notes it consisted also of thirteen keys of recognized modes of transposition.9

He then presents a table of the Greek keys which corresponds to those described by Cleonides. Wooldridge substitutes the term Ionian for Cleonides' Lastian. He also omits the optional names for some of the keys.10

<table>
<thead>
<tr>
<th>NOTE IN GREEK SCALE</th>
<th>GREEK KEY</th>
<th>MODERN EQUIVALENT KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mese</td>
<td>A</td>
<td>Hyperphrygian</td>
</tr>
<tr>
<td>(semitone)</td>
<td>Hyperionian</td>
<td>G# minor</td>
</tr>
<tr>
<td>Lichanos meson</td>
<td>G</td>
<td>Mixolydian</td>
</tr>
<tr>
<td>(semitone)</td>
<td>Lydian</td>
<td>F# minor</td>
</tr>
<tr>
<td>Parhypate meson</td>
<td>F</td>
<td>Aeolian</td>
</tr>
<tr>
<td>Hypate meson</td>
<td>E</td>
<td>Phrygian</td>
</tr>
<tr>
<td>(semitone)</td>
<td>Ionian</td>
<td>D# minor</td>
</tr>
<tr>
<td>Lichanos Hypaton</td>
<td>D</td>
<td>Dorian</td>
</tr>
</tbody>
</table>


Another twentieth century historian to mention the Cleonidian concepts of octave-species and key is R. P. Winnington-Ingram. He outlines the seven species of the octave using the same terminology as Cleonides. But he sheds additional light on the octave-species when he discusses Cleonides' description of Modulation of System. Winnington-Ingram explains that Modulation of System has been taken to refer to modulation from one octave-species to another. He further explains that Cleonides has defined it as a change from disjunction to conjunction or vice-versa, and therefore transformation of the Greater Perfect System into another system employing different combinations of whole and half steps. He concludes, "but clearly a transitory modulation of this kind, if the melody remains within the same range, will in effect produce a modulation of species...."\(^{11}\)

This discussion of modulation is important since it points out that different arrangement of whole and half steps is one of the primary differences between the species of the octave. This distinction between the octave-species is essential to later interpretations of key.

Winnington-Ingram also acknowledges Cleonides' account of thirteen keys. Later he explains that the terms Aeolian and Ionian (Iastian) are terms that were used several centuries before Aristoxenos. Therefore he protests their use in Cleonides' explanation of the keys: "But in Cleonides...many of the keys have two names, and it is generally (and perhaps rightly) assumed that the first-mentioned are those by which they were known to Aristoxenos; at least that the random use of the epithets Aeolian and Ionian for keys which have no essential connection with the modes of those names is late."\(^\text{13}\)

Although neither Otto Gombosi nor Matthew Shirlaw mentions Cleonides' keys, both mention his octave-species. Gombosi translates Cleonides slightly differently than Strunk in the previously quoted passage when he says that Cleonides does not say that the species were to be found between the respective degrees of the systema teleion \(\text{Greater Perfect System}\); he says only that their intervallic structure, the functional role of their tones, is the same as that of the specified degrees of the systema teleion. It is not said that, for instance, the Mixolydian species extends from the hypate hypaton \(B\) to the paramese \(b\), but that its intervallic structure is the same as that of the Greater Perfect System between the hypate hypaton \(B\) and the paramese \(b\).\(^\text{14}\)

The implications of this translation will become clear after the discussion of some later scholars' writings.

Shirlaw's account of the octave-species is unusual in that he mentions only four species: the Dorian, the Phrygian, the Lydian, and

\(^\text{12}\)\textit{Ibid.}, p. 18.

\(^\text{13}\)\textit{Ibid.}, p. 19.

\(^\text{14}\)Gombosi, \textit{op. cit.}, p. 23.
the Mixolydian. His positioning of the four species corresponds exactly with that of Cleonides.\footnote{15}

**Figure 5. Shirlaw's Species**

\begin{figure}[h]
\centering
\begin{tabular}{c c}
\textbf{Dorian} & \textbf{Phrygian} \\
\includegraphics[width=.4\textwidth]{dorian.png} & \includegraphics[width=.4\textwidth]{phrygian.png}
\end{tabular}
\end{figure}

\begin{figure}[h]
\centering
\begin{tabular}{c c}
\textbf{Lydian} & \textbf{Mixolydian} \\
\includegraphics[width=.4\textwidth]{lydian.png} & \includegraphics[width=.4\textwidth]{mixolydian.png}
\end{tabular}
\end{figure}

Isobel Henderson's explanation of the octave-species corresponds exactly with Cleonides'. She doubts Cleonides' accuracy, however, when she discusses the keys.

In Imperial Roman times a baker's dozen - one on each semitone and a superfluous thirteenth at the octave - was imputed (incredibly) to Aristoxenus. Both the number and the names are too illogical for Aristotle's pupil. The work on tonoi ascribed to him, if genuine, may have been about 'tones.'\footnote{16}

Her last statement probably means that Cleonides was actually outlining a system of pitches, rather than keys, in his discussion of the "tones." But whatever her intent, it is still another example of the confusion of terms, so common in Greek music.

In summary, each of the historians who mention Cleonides' octave-species agrees with his interpretation, with the exception of Shirlaw who discusses only four of Cleonides' seven species. Of those historians who mention Cleonides' keys, both Winnington-Ingram and Henderson critic-


ize his system as illogical. Although Wooldridge discusses the Cleoni-
dean keys without criticism, he does not endorse them but mentions them
merely as one of several historically presented systems.

One of the first things that one notices about Cleonides' system
of keys is that names Dorian, Phrygian, and Iastian are each attached
to three keys with the use of the prefixes hypo- and hyper-. This tri-
adric grouping of the keys has not only been noticed, but has even been
systematized by the next scholar under consideration, Aristides Quinti-
lianus.
Another Greek scholar who discusses the octave-species and keys is Aristides Quintilianus, who lived around 100 A.D. His treatise, On Music, is one of the fullest accounts of Greek music that has been preserved. The first book of the treatise, which deals with the theory of scales, rhythms, and meters, follows in the main tradition of Aristoxenos, but also contains some material derived from other sources. His treatise appeared in a Latin translation in 1652, included in Volume II of Antiquae Musicae Auctores Septem, edited by Meibom.\textsuperscript{17}

Although Aristides' description of the octave-species exactly coincides with that of Cleonides, and therefore will not be discussed here, his description of the keys differs substantially. Aristides seems to agree with Cleonides that each of the keys is a region of the voice, but he adds two keys to the Cleonidean system, the Hyperaeolian and Hyperlydian, and organizes his fifteen keys into three groups, the grave, the mean, and the acute.\textsuperscript{18}

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{figure6}
\caption{The Keys of Aristides}
\end{figure}


\textsuperscript{18} Burney, op. cit., p. 53.
There is a passage on page 23 of Meibom's edition of Volume II that implies something like a connection and relation between the five mean keys and those above and below them. After having enumerated the fifteen keys, Aristides says, "By this means, each key has...its bottom, its middle, and its top, or its grave, mean, and acute."19

This passage seems to imply that each set of three keys was considered closely related, so that the two keys belonging to each of the five mean keys, one a fourth above, and the other a fourth below, were regarded as necessary adjuncts, without which the mean keys were not complete. Upon investigation of this idea, one notices that each grave and acute key has a similar relationship to its mean as that of dominant and sub-dominant keys to the tonic in modern music. This relationship is clear if a list of the fifteen keys of Aristides is com-

