Performance Practice Review

Volume 2
Number 1 *Spring*

Article 1

1989

New Light on Late Eighteenth-Century Tempo: William Crotch's Pendulum Markings

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Concerning Classic Tempi

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On January 1, 1800,[1] Dr. William Crotch published an essay in London's *Monthly Magazine* under the heading, "Remarks on the Terms at Present Used in Music, for Regulating the Time." His "Remarks" discussed a method of defining tempo by pendulum length that assured both precision and repeatability, two things lacking in the more generally accepted practice of using Italian words to indicate tempo. He was not unique in his complaint. In 1784 Jean-Baptiste Davaux, announcing a new *chronomètre* in whose creation he claimed a role, had written:

> The inadequacy of these terms and their vague meaning have long been recognized; it was clearly demonstrated that the words *allegro*, *andante*, etc. were susceptible to infinite nuances in their movement, [and] could never fix in a precise manner the intention of the author,

1. *The Monthly Magazine* 8 (Jan. 1, 1800): 941-43. All unassigned quotations from Crotch are taken from that source, which will be referred to as "Remarks" throughout this article.

> even with the help of the words we often add to them to assist in their interpretation . . .[2]

Crotch's approach, codifying a practice familiar to musicians of his day, provides a better tool than any of the complex and expensive mechanisms bruited about during that century,[3] one that is more accurate and more widely represented than the others, as we shall see.

The "Remarks" included a table of tempos in then-current use computed according to the author's recommendations. Except for mention in a valuable article by Barry Brook,[4] tangential allusion by Neal Zaslaw,[5] and a reference in the bibliography of Nicholas Temperley's article on Crotch in the *New Grove*, this essay has gone relatively unremarked.

Crotch's key point was that tempo could be set easily and conveniently by using a small weight attached to a string, or better, to a tape or ribbon marked in "English feet and inches." Musicians and dancing-masters had used some variant of this device as far back as the seventeenth century. Marin Mersenne discussed the pendulum as a time-keeper in Vol. I of his *Harmonie Universelle* (1636) and Thomas Mace recommended it again forty years later in *Musick's Monument* (1676). There is reason to think that its practical use may pre-date that, as the laws governing vibration of a pendulum were published by the young Galileo in the 1580s[6] and a scheme for a pendulum time-marker was found among his papers after his death.

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2. "L'insufficiance de ces termes & leur signification vague sont reconnues depuis trop longtemps; il est demonstré évidemment que que les mots d'*Allegro*, d'*Andante* etc. étant susceptibles d'une infinité de nuances dans leur mouvement, ne peuvent jamais fixer d'une manière precise l'intention de l'Auteur, même avec le secours des mots qu'on y ajoute souvent pour servir à leur interpretation . . ." From the announcement in the *Journal de Paris* of May 8, 1784. Quoted here from Barry S. Brook's presentation of the controversy between Davaux (representing Breguet) and Renaudin in *La symphonie française dans la seconde moitié du xviiie siècle* (Paris, 1962), vol. 1, 503.

3. Renaudin's *Plexichronomêtre*, for example, was advertised in the *Journal de la Harpe* of 1786 with a price of 60 £. Cf. Brook, *La Symphonie française*, 316, where the *Prospectus* is quoted in full.

4. Barry S. Brook, "Le tempo dans l'execution musical à la fin du xviiie siècle: les contributions de C. Mason et William Crotch," *Fontes Artis Musicae* 12 (1965): 196.

5. "Mozart's Tempo Conventions," *International Musicological Society: Compte rendu du congrès* 11 (1972): 720-33.

6. Galileo Galilei (1564-1642) had developed laws explaining the isochronism of a simple pendulum before the end of the sixteenth century. He demonstrated that a pendulum of invariable length will accomplish its period within an invariable time period from the time it settles down to a steady swing until its energy has dissipated. A scheme for a pendulum time-marker was found among his papers after his death. It should be noted that a compound pendulum, such as Maelzel's metronome, follows different laws.

Crotch buttressed his arguments by applying pendulum lengths to performances of standard repertoire in his own day, providing a guideline to the tempo practice of his contemporaries. Furthermore, following the appearance of these "Remarks," a handful of his peers were emboldened to begin publishing new works with tempos indicated by pendulum lengths right after the turn of the nineteenth century. Before the practice became widespread, though, Maelzel's metronome provided a better solution to the problem, and the practice of notating pendulum lengths fell into disuse. When correlated with post-1800 pendulum markings and later metronome marks, though, those early pendulum notations provide an unambiguous basis for exploring tempo in the latter half of the eighteenth century, far more reliable than Quantz's pulse or Saint-Lambert's pace of a hypothetical man walking.

William Crotch (1775-1847) was a well-known composer, organist and professor of music in Georgian England. His lectures (at the Royal College of Music in London) were popular and well-attended, and beginning about 1807 he compiled a three-volume anthology of musical masterworks intended to illustrate them.[7] In these volumes he assigned pendulum lengths to several hundred well-known compositions, reflecting the performance practice of his own time and place. Jan LaRue reached some preliminary conclusions about these:

(1) Crotch's tempos for slow and medium fast (*allegro*) movements are near to ours.