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19 Ibid., p. 54.
pared with a list of corresponding keys in present use:

Figure 7. The Keys of Aristides Compared with Present Keys

<table>
<thead>
<tr>
<th>Keys of Aristides</th>
<th>Present Keys</th>
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</thead>
<tbody>
<tr>
<td>fourth below</td>
<td>fourth above</td>
</tr>
<tr>
<td>Hypodorian</td>
<td>principal</td>
</tr>
<tr>
<td>Hypoiastian</td>
<td>Dorian</td>
</tr>
<tr>
<td>Hypophrygian</td>
<td>Phrygian</td>
</tr>
<tr>
<td>Hypoaeolian</td>
<td>Aeolian</td>
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<tr>
<td>Hypolydian</td>
<td>Lydian</td>
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<td></td>
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<td>Fl</td>
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In summary, Aristides' octave-species correspond exactly with Cleonides'. His keys, however, differ in that he adds two to the thirteen of Cleonides and organizes them into five groups of related keys. Aristides, like Cleonides, discusses the octave-species and the keys separately and explains no connection between them.

H. E. Wooldridge makes only a brief reference to the Keys of Aristides. After his discussion of Cleonides' keys he adds, "later two others were added at the upper end of the system, but these, though they

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20 Ibid., pp. 54-55.
may have been found of use practically, possessed no theoretic value, being only repetitions of two already existing. Wooldridge's comment that the additional two keys may have been found of practical use deserves some explanation. Although modern keys are considered to be infinite in their range, the Greek keys as described by Cleonides and Aristides were regions of the voice, which were limited to two octaves. That is to say, each key was a tessitura. Since two new higher tessaturae could conceivably be of practical value, Wooldridge's remark is justifiable.

Isobel Henderson hints that she does not respect Aristides' system of fifteen keys when she says that "a set of fifteen was begotten by a passion for verbal triads (e. g., Hypodorian-Dorian-Hyperdorian)." She also challenges those who accept either Cleonides' or Aristides' systems of fixed pitch-keys.

Those who prefer the hypotheses of fixed pitch-keys have to explain the absence, in Greek writers, of reference to absolute standards of pitch, and, in Greek music, of the conditions which would plausibly account for the development of such standards.... In the present writer's provisional judgement, the arguments for attributing fixed pitch-values to some tonoi are outweighed by the improbabilities.

Winnington-Ingram mentions the fifteen keys of Aristides as well as the triadic grouping, but makes it clear that Aristides himself "says definitely that the Hyperaeolian and Hyperlydian were added by later theorists in order that there might be such a triadic grouping."

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22 Henderson, op. cit., p. 351.
23 Ibid., p. 352.
24 Winnington-Ingram, Mode in Ancient Greek Music, p. 19.
By "later" he means later than Aristoxenos, who is Aristides' primary source. Winnington-Ingram then attacks Aristides' triadic grouping by saying that the triadic division of keys depends on the triadic division of their names and that "the Hyperdorian is a second name for the lower Mixolydian, the Hyperphrygian (where Hyper- has precise significance) for the Hypermixolydian (where it has not); the Hyperlydian, being a later addition, has no alternative name, and could have none, because with it we have passed beyond the octaves of the Greater Perfect System (it is in fact a repetition at the octave of the Hypophrygian)."

An interesting parallel to Aristides' triadic grouping of keys is presented by Winnington-Ingram when he describes a triadic grouping of the octave-species. This system of octave-species, which he attributes to Riemann,\(^26\) includes those species without prefixes, the Hyper- species which are a fifth higher, and the Hypo- species which are a fifth lower than the fundamental octave-species.

The latter consist of two similar tetrachords (to the type of which they owe their specific character) separated by disjunction; the bye-forms are obtained by adding a similar tetrachord by conjunction, in the one case to the upper, in the other case to the lower tetrachord, and completing the octave with the disjunctive tone at the extreme end (upper or lower) of the scale. So the Dorian group is combined in a compendious scale as from A-b' (Hypodorian A-a, Dorian e-e', Hyperdorian b-b'), the Phrygian group as from G-a', the Lydian as from F-g'.\(^27\)

Winnington-Ingram further explains that the Hyperdorian species is an-

\(^{25}\)Tbid.

\(^{26}\)Hugo Riemann, Handbuch der Musikgeschichte (Leipzig: Breitkopf und Härtel, 1919), pp. 166 ff.

\(^{27}\)Winnington-Ingram, Mode in Ancient Greek Music, pp. 16-17.
other name for the Mixolydian and the Hyperphrygian is another name for the Locrian, the latter being, like the Hypodorian, an A species. 28

Although this explanation is extremely confusing, it is clarified somewhat by Curt Sachs in his explanation of the tripartition of species. He begins by implying simplicity:

The tripartition is obvious: there is a higher group of hyper scales, a lower group of hypo scales, and a middle group without epithets. At first sight, all of them are similar Dorian keys; but the modal structures are fundamentally different in the three groups:

1) The middle scales, based on disjunct tetrachords, have the fifth on top and are plagal.

2) The hyper scales, based on conjunct tetrachords, with an additional note above, are likewise plagal.

3) The hypo scales, based on conjunct tetrachords, with an additional note below, have the fourth on top, or rather, should have the fourth on top and be authentic. 29

Sach's explanation can most easily be understood with the use of a chart. The passage seems to indicate that the middle species and the hyper species were conceived with the fifth on top and the fourth on the bottom, while the hypo scales were conceived with the fourth on the top and the fifth on the bottom. This construction has been indicated by brackets in the chart. As an example, the Dorian species has been chosen. 30

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28 Ibid.
29 Sachs, op. cit., p. 225.
30 Ibid.
Figure 8. Three Dorian Species

Dorian

\[
\begin{array}{cccccc}
E & D & C & B & A & G & F & E \\
(1 & 1 & 1/2) & 1 & (1 & 1 & 1/2)
\end{array}
\]

intervals grouped into tetrachords

Hyperdorian

\[
\begin{array}{cccccc}
B & A & G & F & E & D & C & B \\
1 & (1 & 1 & 1/2)(1 & 1 & 1/2)
\end{array}
\]

Hypodorian

\[
\begin{array}{cccccc}
A & G & F & E & D & C & B & A \\
(1 & 1 & 1/2)(1 & 1 & 1/2) & 1
\end{array}
\]

In summary, each of the historians who mentions Aristides' addition of two keys to those of Cleonides and his organization of the fifteen keys into five triadic groups criticizes Aristides' system as artificial and contrived. In their application of Aristides' principle to the octave-species, Winnington-Ingram and Sachs illustrate the confusion generated by synthetic triadic grouping.

Even those readers with only a superficial knowledge of medieval music will notice a close relationship between the medieval church modes and the Greek octave-species. The similarity in both construction and nomenclature, as well as the reference of medieval scholars to "Greek modes," is probably the reason for the interpretation of the next scholar under consideration, Bontempi.
CHAPTER III

THE INTERPRETATION OF BONTENCI

More than a thousand years after Cleonides and Aristides, Giovanni Andrea Bontempi presented an interpretation of Greek music theory. Bontempi was born in 1624 in Perugia, Italy, and while in that city, changed his last name from Angelini to Bontempi, the name of a rich fellow citizen who was probably his godfather. He began his career as a castrati in St. Marks, but left there to go to Dresden in 1650, where he met Heinrich Schütz, and in 1666 became an associate of Schütz as Kapellmeister. Shortly afterwards he gave up music to devote himself to science and architecture, but he returned briefly to music to write his treatise, Historia Musica, which he published in Perugia in 1695. Ten years later, in Bruso, he died.

Although Bontempi does not discuss the Greek keys in his Historia Musica, he outlines seven species of the octave, and goes on to equate the so-called Greek modes with the species of the octave in one key. He supports his equation by maintaining that both Euclid and Gaudentius had mentioned seven species of the octave in one key, which they called by the same names as the seven modes. His seven octave-species-modes agree with the octave-species of Cleonides and Aristides:

33 Burney, op. cit., pp. 56-57.
Of the twentieth century historians under consideration, Wooldridge is the only one who equates the "modes" and the octave-species. He uses the two terms interchangeably in his discussion of the octave-species.

The diatonic double-octave scale is of course susceptible of seven different octachordal sections, each of which will display the two semitonic intervals in a new position and will therefore, if the first note of each section be taken as its final or keynote, create a new and special scale and a special character of melody in each scale; thus each section of the double-octave system becomes in itself a rule of melody founded upon the particular order of its intervals in relation to the final note, and this was undoubtedly the aspect in which the system of Modes or Species of the octave presented itself to the composers of the Graeco-Roman period.34

Wooldridge then presents a chart of the seven "Modes or Species" as they appear in the double-octave scale previously used to illustrate the Greater Perfect System.35

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34Wooldridge, op. cit., p. 15.
35Ibid., p. 17.
Figure 10. Wooldridge's Seven Modes or Species Reduced to the Fundamental Scale of A and Shown as Sections of that Scale.
Each of the other recent historians denies that the "modes" and the octave-species were synonymous. For instance, Otto Gombosi firmly states:

There is no modal aspect to the pure species. Modus and species are by no means synonymous. Medieval modes, for instance, were no octave species; they only used the several octave species for a framework after they became involved with remnants of Greek history, i.e., after the late ninth century. They were no octave species because they had by nature a final tone and at least one more tonal focus - something the pure species cannot have.\(^{36}\)

Matthew Shirlaw makes an equally firm denial when he says that it is impossible to imagine that

the ancient modes were nothing more or less than octave sections of the Perfect System; that their original tonal structure and relationship to each other permitted of their being assembled in a unified and symmetrical tonal order, such as the Perfect System displays.\(^{37}\)

Reese expresses his doubt that the two concepts could be equated by posing a question.

Before entering into a brief discussion of the matter, it is necessary to state that "mode" will be used in the sense of an organized group of tones (or scale).... Such a mode... tends to give rise to a distinct tonality. If the octave-scales were merely segments of the Greater Perfect System and if they always used as center of the tonal nucleus the predominant tone of the Dorian, they shared among them only one tonality and there was only one true mode; if, however, each had its own predominant tone, then a variety of modes existed, such as we find in plainsong. Did each have its own predominant tone?\(^{38}\)

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\(^{37}\) Shirlaw, op. cit., pp. 132-133.

\(^{38}\) Gustave Reese, Music in the Middle Ages (New York: W. W. Norton and Co., 1940), p. 46.
Isobel Henderson mentions that several scholars have equated the octave-species with the "modes." Like Reese, she begins by defining some crucial terms. First, she establishes that the Greek word *harmonia* is usually translated as *mode* and denotes a group of tones with a distinct tonality. She then complains that Heraclides Ponticus was confused when he said that a *harmonia* must have "a peculiar *eidos* of *ethos* and *pathos." *Eidos* technically meant a *species* or segment of an octave, and *ethos* and *pathos* meant musical character and feeling. She concludes, "against such confusions...we must appeal to Aristoxenus. He briefly dismisses the preoccupation of his predecessors with 'the seven octachords which they called *harmoniae*.'"

Two other historians complain about the equation and then point out a parallel between the equation and the modes of the medieval church. For example, Winnington-Ingram presents an excellent criticism and analysis of the equation:

The modes are indeed often simply equated with the species. It is attractive. We find them enumerated by Aristoxenian writers in association with the modal names, Dorian, Phrygian, Mixolydian, and the rest. Even the term *harmonia* was sometimes applied to them. They can be compared with the modal system of the Roman church, where similar variety of character is ascribed to similar scales. It may well be near the truth. Yet it is rash to accept a simple identification of them with the *harmoniae* in practical use in, for instance, the fifth century. The species are known to us only as part of the systems of Aristoxenus and Ptolemy. There is evidence for earlier forms, and it seems probable that the species are systematised surrogates of less uniform scales and display a greater symmetry than did their forerunners. It is rasher still to found upon this symmetry a theory of tonics such as those we find in the works of Westphal and even later writers. It is rashest of all to base such a theory upon the species of the fourth and fifth, into which Aristoxenus may have

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Henderson, *op. cit.*, pp. 348-349.
analyzed those of the octave. It has often been put forward that the fundamental differences between the Dorian, Phrygian, and Lydian modalities are connected with the three different positions the semitone can occupy in a tetrachord. This may be true. But, if we are to believe it, it must be on the evidence, not of Greek theory, but of the fragments and of analogy. 40

Curt Sachs provides another example when he says that "until recently all books on the subject taught that the modal scales of the Greeks were toptail inversions, that is, so to speak, cut out of the series of white keys:\footnote{Winnington-Ingram, Mode in Ancient Greek Music, p. 10.}

\begin{verbatim}
Hypodorian  A G F E D C B A
Hypophrygian G F E D C B A G
Hypolydian  F E D C B A G F
Dorian      E D C B A G F E
Phrygian    D C B A G F E D
Lydian      C B A G F E D C
Mixolydian  B A G F E D C B
\end{verbatim}

Sachs goes on to conclude that the confusion outlined above also explains why the medieval monks misunderstood the system of the Greeks and transmitted to posterity (including our own counterpoint studies) a pseudo-Dorian between D and D, a pseudo-Phrygian between E and E, a pseudo-Lydian between F and F, and so on. Lost in the tangle of Greek terminology, they mixed two opposite facts: (a) that, defined in 'white key' terms, Hypodorian was an A-mode; (b) that in the perfect system Hypodorian was the lowest key. As a consequence, they establish the following well-known systems of eight church tones on Hypodorian as the lowest modal scale between A and A:\footnote{Sachs, op. cit., p. 237.}

\begin{verbatim}
^\textsuperscript{42}Winnington-Ingram, Mode in Ancient Greek Music, p. 10.
^\textsuperscript{41}Sachs, op. cit., p. 237.
^\textsuperscript{42}Ibid., p. 238.
Seventh tone or Mixolydian  
G A B C D E F G

Fifth tone or Lydian  
F G A B C D E F

Third tone or Phrygian  
E F G A B C D E

First and eighth tone or  
Dorian and Hypomixolydian  
D E F G A B C D

Sixth tone or Hypolydian  
C D E F G A B C

Second tone or Hypophrygian  
B C D E F G A B

Second tone or Hypodorian  
A B C D E F G A

In summary, every historian except Wooldridge censors Bontempi's equation of the Greek octave-species with "modes." Winnington-Ingram and Sachs suggest that the interpretation is a result of the medieval monks' misunderstanding of the Greek octave-species and their consequential formation of the church modes. Even Wooldridge's acceptance of the interpretation is probably the result of semantics. Rather than defining "mode" as "an octave segment of a diatonic system which has a final tone and at least one more tonal focus," Wooldridge probably intends both "octave-species" and "mode" to denote "different octave segments of a diatonic system," the previously mentioned definition of "octave-species."