(2) His very fast movements seem a bit faster than our average performances:
Haydn, Symphony no. 63 (Roxelane) — *vivace* = quarter note at MM 168.

(3) Middle tempos seem to run a bit faster than ours:
Haydn, Symphony no. 85 (La reine) — *Romanze* = half note at MM 66.
Haydn, Symphony no. 82 (L'ours) — *allegretto* = quarter note at MM 88.

7. *Specimens of various styles of music referred to in a course of lectures read at Oxford and London and adapted to keyed instruments by William Crotch, Mus. Doc. Professor of Music in the University of Oxford.* London: Robert Birchall for the author, *ca.* 1807. This anthology consisted of three volumes. The first was issued by subscription *ca.* 1807 and the second is dated 1808 in the Preface. The third volume (n.d.) was apparently published soon after, although Eitner gives it the date 1818. See A. H. Heyer, *Historical Sets, Collected Editions, and Monuments of Music* (London, 1980), vol. 1, 160-61, for a complete index.

(4) Some minuets are very fast:
Haydn, Symphony no. 74 — Minuet = dotted half at MM 66.[8]

The need for a scientific way to measure musical speed had long been a subject of discussion and experiment. If anything were to be done about it, it would have had to come out of the performance pressures of a major urban center. If there was ever a time and place in which composers were kept busy writing for third-party performance, it was the London of George III. It is no wonder, then, that its busy musicians were eager to find a way to fix musical tempo.

A second factor in this equation was that the latter half of the eighteenth century saw history become an overwhelming presence, infusing intellectual life with a sensitivity to the future as well as reverence for the past. Crotch cited this concern for the future as one reason to preserve correct tempos in order to protect the music against the time when the original composers and performers would no longer be around. In his assessment of the importance of tempo he agreed with his mentor, Dr. James Nares, who had written, "Music perform'd in just time is like a painting set in a good light."[9] It is only to be expected, then, that his "Remarks" open by arguing the need for a reliable, convenient way of setting precise tempos, then proceed to three main points: First, that current tempo terminology, by which he means the use of Italian words, is indefinite, "or at least misapplied." He defends this by illustrating tempo inconsistencies in current practice. He then proposes that "definite chracters" be substituted for the ambiguous Italian tempo terms, though not for the terms of expression. Those characters, he makes clear, would consist of setting a precise pendulum length equal to a specific note value in a composition. Finally, with an eye to the future, he concludes that "Much trouble and difficulty would be removed by the proposed alteration," and deftly refutes arguments against such mechanical aids to musicianship.

In dealing with the first point, the inconsistency of tempo designations, he agrees with Rousseau that there are "five principal terms" defining musical time, and puts those in order as: *largo, adagio, andante, allegro,* and *presto*. In addition, he writes, there are "collateral terms." In ancient music, "those are *grave, alla breve, tempo ordinario* and *tempo giusto*," and in "modern music," *lento, andantino* and *allegretto*. In both ancient and

8. Cited in Barry S. Brook, "Le tempo dans l'execution musical," 201.
9. In the *Remarks*, Crotch quotes this from the *Preface* to *Twenty Anthems* by Dr. James Nares (1715-87), London, 1778.

modern music he also notes the use of the terms *larghetto*, *vivace*, and *prestissimo*. He then arranges all of those in a list, saying:

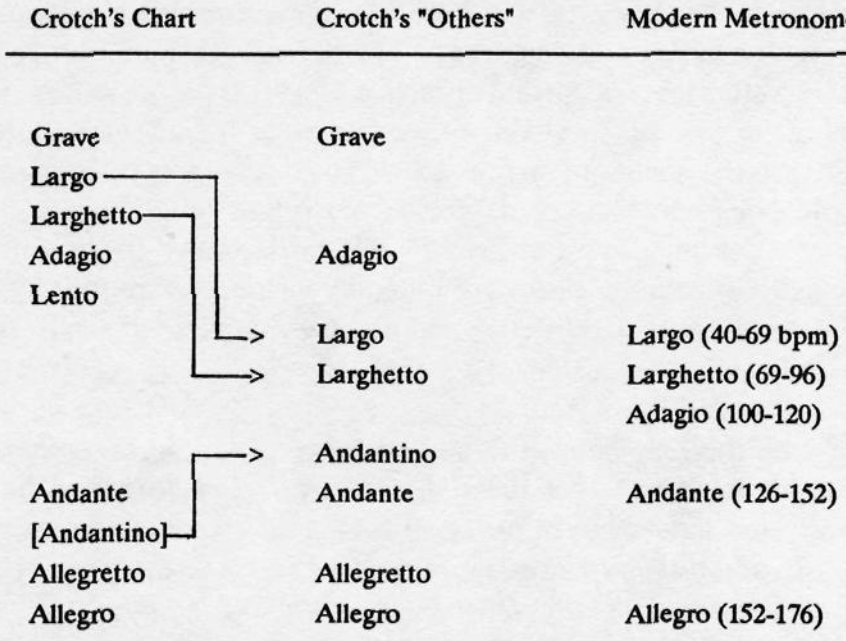
> It is, I believe, generally understood that the order of succession is as follows: *Grave, largo, larghetto, adagio, lento, andante, allegretto, allegro, vivace, alla breve, presto, prestissimo.*

He qualifies that by noting,

> I am perfectly aware, however, that this order may be disputed. By some, *adagio, lento, andante, alla breve*, and *vivace* are regarded rather as terms of expression and taste, than of time.