Bontempi's equation is vividly contrasted by another equation, that of D. B. Monro, whose interpretation is next discussed.
CHAPTER IV

THE INTERPRETATION OF D. B. MONRO

David Binning Monro (1836-1905) was a British scholar in classical studies who was Vice Chancellor of Oxford University and Provost of Oriel College from 1882 until his death. Although his treatise, *The Modes of Ancient Greek Music*, which was published in 1894, was adversely reviewed by several scholars, it was also enthusiastically accepted by many others.43

After a careful examination of the available evidence, Monro concludes that the so called modes of classical Greece are keys and therefore differ from one another not in intervallic construction, but rather in pitch. For example, the Lydian "mode" differs from the Hypodorian "mode" not as F major differs from F minor, but as F major differs from A♭ major. He supports his contention by four important considerations: (1) Plato and Aristotle seem to indicate that the ethical character of the "modes," which were anciently called harmoniai, came from differences in pitch; (2) the list of harmoniai from Plato, Aristotle, and Heraclides Ponticus is substantially the same as the list of keys (tonoi) from Aristoxenos (Ionian is absent from both lists); (3) the usage of the words harmonia and tonos is never such that they refer to different things (in the earlier writers, down to and including Aristotle, harmonia is used, never tonos, but in Aristoxenos and his school only tonos is used; Plutarch uses both terms, but observes no

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distinction between them); and (4) if the names Dorian, Phrygian, Lydian, etc., were applied to two sets of things so distinct from each other, and yet so important as "modes" and keys, it is incredible that there should be no trace of double usage: "yet our authors show no sense even of possible ambiguity." 44

Monro includes in his discussion a diagram of the fifteen mode-keys. It should be noted that although the same names are used, the keys are not those outlined by Aristides. 45

Figure 11. Monro's Fifteen Mode-Keys

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At the end of his treatise, Monro concludes that since the Greek mode-keys bear no resemblance to the medieval church modes, the medieval
word "mode" is perhaps inappropriate.\textsuperscript{46} This conclusion has been accepted and expanded upon by Otto Gombosi, whose statement that the Greeks knew no modes has already been discussed. Gombosi credits Monro with having made "admirable efforts at the clarification of the issues of key and mode," but says that he was "utterly misunderstood."\textsuperscript{47}

Gustave Reese also praises Monro's conclusion that the word "mode" is inappropriate to Greek music when he says that "the latter's book provoked much hostile criticism upon its appearance, but new light shed upon the problems of Greek notations and upon the construction of the lyra and kithara has tended to vindicate his main contentions."\textsuperscript{48}

Other recent scholars, however, have attacked his contention that the Greek "modes" were actually keys. Winnington-Ingram, for instance, speaking of Monro's interpretation says that "it is however open to fatal objections, notably that it cannot adequately account for the differences of character (ethos) so commonly ascribed to them."\textsuperscript{49}

Isobel Henderson also attacks Monro's interpretation by saying that "in its original form, Monro's theory that the classical harmoniai were pitch-keys no longer needs refuting; and recent modifications of this theory - to the effect that the harmoniai had specific pitches as well as individual tunings - are no better founded." She then discredits

\textsuperscript{46}Ibid., pp. 108-112.
\textsuperscript{47}Gombosi, \textit{op. cit.}, p. 21.
\textsuperscript{48}Reese, \textit{op. cit.}, p. 24.
\textsuperscript{49}Winnington-Ingram, \textit{Mode in Ancient Greek Music}, p. 8.
the first consideration which he offers in support of his interpretation.

Plato, indeed, tells us that some harmoniai, used for men's drinking songs, were 'low', and others, used for women's keening-songs, 'high'. But since he adds that the latter are morally unfit for either sex, it is clear that they might be sung in the male register too. Their pitch-notations are purely relative and general, meaning no more than what Greek authors call them - viz. 'high', 'low', or 'middle'.

In summary, Monro's equation of the keys with "modes" had been attacked by every historian who mentions the equation. But his conclusion that the term "mode" is inappropriate to Greek music, which is one of the premises of this paper, has been endorsed by both Gombosi and Reese.

Monro's interpretation is the most recent of those discussed in this paper. The next interpretation under consideration is several centuries older.

50 Henderson, op. cit., p. 348.
CHAPTER V

THE INTERPRETATION OF WALLIS AND BACCHIUS

Another interpretation of the two terms has been presented by two scholars who lived more than a millenium apart. The first, known as Bacchius The Elder or Bacchius senior, was a musical theorist who lived around 350 A.D. His catechism, Introduction to the Art of Music, was translated into French by Mersenne in 1623, and therefore may have influenced the writings of Dr. John Wallis. Wallis (1616-1703) was an English mathematician who held a chair at Oxford as Professor of Geometry. He is best known to musicians for his Latin translations of Ptolemy's Harmonics, which was published in 1683.

Dr. Wallis, who has reduced the octave-species and keys to modern notation, presents a system of seven keys, each consisting of a transposition of the Dorian key, which he calls the first. He writes the Dorian key in the modern key of A minor, placing it in the same position as the Hypodorian or Hyperphrygian in the Cleonidean-Aristidean system. A table of the seven keys according to Wallis follows:

Figure 12. The Keys of Wallis

| Dorian | Mixolydian | Hypolydian | Lydian |

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53Burney, op. cit., p. 57.
Bacchius places two of these keys, the Hypolydian and the Lydian, a half tone higher than Dr. Wallis, who apparently has mistaken their places. Using a notational system comprised of letters, he cites the Mixolydian as the highest key, places the Lydian half a tone lower, the Phrygian a tone below the Lydian, the Dorian a tone below the Phrygian, the Hypolydian half a tone below the Dorian, the Hypophrygian a tone lower than the Dorian, and the Hypodorian, the lowest key, a tone below the Hypophrygian. Therefore, a diagram of the seven keys, as corrected by Bacchius, would be as follows:

Wallis indicates that the ancient keys were related to one another in much the same way as modern keys when he says that Ptolemy made

the Dorian the center or mean; after which he placed the Mixolydian a fourth above the Dorian; the Hypolydian a fifth below the Mixolydian; and the Lydian a fourth higher than Hypolydian. Then, beginning again at the Dorian, he placed the Hypodorian a fourth below it;

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84 Ibid.
the Phrygian a fifth above the Hypodorian, and the Hypophrygian a fourth below that.\textsuperscript{55}

It should be noticed that the relation between the modes without prefixes and those with the same root name with the prefix hypo- is the same as in the Cleonidean and the Aristidean systems of keys.

An important difference between Wallis' system of keys and those of Cleonides and Aristides is that in the latter systems the first and characteristic pitch of each key is the \textit{Proslambanomenos}, while in the Bacchius-Wallis system the \textit{Mese} is made the key-note, and the center of the tones in that key. The pitches shown in the above diagrams are the \textit{mesai} of each key.\textsuperscript{56}

Wallis also mentions a system of octave-species similar to that already mentioned. He says that each of the keys produces seven species of the octave and therefore reasons that the seven keys would furnish seven times seven, or a total of forty-nine species of the octave. He carefully notes that several of the forty-nine species will be made up of the same series of intervals, but maintains that all forty-nine are distinct since they will each be notated differently.\textsuperscript{57}

In summary, Wallis and Bacchius present a system of seven keys which are related by fourths and fifths. The first and characteristic pitch of each key is the \textit{mese}. Wallis also assigns seven octave-species to each key, yielding a total of forty-nine octave-species.

Wooldridge describes a system of keys similar to that of Wallis

\textsuperscript{55}\textit{Ibid.}, pp. 57-58.

\textsuperscript{56}\textit{Ibid.}, p. 56.

\textsuperscript{57}\textit{Ibid.}, p. 58.
and Bacchius in that it consists of seven keys all related to the central Dorian key. There are a few differences, however, between the two systems. One drastic difference is that although the same seven names are used for the seven keys, the names correspond to different keys. The names are the same as those of the keys of Cleonides and Aristides. Another difference is that instead of enumerating forty-nine octave-species, Wooldridge indicates that there are only seven, one for each key. In every key, the species of the same name is found within the octave A-A. A diagram of the seven keys which Wooldridge calls the "seven oldest keys" follows:

Figure 14. Seven Keys of Wooldridge with the Species of the Same Names Marked.

Mixolydian Key

Lydian Key

Phrygian Key

Dorian Key

Hypolydian Key

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58Wooldridge, op. cit., p. 16.
Matthew Shirlaw also describes a system of seven keys which are closely related to one another. Each of his seven names, as well as the relative positioning of the names, corresponds to those of Wallis and Bacchius. But, like Wooldridge, Shirlaw has described a system of keys different from that of Wallis in at least two ways. First of all, each of Shirlaw's keys has been transposed a half step higher than the corresponding keys of Wallis. Secondly, he indicates that instead of seven, each key has only one characteristic species which occurs between F and F in each key. A diagram of Shirlaw's seven keys, with the characteristic species marked in each key, follows:

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Like Wallis, Shirlaw discusses the relationship among the keys by fourths and fifths. He identifies the source of the previously quoted passage from Wallis as chapters nine and ten of Book II of Ptolemy's Harmonics, which he himself quotes:

...if we begin with the higher key, the Mixolydian, that which is a fourth lower is the Dorian (Eb), while that a fourth lower than the latter is the Hypodorian (F). Again, because the key which is a fourth lower than the Hypodorian oversteps the octave, we take instead a fifth higher, viz. the Phrygian (C). A fourth below the Phrygian key is the Hypophrygian (G). Then again, instead of a fourth lower we ascend a fifth higher to the Lydian (D), while a fourth below the Lydian lies the Hypolydian (A).

60 Ibid., p. 182.
Winnington-Ingram acknowledges the difference between the key-notes in the Cleonides-Aristides and the Bacchius-Wallis systems of keys when he says that

it is significant that Cleonides and Aristides compare tonoi by relations of their Prosamabanomenoi, Wallis by the relations of their Mesai.... As there are only seven degrees upon which Mese can fall (the eighth is a mere repetition of the octave), there can only be seven tonoi; any others will be otiose, merely duplicating one of the existing tonoi a semitone higher or lower.61

In summary, although both Wooldridge and Shirlaw describe systems of seven closely related keys, both systems differ considerably from that of Bacchius and Wallis. In addition, none of the historians has mentioned forty-nine octave-species. Winnington-Ingram, however, agrees that the first and characteristic pitch of each key is the mese.

Winnington-Ingram also says that although the keys can, in one aspect, be regarded as transpositions of the Dorian key on seven degrees of pitch, they should be regarded as a means to produce the seven octave-species within a given two octave range. He clarifies his contention by saying that "each of them is then a Perfect System, not, like the Aristoxenian key, a replica of the Changeless System, but each a different species of the double-octave."62 This way of regarding the keys, not as different transpositions of the set of intervals in the diatonic Greater Perfect System, but rather as merely a means to produce the intervals of each of the octave-species within a given range, is part of the interpretation of Sir Francis Haskins Eyles Stiles, whose work will next be considered.

61 Winnington-Ingram, Mode in Ancient Greek Music, pp. 68-69.
62 Ibid., p. 68.
CHAPTER VI

THE INTERPRETATION OF SIR FRANCIS STILES

About seventy-five years after Wallis published his treatise, another Englishman, the baronet Sir Francis Haskins Eyles Stiles, read An Explanation of the Modes or Tones in the Antient Graecian Music to the prestigious Royal Society of London. The dissertation was read at several meetings of the Society from December 1759 to January 1760.

Although Sir Francis uses the term "mode" in place of the more precise terms "key" and "octave-species," a clear explanation of the Greek concepts of key and octave-species emerges from his treatise. He begins his discussion by dividing it into explanations of two doctrines:

we find two distinct and seemingly contradictory doctrines delivered by the antients; and this it is, which has perplexed the subject; for some, not aware of the distinction, have charged the antients with contradictions; and others who perceived the two doctrines, not being able to reconcile them, have either adopted one, and rejected the other, or given up the subject as hopeless; but, as they were both admitted by the antients, they must both have been true, in some sense. What, therefore, I have principally in view in these sheets, is to shew, that the difference between the doctrines arose only from the different ways of considering one and the same object; and that therefore there was such an agreement betwixt them, as that, under certain restrictions, they may be embraced under one common interpretation.

For distinction sake, I shall call one of these doctrines the harmonic, and the other the musical doctrine; the reason of which will sufficiently appear when I come to treat of the distinction between the science of harmonic and that of melopoeia or musical composition.63

Stiles points out that the harmonic doctrine is that explained by theoretical musicians who were scholars of the science of harmonic,

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63Sir Francis Haskins Eyles Stiles, An Explanation of the Modes or Tones in the Antient Graecian Music (London: Read at the Royal Society, 1761), pp. 5-6.
such as Aristoxenos. These theoretical musicians, because of their passion for systematizing, described a system of thirteen keys, one for each semitone within the octave, even though practical musicians did not use all thirteen. This same passion, according to Stiles, caused later theoreticians to present fifteen keys, thereby allowing an attractive triadic arrangement. Stiles' descriptions of the sets of thirteen and of fifteen keys correspond exactly with those of Cleonides and Aristides. The theorists' love of order prompted them to compartmentalize the keys and the octave-species into separate areas of music theory, thereby obscuring the close relationship between them.

Stiles goes on to compliment Ptolemy for being sympathetic with the musical doctrine even though he was a theorist, and for reducing the number of keys to seven, in accordance with the musical doctrine, which regarded the keys as merely a tuning trick for producing the species of the octave between two fixed pitches. The musical doctrine to which Stiles assigns the greater antiquity was adopted by practical musicians since they had to perform and compose music between fixed pitches, whether the pitches were the highest and lowest pitches of an instrument, or the outer limits of the voice range. Since there are only seven species of the octave, only seven keys were of practical use.