Some, he goes on, consider *adagio* slower than *largo*, and some feel that *andantino* is slower than *andante*.[10] Figure 1 compares Crotch's own list with the one he imputes to unnamed "others," and places alongside those two a list of tempos given on the face of a modern Seth Thomas metronome built *ca.* 1975.

Fig. 1. Comparison of William Crotch's Tempos With Those of His Contemporaries and a Present Metronome



10. Zaslaw in "Mozart's Tempo Conventions," 722 and 725-26, notes that seven of the ten theorists he surveyed regarded *andantino* as slower than *andante*. Those were J. J. Rousseau (1768), E. W. Wolf (1788), D. G. Türk (1789), C. Mason (*ca.* 1801), M. Clementi (1801), J. Starke (1819), and J. N. Hummel (1828). The dissenters were J. B. Cartier (1798) and W. Crotch (1800). Leopold Mozart (1756) did not show *andantino* at all.

Vivace		
Alla breve		
Presto	Presto	Presto (184-208)
Prestissimo	Prestissimo	

Crotch's ordering of tempo words in Figure 1 has two notable deviations from that on the modern metronome: the positions of *adagio* and *largo* are reversed, as are those of *andante* and *andantino*. He views *alla breve* as a tempo rather than a proportional term, placing it just below *presto* in the scale and well above *allegro*. He has also changed the earlier position of *vivace* to a place more in line with modern usage. Only 22 years before, his teacher, James Nares, had characterized *vivace* as a slower tempo than *allegro*, as Charles Cudworth demonstrated in 1965.[11]

Crotch then draws the chart shown in **Appendix 1** based on his own experiments with a pendulum, demonstrating the inconsistency of Italian tempo words assigned by composers.

The first seven columns of **Appendix 1** are reproduced literally from Crotch's "Remarks." The last column represents the conversion of each pendulum length to a modern metronome mark by a formula to be given shortly. A peripheral point of interest is that Crotch does not hesitate to indicate, in faster tempos, that the note value on which the tempo is based may be different from the lower number of the meter signature. In slow tempos, for example, he indicates the eighth-note as recipient of the beat in some 2/4, 3/4, and 4/4 meters, while in faster ones he marks the tempo by halves, although the quarter-note, strictly speaking, appears to get the beat.

The chart is an invaluable source for English tempos at the end of the eighteenth century. Granted that Crotch's method of determining these tempos may have been less than scientific in the modern sense, it still represents objective calculation of tempos *by a musician*, and for that reason, is in some respects more reliable than the mechanical clock-work instruments presently undergoing reconstruction at the University of Louvain or the "lost" barrel-organ spindles of the Württemberger Landesmuseum in Baden-Baden, or in China (where they turned up as gifts of the Austrian emperor).[12]

11. "The Meaning of 'Vivace' in Eighteenth Century England," *Fontes artis musica* 12 (1965): 194.

12. See William Malloch, "Toward a 'New' (Old) Minuet," *Opus* (August 1985): 14f. I believe that Crotch's tempi may be more valid because, regardless of how faithful the mechanical instruments are to the tempos for which they were originally built, they represent the work of artisans rather than musicians and functioned as "toys" rather than

Setting aesthetic questions aside for the moment, let us follow Crotch's argument that the Italian tempo terms were inconsistent in their application. Figure 2 shows *grave*, for instance, varying from a metronome marking of 69 to 116 for the eighth-note, while *prestissimo* ranges from 77 to 168 beats per minute in somewhat comparable duple meters. *Lento*, astonishingly, embraces a low of 69 eighth-notes per minute and a high of 153 — more than twice as fast. Crotch's argument for more accurate tempo indication, so apparent to us after the fact, is confirmed by the ambiguity that he demonstrates. That very inconsistency, though, may yet serve as a means for better understanding the use of Italian tempo words in this period once we can establish a way to subject the tempos to closer scrutiny.

Crotch calls attention to still other illogicalities generated by those terms. To cite only three of his examples, he points out that Handel marks the bass aria "But who may abide" (*Messiah*) *larghetto* in the score, but writes *andante larghetto* in the Appendix. In a second example he notes that Handel marks the recitative "For behold, darkness shall cover the earth" *andante larghetto*, and the succeeding air *larghetto*. "Now, larghetto," Crotch writes, "is certainly slower than *andante larghetto*, yet the quavers in the air are always performed full as quick as the semiquavers in the recitative." A final complaint about the existing system concerns the air "Thou art gone up on high," which is marked *andante* for soprano. He observes that, "the same song, with the slightest variation, for a bass voice, is marked *allegro*." In an interesting aside that deserves further exploration, Crotch avers that tempos were slower at the beginning of the eighteenth century. His evidence is the "admirable and accurate performances of Handel's works at Westminster Abbey, and those of other great composers of the same period at the Concert of Ancient Music." He also cites "the assurances of many elderly musical gentlemen."

To put an end to the confusion engendered by ambiguous tempo words in either English or Italian, Crotch recommends the use of a simple pendulum. He discards Loulié's *chronomètre* as "more complex, expensive and unwieldy than is necessary." All that is needed, he says, is "merely a piece of tape and a plummet, graduated into English feet and inches; a measure more generally intelligible than the cyphers used by Loulié." He then disposes of the objections to this practice aimed by Diderot at Loulié's *chronomètre*. To Diderot's protest that, "in a

as artistic performances. One need only listen to the variant readings of music-boxes today to realize that it would be a mistake if scholars 200 years from now were to base their understanding of 20th-century tempos or rhythms on our music boxes.

movement there are, perhaps, no two bars of the same duration," Crotch parries, "Happily . . . we have no such music. It never existed outside of France and is at length banished its only asylum."

On another point, the encyclopedist had objected that "It is impossible for a leader to have his ear attentive to the sound of the pendulum, and his eye on the book throughout the whole of a movement." Crotch's dismissal of this is scathing:

> And this were an arduous task indeed! but the objection does not apply to my proposal . . . [because this pendulum makes no noise. It is] only to be set in motion before a movement at a rehearsal, or perhaps in the leader's own room, but certainly not at a performance.

On the positive side he argues,

> A leader of the most ordinary abilities may remember and preserve the time of a piece of music he has ever heard. But it is a different, and far more difficult thing, to *discover* [sic] that time.

Answering objections that "attention will [as a result of concentrating on time] be diverted from an important to an unworthy object" [i.e., from expression to tempo], Crotch protests "I have not the least wish that my plan should interfere with the expression, which I think of far greater importance than any accuracy of time." He goes on to advocate the importance of "expression words" like *grazioso*, *spiritoso*, etc.

His final argument grows out of the historicism that characterized the period. Not only would this practice help in learning new music, he feels, but it would correct — or at least halt the deterioration of — bad tempos in the works of the older composers.

> The time of music already composed may be obtained at the many judicious performances at the concert of ancient music, at cathedrals and operas; and allowing this time to be incorrect from having traditionally been handed down to us, it appears to me the only way of preventing it from becoming still more so. It will be easy for present and future composers to render the time of their works indisputable, by prefixing one of the notes to each strain, with its duration expressed by the swing of a pendulum.

Finally, speaking as a practical musician, he foresees that,

> Should this scheme be approved and adopted, the chronometer [i.e., Crotch's 'tape and plummet'] would become as much of an appendage to a musical instrument as a desk is at present to a piano forte, or a bow to a violin . . . [it] would be found of the highest use to scholars [i.e., students]; who in the absence of their master, are frequently at a loss to discover, remember, and retain the time of any movement.

Both Rosamond Harding and Frank Kidson attribute the earliest objective tempo markings published in England to a composer by the name of Thomas Wright (1763-1829) who, about 1795, wrote "A concerto for the harpsichord or pianoforte . . . dedicated to the Hon. Miss Dundas,"[13] while Barry Brook proposes French honors for Jean-Baptiste Davaux's three symphonies of 1784, marked with obscure references to dial readings on the face of Breguet's *chronomètre*. Harding speculated about why Wright never patented or publicized the device he used, described by Frank Kidson as "a simple pocket metronome consisting of a weighted string swinging across a wooden arc marked from zero in tens." The reason, I would now suggest, was that tempos given in pendulum references were not a novelty in 1795, but represented an ongoing, or at least not unfamiliar, practice among English composers of the latter part of the eighteenth century.

The earliest use of such tempo notations can be attributed to Marmaduke Overend,[14] whose glee of *ca.* 1780, "For fragrant sweets,"[15] bears a published designation of tempo that pre-dates both Wright's concerto and Davaux's symphonies. A rubric at the head of Overend's piece reads:

> A foot long pedulums [sic] half swing
> Will time each quaver's length to sing.

The couplet setting the tempo of Overend's glee produces the equivalent of eighth-note = 108 (in 3/8 meter). As the prefatory verse was included with no further comment, we can infer that the technique was not

13. Rosamond E. M. Harding, *Origins of Musical Time and Expression* (London, 1938), 19, and Frank Kidson in *Grove's* 6, vol. 9, 372.

14. Overend, an organist and student of William Boyce, was born at an unknown date in the first half of the eighteenth century. He died in 1790, leaving behind three little-known glees, twelve sonatas for two violins and cello, and a small handful of other compositions.

15. London: S. A. & P. Thompson, [*ca.* 1780]. A copy of this is in the British Museum: G.806.v.(2). S[amual], A[nn] & P[eter] Thompson published under this rubric between 1779 and 1793 (cf. Humphries & Smith, *Music Publishing in the British Isles*, p. 309).

unfamiliar to his contemporaries. According to Galileo's law governing isochronism of a pendulum, a pendulum of given length will settle down to a mathematically predictable and stable motion independent of the mass at its end and unaffected (except in remote regions after the decimal point) by other considerations, such as humidity, temperature, or atmospheric pressure.