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64 Ibid., p. 11.
65 Ibid., pp. 23-24.
66 Ibid., p. 6.
67 Burney, op. cit., p. 58.
68 Ibid., p. 60.
To illustrate the musical doctrine, Stiles uses the octave from hypate meson, our E in the bass, to nete diezeugmenon. He chooses this octave because it is the most comfortable for the male voice. (One should recall that the actual pitch of this octave was probably from c# to G#). A diagram of the seven octave-species produced within the "characteristic octave" by the seven keys of the musical doctrine follows:

Figure 16. The Octave-Species Produced by the Seven Keys of Stiles' Musical Doctrine

Mixolydian

Lydian

Phrygian

Dorian

Hypolydian

Hypophrygian

Hypodorian

69 Ibid., p. 59.
In this way the name of each key coincides with that of the species it produces.

As an example of the practical use of the musical doctrine, Stiles cites the various tunings of the lyre. The lyre he describes has fifteen strings (a' to A) called by the same names as the fifteen notes of the Greater Perfect System. When the lyre is tuned to the Dorian key, the pitches of the strings match the pitches of the Greater Perfect System exactly. To change the species of the double octave produced by the lyre, the musician must re-tune one or more of the strings, thereby changing the key. For instance, to shift from the Dorian to the Hypodorian species, the musician must tune parhypate meson and trite hyperbolaion a half step higher; to shift from the Dorian to the Mixolydian species, he must tune hypate hypaton and paramese half a step lower. Stiles continues to say that, when changing species, the mese changes strings. This statement is confusing since he has previously said that the strings of the lyre are called by the same names as the fifteen notes of the Greater Perfect System, and therefore the middle note (a below middle c in modern notation) is always called mese. This apparent contradiction is explained in that the System's nomenclature is used in a double sense: not only as a term of reference to notes by their serial order of position (thesis) on the basic System, but also, like solmization syllables to describe notes by their function (dynamis) in each particular species without regard to position. In Fig. 16, the middle note (a) remains mese by thesis on the System, but the next higher note (b) becomes

70 Stiles, op. cit., p. 12.
mese by dynamis in the species produced by the Phrygian key.  

Figure 17. The Mese by Dynamis and Thesis

In summary, Stiles says that the harmonic and musical doctrines are merely two ways of looking at the keys and octave-species. The harmonic doctrine, outlined by theoretical musicians, compartmentalizes the two concepts into separate categories. The musical doctrine, used by practical musicians, stresses the connection between the two concepts, regarding the keys as a means for producing the octave-species between fixed pitches.

H. E. Wooldridge describes a relationship of keys and species which is similar to that of Stiles' musical doctrine in that seven keys are used to produce the seven species of the same names between fixed pitches. (See Fig. 14 from the previous chapter.) But Wooldridge's description differs from Stiles' in some important ways. Even though the same seven names are used for the keys, they are attached to different keys. The names correspond with those of Aristoxenos (as interpreted by Cleonides and Aristides) rather than those of Ptolemy (interpreted by Bacchius and Wallis). Because Wooldridge's keys bear different names from those of Stiles, Wooldridge has to choose a different "character octave" (a to A instead of e to E) in which the species of the same names are produced.

---

Wooldridge further recalls the musical doctrine of Stiles when he questions the practical value of all seven of the species:

The question, which naturally arises, whether all the species were of equal practical value for the later composers as rules of melody, may be partly answered by a reference to the scales generally recognized as proper to the Cithara, since this instrument supplied both the accompaniment to the narrative and lyric songs and the instrumental solo, which were at this time the prevailing musical forms. The citharodic species are generally said to be five - the Dorian, the Hypophrygian or Iastian, the Hypodorian or Aeolian, the Phrygian, and the Lydian; the omitted are the Hypolydian, in which the fourth is a tritone, and the Mixolydian, in which the fifth is imperfect; the Hypolydian, however, seems to have been allowed in practice....

Of the seven existing specimens of Greek music which are of sufficient length to give a clear indication of their scales, two are written in the Aeolian, one in the Iastian, one in the relaxed Iastian in which the range was extended to the fourth below the final, and three in the Dorian.\(^2\)

Winnington-Ingram indicates an agreement with the historical position of the harmonic and musical doctrines when he says that

the conception of tonos passed through two phases. In the first the tonoi were the means of relating modal octaves in the same range of pitch by representing them as segments of a uniform scale repeated at different degrees of pitch. In the second these repetitions of the uniform scale took on an independent existence as keys in the modern sense. The second phase was clearly reached as a development of the first.\(^3\)

He tries to be more precise than Stiles when he attempts to date the epochs in which the two doctrines flourished. He says that the musical doctrine was certainly the most prominent at least until the fifth century B.C. and probably until the fourth.\(^4\) Aristoxenos was probably one of

\(^2\) Wooldridge, op. cit., pp. 18-19.
\(^3\) Winnington-Ingram, Mode in Ancient Greek Music, p. 71.
\(^4\) Ibid., p. 81.
the first theorists to outline the harmonic doctrine, although his Harmonics is confusing partially because of his inclusion of some elements characteristic of the musical doctrine. Winnington-Ingram adds that "there appears to be an unbroken tradition between the ancient musical doctrine and the close relationship between the keys and species explained circa 100 A.D. by Ptolemy. Since the harmonic doctrine flourished at least until the time of Aristides Quintilianus, the two doctrines existed simultaneously for approximately 400 years."

Otto Gombosi also agrees with Stiles' double doctrine and even says that he is "following in the footsteps of Sir Francis Haskins Eyles Stiles." But he goes on to say that Stiles' statement that the musical doctrine is older than the harmonic has caused many historians since him to assume wrongly that the species were older than the keys. Gombosi complains that "we have been mislead into interpreting the vast majority of ancient statements concerning the tone system and its categories in a strange manner full of inner contradictions" because of this wrong assumption. He corrects the assumption by saying that the Greeks' "octave species were in filial relation and their keys - and not their keys to their species - and consequently, the octave species were of no importance for the concept of tonality or modality, or for any key-like ('tonartlich') quality of ancient Greek music."

75 Ibid., p. 82.
76 Gombosi, op. cit., p. 21.
78 Ibid., p. 21.
Gombosi supports his correction by saying that the keys and species

are sharply differentiated: the one as a concept of tonality, the other as a concept of a structure of practical-technical nature. Since the species lack, by definition, all characteristics of tonality, their derivative character is established beyond doubt. There is no species without a key (Transpositionsskale). 79

He further agrees with Stiles in that the seven keys produce the seven species within the "characteristic octave" e' to e. He illustrates this with a chart.

Figure 18. Gombosi's Seven Keys Producing the Seven Species

<table>
<thead>
<tr>
<th>Key</th>
<th>Scale Degree</th>
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<tbody>
<tr>
<td>e'</td>
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<tr>
<td>d'</td>
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<td>g</td>
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<tr>
<td>f</td>
<td>e</td>
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<tr>
<td>Dorian</td>
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<table>
<thead>
<tr>
<th>Key</th>
<th>Scale Degree</th>
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<td>e'</td>
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<td>g</td>
<td>f#</td>
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<td>f#</td>
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<tr>
<td>Phrygian</td>
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<th>Key</th>
<th>Scale Degree</th>
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<tr>
<td>f#</td>
<td>e</td>
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<tr>
<td>Lydian</td>
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<th>Key</th>
<th>Scale Degree</th>
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<td>g</td>
<td>f#</td>
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<tr>
<td>f#</td>
<td>e</td>
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<tr>
<td>Mixolydian</td>
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<th>Key</th>
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<tr>
<td>g</td>
<td>f#</td>
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<tr>
<td>f#</td>
<td>e</td>
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<tr>
<td>Hypodorian</td>
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<tr>
<th>Key</th>
<th>Scale Degree</th>
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<td>e'</td>
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<td>a</td>
<td>g#</td>
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<td>g#</td>
<td>f#</td>
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<tr>
<td>f#</td>
<td>e</td>
</tr>
<tr>
<td>Hypophrygian</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Key</th>
<th>Scale Degree</th>
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<tbody>
<tr>
<td>e'</td>
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<td>d'</td>
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<td>g#</td>
<td>f#</td>
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<tr>
<td>f#</td>
<td>e</td>
</tr>
<tr>
<td>Hypolydian</td>
<td></td>
</tr>
</tbody>
</table>

Henderson agrees with Stiles that a distinction must be drawn between the Aristoxenian system of keys on consecutive semitones (harmonic doctrine) and the Ptolemaic system of seven keys, "which is pitchless" (musical doctrine). 80 She also agrees with Stiles' musical doctrine that the keys are used as a means to produce the species within

79Tbid., p. 25.

80Henderson, op. cit., p. 352.
the "characteristic octave" e' to e. She explains the relationship between the keys and the species with a chart.

**Figure 19. Henderson's Species Produced by the Seven Keys**

The typical scale-form mi'-mi (always in black notes) is carried down the System's register by each key successively; the white notes at either end represent the space through which this scale-form moves. The System's central octave-register (here = e-E, marked not between bars but in square brackets on each key) is successively filled by seven different species of the revolving scale. These species have no melodic meaning: they exist only as thetic terms of reference to the relative positions of the keys. It will be noted that the System's central octave-register is the only octave whose terminals all the keys have in common. If, like the feebler Greek theorists, we insert extra keys at the inter-diatonic semitones, these keys will fail by a semitone to touch the two terminals of the central octave where the species meet. Since there are only seven species of the octave, the logical number of keys is seven.

---

81 Ibid., p. 354.
Both Gustave Reese and Curt Sachs support Stiles' contention that the seven keys produce the seven species between the pitches e' to e, according to the *musical* doctrine. But using this concept, they go on to defend the "Feebler Greek theorists" (according to Henderson) in their insertion of extra keys at the inter-diatonic semitones.

Their ingenious defense is based on the tunings of the five string lyre and bears a slight resemblance to Stiles' account of the tunings of the fifteen string lyre. Since the five string lyre was always tuned in the pentatonic pattern of three major seconds and two minor thirds, the player was forced either to avoid certain notes or to produce them with the help of artificial devices which were technically difficult and probably unsatisfactory in timbre. One of the tunings was both natural and desirable. The player started tuning from the central note a; jumped down a fourth to e and back a fifth to b, and in the opposite direction, jumped from the a up a fourth to d' and back a fifth to g, so that he obtained:

```
g\______________\    
\            /\        
d'///|    |\//a\        
\        |   |        
e\        |   |        
 \       |   |        
    b        
```

According to Sachs, "this was an excellent heptad of open strings for Phrygian melodies, but unusable for...Mixolydian, which, instead of b, needed b♭." Since it would be impossible to relax the b string, since no semitones were allowed in pentatonic tuning, the b string was replaced by a c' string. These two tunings of the lyre, then,

---

Sachs adds that a third tuning was also in use in which the E was sharpened to F:

F D C A G F.

"In connection with the F tuning, the entire perfect system with all its shifts underwent transposition by a semitone upward, which did not supplant the E series, but was alternately used when musical reasons made it preferable. The result (restricted to the central octave) was:

Figure 20. The Seven Species Produced by the Keys in the Higher Tuning

<table>
<thead>
<tr>
<th>Species</th>
<th>f'</th>
<th>e b'</th>
<th>d b'</th>
<th>c'</th>
<th>b b</th>
<th>a b</th>
<th>g</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypermixolydian</td>
<td>f'</td>
<td>e b'</td>
<td>d b'</td>
<td>c'</td>
<td>b b</td>
<td>a b</td>
<td>g</td>
<td>f</td>
</tr>
<tr>
<td>Mixolydian</td>
<td>f'</td>
<td>e b'</td>
<td>d b'</td>
<td>c'</td>
<td>b b</td>
<td>a b</td>
<td>g b</td>
<td>f</td>
</tr>
<tr>
<td>Lydian</td>
<td>f'</td>
<td>e'</td>
<td>d'</td>
<td>c'</td>
<td>b b</td>
<td>a</td>
<td>g</td>
<td>f</td>
</tr>
<tr>
<td>Phrygian</td>
<td>f'</td>
<td>e b'</td>
<td>d'</td>
<td>c'</td>
<td>b b</td>
<td>a b</td>
<td>g</td>
<td>f</td>
</tr>
<tr>
<td>Dorian</td>
<td>f'</td>
<td>e b'</td>
<td>d b'</td>
<td>c'</td>
<td>b b</td>
<td>a b</td>
<td>g b</td>
<td>f</td>
</tr>
<tr>
<td>Hypolydian</td>
<td>f'</td>
<td>e'</td>
<td>d'</td>
<td>c'</td>
<td>b</td>
<td>a</td>
<td>g</td>
<td>f</td>
</tr>
<tr>
<td>Hypophrygian</td>
<td>f'</td>
<td>e b'</td>
<td>d'</td>
<td>c'</td>
<td>b b</td>
<td>a</td>
<td>g</td>
<td>f</td>
</tr>
<tr>
<td>Hypodorian</td>
<td>f'</td>
<td>e b'</td>
<td>d b'</td>
<td>c'</td>
<td>b b</td>
<td>a b</td>
<td>g</td>
<td>f</td>
</tr>
</tbody>
</table>

Sachs (and Reese) then combine the two pitch forms of the Perfect System to produce a system of fifteen keys in chromatic sequence which is not susceptible to Henderson's criticism. This Hybrid system also explains the double names present in Cleonides' and Aristides' keys since the names of the keys which were duplicated, to avoid confusion, were

---

84Ibid., pp. 229-231.
"distinguished by the epithets 'lower for the F scales and 'higher' for the F scales or else kept apart by reviving obsolete names, Iastian (Ionian) and Aeolian."\(^5\)

Figure 21. The Two Systems of Keys and Species Combined

<table>
<thead>
<tr>
<th>Key</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperlydian</td>
<td>f' e' d' c' bb a g f</td>
</tr>
<tr>
<td>Hyperaeolian</td>
<td>e' d' c# b a g# f# e</td>
</tr>
<tr>
<td>Hypermixolydian</td>
<td>f' e' d' c' bb ab g f</td>
</tr>
<tr>
<td>Hyperphrygian</td>
<td>e' d' c' b a g f# e</td>
</tr>
<tr>
<td>Low Mixolydian</td>
<td>f' e' d' c' bb a g f</td>
</tr>
<tr>
<td>High Lydian</td>
<td>e' d# c# b a g# f# e</td>
</tr>
<tr>
<td>Low Lydian</td>
<td>f' e' d' c' bb ab g f</td>
</tr>
<tr>
<td>High Phrygian</td>
<td>e' d' c' b a g f# e</td>
</tr>
<tr>
<td>Low Phrygian</td>
<td>f' e' d' c' bb ab g f</td>
</tr>
<tr>
<td>Dorian</td>
<td>f' e' d' c' bb a g f</td>
</tr>
<tr>
<td>High Hypolydian</td>
<td>e' d# c# b a# g# f# e</td>
</tr>
<tr>
<td>Low Hypolydian</td>
<td>f' e' d' c' bb a g f</td>
</tr>
<tr>
<td>High Hypophrygian</td>
<td>e' d# c# b a g# f# e</td>
</tr>
<tr>
<td>Low Hypophrygian</td>
<td>f' e' d' c' bb ab g f</td>
</tr>
<tr>
<td>Hypodorian</td>
<td>f' e' d' c' bb a g f</td>
</tr>
</tbody>
</table>

It should be noted that these keys do not match the keys of Cleonides and Aristides. They do, however, correspond to the fifteen "mode-keys" of D. B. Monro.