Pendulum lengths can be converted to metronome markings by using a formula that can be found in any watchmaker's guide or compendium of standard physical formulas:

$$P = \frac{60}{2\pi\sqrt{\frac{l}{g}}}$$

This gives the time in seconds of a complete period of a pendulum (P), where "l" is its length in centimeters and "g" represents the force of gravity in centimeters per second. To count "beats" we need half of the full period or twice the number resulting from the formula. Correcting the formula to suit the needs of musical investigation we arrive at the following:

$$P = 2\left(\frac{60}{2\pi\sqrt{\frac{l}{g}}}\right)$$

The combined effect of other factors, such as friction, air density, etc., is negligible — one could say non-existent from a practical standpoint. It is also worth noting that following the adoption of the metric system in 1799 by the *noveau régime* in Paris and standardization of the inch to the centimeter at that time, there is no difference between the measurements given in the original and their modern counterparts. The arithmetic is confirmed by Georgian composers, who recognized that a 39" pendulum provided a "beat" every second, while the formula given above produces a result of 60.11 beats per minute, certainly accurate enough for practical use.[16] A table of equivalent metronome speeds

16. C. Mason, for example, in his *Rules of the Times, Meters, Accents and Phrases of Composition* [London, *ca.* 1801] says, "Get an ounce of lead and fix it to a tape; and thirty-nine inches will vibrate a second of time; which is exactly the quaver in the slowest Musical movement, viz. Grave time." MM = 60 is given as *larghetto* on the modern metronome, while it shows up in Crotch's table under *largo* as the slowest tempo on the chart (see Figure 2, above). The Italian word *grave* does not have any tempo marked as slow as 60, although it was agreed to be even slower than *largo* by Crotch and his contemporaries (see Figure 1, above).

generated by this fomula, using pendulum lengths from 1/2 inch to 2 feet at 1/2" intervals, follows.[17]

Fig. 2. Conversion of Pendulum Lengths to Metronome Markings

Length in Inches	Length in Cm.	Seconds per Period	Actual Beats Per Min.	MM	
0.5	1.27	0.22605	530.85	531	
1.0	2.54	0.31969	375.37	375	
1.5	3.81	0.39154	306.48	306	
2.0	5.08	0.45211	265.42	265	
2.5	6.35	0.50547	237.40	237	
3.0	7.62	0.55372	216.72	217	
3.5	8.89	0.59808	200.64	201	
4.0	10.16	0.63938	187.68	188	
4.5	11.43	0.67816	176.95	177	
5.0	12.70	0.71484	167.87	168	
5.5	13.97	0.74974	160.06	160	
6.0	15.24	0.78307	153.24	153	
6.5	16.51	0.81505	147.23	147	
7.0	17.78	0.84582	141.87	142	
7.5	19.05	0.87550	137.06	137	
8.0	20.32	0.90421	132.71	133	
8.5	21.59	0.93204	128.75	129	
9.0	22.86	0.95906	125.12	125	
9.5	24.13	0.98535	121.78	122	
10.0	25.40	1.01094	118.70	119	
10.5	26.67	1.03591	115.84	116	
11.0	27.94	1.06029	113.18	113	
11.5	29.21	1.08412	110.69	111	
12.0	30.48	1.10743	108.36	108	**1 foot**
12.5	31.75	1.13027	106.17	106	
13.0	33.02	1.15265	104.11	104	
13.5	34.29	1.17461	102.16	102	
14.0	35.56	1.19616	100.32	100	
14.5	36.83	1.21734	98.58	99	

17. This table can be extended to 4 feet (MM 54), 5 feet (MM 48), and 6 feet (MM 44), with corresponding gradations between.

15.0	38.10	1.23815	96.92	97	
15.5	39.37	1.25861	95.34	95	
16.0	40.64	1.27875	93.84	94	
16.5	41.91	1.29858	92.41	92	
17.0	43.18	1.31811	91.04	91	
17.5	44.45	1.33735	89.73	90	
18.0	45.72	1.35632	88.47	88	
18.5	46.99	1.37503	87.27	87	
19.0	48.26	1.39349	86.11	86	
19.5	49.53	1.41171	85.00	85	
20.0	50.80	1.42969	83.93	84	
20.5	52.07	1.44745	82.90	83	
21.0	53.34	1.46500	81.91	82	
21.5	54.61	1.48233	80.95	81	
22.0	55.88	1.49947	80.03	80	
22.5	57.15	1.51641	79.13	79	
23.0	58.42	1.53317	78.27	78	
23.5	59.69	1.54975	77.43	77	
24.0	60.69	1.56615	76.62	77	**2 feet**
24.5	62.23	1.58238	75.84	76	
25.0	63.50	1.59844	75.07	75	
25.5	64.77	1.61435	74.33	74	
26.0	66.04	1.63010	73.62	74	
26.5	67.31	1.64570	72.92	73	
27.0	68.58	1.66115	72.24	72	
27.5	69.85	1.67646	71.58	72	
28.0	71.12	1.69163	70.94	71	
28.5	72.39	1.70667	70.31	70	
29.0	73.66	1.72157	69.70	70	
29.5	74.93	1.73635	69.11	69	
30.0	76.20	1.75100	68.53	69	
30.5	77.47	1.76554	67.97	68	
31.0	78.74	1.77995	67.42	67	
31.5	80.01	1.79425	66.88	67	
32.0	81.28	1.80843	66.36	66	
32.5	82.55	1.82250	65.84	66	
33.0	83.82	1.83647	65.34	65	
33.5	85.09	1.80533	64.85	65	
34.0	86.36	1.86409	64.37	64	
34.5	87.63	1.87774	63.91	64	