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\(^5\) Ibid., p. 233.
Although Matthew Shirlaw does not use the terms harmonic and musical doctrine, he supports Stiles in his historical division of the concepts key and species. He says that before the time of Aristoxenos the two concepts were inseparably connected, and that after Aristoxenos the concept of key became independently important and was therefore separated from the species. He also supports the connection between the concepts explained in accordance with the musical doctrine:

\[
\text{Species} \] and keys are indissolubly linked together. In the seven keys all seven \( \text{species} \) are defined at the Dorian octave e-e' (later a semitone higher, f-f'). Each \( \text{species} \) is linked with its key.  

Shirlaw seems to be familiar with the Reese-Sachs explanation of the higher and lower tunings of the lyre when he explains the connection between the seven keys and the seven species in a chart utilizing the higher tuning. It should be noted that the terms Proslambanomenos, Mese, and Nete Hyperboleon are used in the thetic sense.

Figure 22. Shirlaw's Seven Keys (and Species) in the Higher Tuning

\[ \text{Species} \]

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88 Ibid., p. 187.
In summary, Stiles' division of the octave-species and keys into a harmonic doctrine which was outlined by the theorists and a musical doctrine which was employed by practical musicians and which antedates the harmonic is endorsed by Winnington-Ingram, Shirlaw, Gombosi, and Henderson. All of the historians agree with Stiles' musical doctrine that the keys are used as a means to produce the octave-species within fixed pitches. Wooldridge presents the only discussion of the musical doctrine which differs significantly from that of Stiles in that he presents the keys at different pitches than Stiles, and therefore has to choose a different "characteristic octave" in which the species are pro-
duced. Sachs' and Reese's expansion of the musical doctrine, resulting from different tunings of the lyre, possibly explains the origin of Cleonides' and Aristides' systems of keys in chromatic sequence.
CONCLUSION

In the six preceding chapters the interpretations of "key" and "octave-species" as presented by Cleonides, Aristides, Bontempi, Monro, Wallis and Bacchius, and Stiles have been explained and have been traced through the writings of seven recent scholarly historians to discover which interpretation has been championed most frequently. A brief review of the findings of each chapter will help to focus on the outstanding interpretation.

Although most of the historians agree with Cleonides' interpretation of the octave-species, they either discredit his interpretation of the keys or merely mention it historically. Aristides' interpretation of the keys has been even more severely criticized as artificial and contrived. Bontempi's interpretation that the so-called Greek modes were actually octave-species has been rejected by every historian except one, whose acceptance is probably the result of a semantic confusion. Monro's interpretation that the "modes" were actually keys has been attacked by every historian who mentions the interpretation. Even Monro's own conclusion that the term "mode" is inappropriate to Greek music makes nonsense of his previous equation of the "modes" and keys. Although two historians have described systems of keys similar to, but not exactly like those of Bacchius and Wallis, no historian has mentioned Wallis' system of forty-nine octave-species. Stiles' interpretation of the two concepts, however, including his explanation of the relationship between them and his division of the concepts into two doctrines has been overwhelmingly endorsed.
It is obvious that Stiles' interpretation has best withstood the test of time, but one may well ask why it has been championed most frequently by scholarly historians. Several reasons are suggested by the evidence. One is that Stiles not only discusses each concept separately, but also discusses a connection between them. Although neither Cleonides, nor Aristides, nor Bacchius and Wallis discusses any relationship between the keys and the octave-species, Stiles says that, according to the musical doctrine, the keys are a means to produce the species between fixed pitches. Since Stiles discusses this connection between the two terms, his interpretation is more complete than the others.

Furthermore, Stiles' interpretation is more analytic than the others in that it divides the discussion of the two concepts into two doctrines: the harmonic, and the musical. This division explains why Aristides Quintilianus and Ptolemy, who were contemporaries, describe the concepts key and octave-species in considerably different ways. Aristides, who was a theorist and therefore was sympathetic with the harmonic doctrine, explains the concepts separately without mentioning a relationship between them. Ptolemy, however, who was sympathetic with the musical doctrine, explains the concepts as inseparably related since the relationship was important to practical musicians. According to Stiles' double doctrine, Aristides and Ptolemy merely describe the same two concepts from different points of view.

Still another reason suggested by the evidence is that Stiles' interpretation explains some of the inconsistencies among the other interpretations. One such inconsistency is that while Cleonides presents a system of thirteen keys, Aristides presents fifteen keys, and Bacchius and Wallis present only seven keys. This contradiction can be explained
in that Bacchius and Wallis are interpreting the musical doctrine, which includes only seven keys since only seven are needed to produce the seven octave-species between fixed pitches. Cleonides and Aristides, on the other hand, are theoreticians and are therefore interpreting the harmonic doctrine. Because of his desire for theoretical symmetry and order, Cleonides presents thirteen keys, one on each semitone with an added thirteenth at the octave. Aristides goes even further in his theoretical symmetry, and presents fifteen keys so that they fall into five triadic groups, within which the three keys bear the same root name. Stiles' interpretation perhaps also explains the contradiction between Bontempi's and Monro's equations. Bontempi used Ptolemy as his primary source; Monro used the Aristoxenian theoreticians. Because in the musical doctrine, as presented by Ptolemy, the concept of octave-species is most prominent (the keys are merely the means to produce the species), Bontempi confused the octave-species with the medieval concept of mode. Because in the harmonic doctrine, as presented by the Aristoxenian theoreticians, the concept of key is most prominent (since the keys lend themselves more readily to systemization), Monro confused the keys with what he thought were Greek "modes".

Furthermore, Reese's and Sach's expansion of Stiles' interpretation using two tunings of the lyre offers a plausible explanation for the theoreticians' systems of keys on every semitone. Although the system of keys resulting from the fusion of the two tunings of the lyre is a major third lower than that of Cleonides and Aristides, it corresponds exactly with Monro's system of mode-keys.

In conclusion it should be emphasized that this study does not prove the accuracy of Stiles' interpretation; it merely shows that some
recent scholarly historians have endorsed his interpretation rather than those of several other prominent scholars. The discovery of new evidence could conceivably refute much of Stiles' interpretation. It is most likely, however, that the question of which interpretation is accurate will remain unanswered.

Not even the main course of development of Greek music, far less the full details of its keys and octave-species, can be established on the evidence. It is a result to give rise to pessimism; and the prospects of further advances in our knowledge are not bright. We need actual pieces of music; and, though papyrus and stone will doubtless continue to give them to us, they will in all probability be as late, brief, and mutilated as those we already possess.\(^9\)

BIENVENUE

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Periodicals