35.0	88.90	1.89130	63.45	63	
35.5	90.17	1.90476	63.00	63	
36.00	91.44	1.91813	62.56	63	**3 feet**

Both manuscript and printed pendulum indications can be found in the music of the English glee, whose greatest popularity coincided with the reign of George III. Many of the marginal notes giving pendulum lengths in that repertoire, though, were made by hand after publication, leaving as datable only a handful of printed indications pre-dating the metronome, mostly from right at the turn of the nineteenth century. Some of those specifically cite Crotch as their authority. In William Horsley's *Second Collection of Glees . . . Op. 4* (*ca.* 1804), the composer notes tempos according to the "useful method suggested by Dr. Crotch in the *Monthly Magazine* for Jany. [sic] 1800." Horsley's glee, "Beauty, sweet love" bears the printed header: "A pend. 3 feet long will vibrate the [quarter-note]." This piece appeared in Horsley's first collection, which should probably be dated *ca.* 1801. Crotch himself included pendulum lengths as tempo indicators in his *Specimens of Various Styles of Music* . . . (See note 7), and marked some publications with both pendulum lengths and metronome marks, as in "Sweet sylvan scenes" (of Appendix 2).

The present writer has collected pendulum length tempo indications for a number of English glees, a number of which are multi-movement pieces. Some of those are of uncertain provenance; in other cases manuscript marks that might have been interpreted as pendulum lengths are ambiguous (e.g., a marginal manuscript note such as: 22") or were entered after publication at an unascertainable date. Others, though, bear printed pendulum lengths on dated or datable publications. This body of music provides a chronological sampling of a geographically focused, stylistically coherent repertoire subject to the approbation of the noblemen and gentlemen amateurs for which the composers wrote.[18] It is an ideal body of music to study because of the social and economic forces that have kept the genre relatively constricted.

The following examination of tempos found in glees includes only those pieces for which I have been able to establish provenance and in which pendulum lengths or metronome indications were printed as part of the original publication. I have also included for comparison a number of glees published with only metronome markings, chosen because they met

18. For a discussion of the influence of these clubs on the musical style of the glee in Georgian England, see the present writer's "The Corporate Muse," *Journal of the Catch Society of America* (Spring 1969): 3-13.

the following criteria: (1) they were written by a composer who had published glees before 1801, (2) they were stylistically consistent with glees bearing pendulum lengths only; i.e., there were no startling innovations in harmony, structure or melodic style, and/or (3) they achieved popularity among the audience for which the pendulum-notated glees found acceptance: the gentleman's singing clubs.

Where a piece was later republished with pendulum lengths changed to metronome markings, both are shown in the chart. The two markings are usually identical, or almost so, in speed. If there are variances they are in the neighborhood of 1% to 2%, a negligible amount, and in tempos faster than *largo*, indistinguishable. William Crotch's own glee, "Sweet sylvan scenes,"[19] has a tempo marking of "Eighth-note = 100 (MM) or 14" pendalum" [sic] for *Larghetto*, 3/4. As a glance at Figure 3 will show, a 14" pendulum beats 98.58 times per minute, a variance of only 1.42% from the metronome mark. His glee of that same year, *On Returning to Heathfield Park*,[20] (also 3/4 meter) gives "Quarter-note = Maelzel's Met. #84, Pendalum [sic] 21 inches." A twenty-one inch pendulum beats 81.91 times per minute, an "error" of only 2.49%. A summary of glees with published tempo markings follows in **Appendix 2.**

The first two columns of **Appendix 2** are self-explanatory. Multiple movements of the same glee are indicated by using the opening text of the first movement to represent all the movements as a way of quickly showing their common identification for this analysis. Column "C" (headed, "Volume ID") is a short-title reference to the publication. The next three columns (D-F) indicate the page number, year of publication and movement for multi-movement pieces. The crux of the chart is in columns "G-M." Column "G" indicates the "beat note" value, while columns "H" and "I" represent the published metronome mark and/or pendulum length. Column "J" gives the tempo, either as a metronome mark computed from the pendulum length or as the original metronome mark. Columns "K" and "L" combine to show the meter signature and column "M" gives the tempo or character word for that movement if any is present.

There are too few examples to arrive at anything but the most tentative conclusions about what can be learned from this. We can see, for

19. London: Royal Harmonic Institution. Copies in the London College of Music, and the British Library, give the date of publication as *ca.* 1800; however, in the light of the presence of a metronome mark *ca.* 1816 might be more accurate.

20. "Hail all the dear delights once more," London: Royal Harmonic Institution, *ca.* 1816? (c.f. note 19). Copies are in the British Library and the London College of Music.

example, that *larghetto* is the most common tempo word (12 occurrences in 81 observations, almost 15% of the total) or that *allegro* and *allegro moderato* do not seem especially fast — not as fast as the single *tempo giusto* represented here. As yet, though, we cannot build any kind of structure on this information that could be extended with confidence beyond this group of compositions. It is possible, though, that further statistical study of this material may yield some valuable evidence, and work is beginning to take shape in that direction. Even that, though, will require a broader range of examples from the glee repertoire and/or from other sources. Part of the intent of this article is to call attention to these findings in the hope that others, too, will begin to recognize obscure notations as possibly referring to pendulum length.

Because of its simplicity, accuracy, and history of practical use, the pendulum shows promise of being a useful tool for examing tempos of this period, and scholars are alerted to the appearance of notes such as "14 inches the quaver." Statistical study and extrapolation based on Galileo's law governing the relationship between a pendulum's length and its oscillation carry a possibility of establishing related values for the Italian tempo words in English use. Crotch's "Remarks" provide a key to eighteenth century English tempos based on the judgment of musicians rather than clockmakers, one that is objective rather than speculative, and one that improves our understanding of English tempos in the period immediately preceding the invention of the metronome.

Appendix 1

William Crotch's "Tables of Times of the Various Pieces, Measured by a Pendulum, " *Monthly Magazine*, Jan. 1, 1800

Time	Name of the Pieces	Composer	Time	Notes which one Swing of the Pendulum expresses.	Length of the Pendulum |——————| Feet	Inches	Equiv. MM.
Grave	Chorus, "Since by man came death"	Handel	C	Quaver	2	6	69
	1st mov't, overture to The Messiah	Handel	C	ditto	0	10 1/2	116
Largo	Song, "Sommi Dei," in Radamisto	Handel	3/4	ditto	1	0	108
	4th movement in the Passione Stromentale	Haydn	3/4	ditto	0	10	119
	Song, "He was despised"	Haydn	C	ditto	3	3	60
	Chorus, "Worthy is the lamb"	Haydn	C	ditto	2	0	77
Larghetto	Air, "Their sound is gone out" (Messiah)	Handel	C	ditto	1	4	94
	Chorus, "Blessing and honour"		C	ditto	0	7	142
	Chorus, "Let us break their bonds"		3/4	ditto	0	6	153
	Duetto, "Deh quel pianto"	Bach	3/4	ditto	1	0	108
Adagio	Aria, "Il consine della vita"	Handel	C	ditto	2	10	64
	Sonata second Op. 42	Haydn	2/4	ditto	1	6	88
	5th mov't. of the Passione Stromentale	Haydn	C	ditto	0	9	125

Lento	Middle mov't of Sonata I, Op. 25	Clementi	2/4	ditto	2	6	69
	6th mov't. of the Passione Stromentale	Haydn	C	ditto	0	6	153
Andante	Duett, "O Death," Messiah	Handel	C	ditto	0	6	153
	Air, "Every Valley"	ditto	C	ditto	1	7	86
	Middle Mov't. of Sinfonia in C	Haydn	2/4	ditto	1	0	108
	Middle mov't. of overture Festino	ditto	2/4	ditto	2	3	72
Andantino	Middle mov't of Sonata II, Op. 21	Kozeluch	6/8	ditto	1	6	88
	Ditto in overture La reine de la France	Haydn	C	Minim	2	8	66
Allegretto	Last mov't. of Sonata III, Op. 21	Kozeluch	2/4	Crochet	1	6	88
	Entr'acte of the Overture Henry IV	Martini	2/4	ditto	1	0	108
Allegro	Chorus, "And the glory of the Lord"	Handel	3/4	ditto	1	0	108
	Finale to fourth sonata, Op. 17	Haydn	3/4	ditto	0	6	153
	Chorus, "He trusted in God"	Handel	C	ditto	1	5	91
	Air, "Se il ciel mi divide"	Piccini	C	ditto	0	8	133
Vivace	Second Oboe concerto	Handel	3/4	ditto	1	6	88
	Overture Roxalana	Haydn	3/4	ditto	0	5	168

Alla Breve	Chorus, "And with his stripes"	Handel	¢	Minim	1	2	100
	Chorus, "Throughout the land" - Solomon	Handel	¢	ditto	1	9	82
Presto	Last movement of La Chasse	Kozeluch	2/4	ditto	1	9	82
	Ditto of Sonata I, Op. 25	Haydn	2/4	ditto	1	0	108
Prestissimo	Last mov't. of "But who may abide"	Handel	C	ditto	2	0	77
	Ditto of Sonata II, Op. 17	Haydn	6/8	Dotted Crotchet	0	5	168

APPENDIX 2
Glees Bearing Pendulum Length and/or Metronome Marks

(A) Composition (Represented by Text Incipit)	(B) Composer	(C) Publication Bibliography Volume ID	(D) Pub.	(E) Page	(F) Mvt.	(G) Nt	(H) Tempo MM	(I) Tempo PL	(J) Computed MM	(K) Meter Bt	(L) Meter NV	(M) Verbal Indication of Tempo/Style/Mood
Awake fair maid	Horsley	Horsley II	1804	14	1	Q		16	94	4	4	*With animation, but not too fast*
Awake fair maid	Horsley	Horsley II	1804		2	Q		30	69	3	4	*Tenderly*
Awake thou	Horsley	Horsley II	1804			Q		20	84			
Beauty, sweet love	Horsley	Horsley II	1801			Q		36	63	3	4	
Begin the charm	Attwood	Attwood	1827	18	1	Q	50		50	3	4	*Larghetto*
Begin the charm	Attwood	Attwood	1827		2	Q	92		92	2	4	*Allegro*
Begin the charm	Attwood	Attwood	1827		3	E	92		92	6	8	*Siciliano*
Blest is the fairy hour	Horsley	Horsley I	1801	20		Q		20	84	3	4	*Larghetto e Sostenuto*
Blow thou winter wind	Webbe	Webbe Coll	1830	24	1	Q	108		108	4	4	*Tempo giusto*
Blow thou winter wind	Webbe	Webbe Coll	1830		2	Q	76		76	4	4	*Un poco vivace, grazioso*
Blow thou winter wind	Webbe	Webbe Coll	1830		3	E	92		92	4	4	*Larghetto*
Cold is Cadwallow's tongue	Horsley	Horsley VH (VII)	1807	751		H		40	59	4	4	

Come Lelia fill the goblet up	Horsley	Horsley I	1801	40		E		4	188	2	4	*Allegretto*
Come sons of summer	King	King 4	1818?	22	1	Q	160		160	4	4	*Vivace spiritoso*
Come sons of summer	King	King 4	1818?		2	Q+	70		70	6	8	*Pastorale, poco allto.*
Crown the passing	Horsley	Single issue	1822			Q	76		76	2	4	*With animation*
Dear innocence where e'er	Horsley	Op. 3	1806	7		Q		28	71	3	4	*With expression*
Dearest do not now	Horsley	Op. 3	1806	10		Q		22	80	2	4	*With expression but not too slow*
Etherial race	Horsley	Horsley II	1804	18		Q		42	58	3	4	
For fragrant sweets	Overend	Single issue	1780			E		12	108	3	8	
Go tuneful bird	Crotch	Single issue	1815			Q		10	119	4	4	*Allegro moderato.*
Gone is my heart	Horsley	Horsley I	1801	42		Q		36	63	4	4	
Good folk	Horsley	Horsley 4th	1827	12	1	Q	72		72	4	4	*Slowly*
Good folk	Horsley	Horsley 4th	1827		2	Q	144		144	4	4	*Faster*
Good folk	Horsley	Horsley 4th	1827		3	Q	80		80	4	4	*Rather Slower*
Hail all the dear	Crotch	Single issue	1810			E	84	21	84	3	4	*Larghetto*
Hail sympathy	Crotch	Single issue	1819		1	Q		15	97	3	4	*Allegro*
Hail sympathy	Crotch	Single issue	1819		2	E		14	100			*Larghetto*
Hark! How the sacred	Attwood	Attwood	1827	35		Q	52		52	4	4	*Largo*
Haste my charmer	Horsley	Op. 3	1806	4		Q		12	108	4	4	*Cheerfully*
Here my Cloe	Horsley	Horsley II	1804	29		H		42	58	3	2	
I never knew a sprightly fair	Webbe	Webbe Coll	1830	93		Q	132		132	2	4	*Vivace*
In April	King	King 4	1818?	10		Q	160		160	3	4	*Allegro moderato.*
In glorious dress	Webbe	Webbe Coll	1830	49	1	Q	52		52	4	4	*Larghetto grazioso*

she comes												
In glorious dress she comes	Webbe	Webbe Coll	1830		2	Q	76		76	4	4	*Larghetto*
In this fair vale	Attwood	Attwood	1827	1		Q+	52		52	6	8	*Andante*
In this fair vale	Horsley	Horsley II	1804	38		Q		8	133	4	4	
Little lowly hermitage, A	King	King 4	1818?	16	1	Q	100		100	4	4	*Moderato*
Little lowly hermitage, A	King	King 4	1818?		2	H	88		88	2	2	*Moderato*
Little lowly hermitage, A	King	King 4	1818?		3	Q+	88		88	6	8	*Andante ed affetuoso*
More sweet than odours	Attwood	Attwood	1827	39		E	112		112	6	8	*Larghetto*
My pretty maids so blythe	Webbe	Webbe Coll	1830	2	1	Q+	72		72	6	8	*Allegretto*
My pretty maids so blythe	Webbe	Webbe Coll	1830		2	Q	80		80	4	4	*Andante*
No longer cry	Horsley	Horsley 4th	1827		1	Q	112		112	4	4	*Moderately Fast*
No longer cry	Horsley	Horsley 4th	1827	7	2	Q	92		92	3	4	*Expressively*
No radiant pearl	Attwood	Attwood	1827	58		Q	88		88	4	4	*Moderato*
O may I steal	Horsley	Horsley II	1804	34		H		34	64	3	2	
O nightingale	Horsley	Vocal Harm IX	1807	885	1	Q	60		60	4	4	*Moderately*
O nightingale	Horsley	Vocal Harm IX	1807		2	Q+	92		92	6	8	*With animation (much)*
O nightingale	Horsley	Vocal Harm IX	1807		3	H	69		69	3	2	*With expression*
O nightingale	Horsley	Vocal Harm IX	1807		4	H	76		76	3	2	*Moderately fast*
O sad and watchful	Horsley	Horsley I	1801	31		Q		24	77	4	4	
On parent knees	Webbe	Webbe Coll	1830	80		Q	84		84	4	4	*Andantino*
Piu bianca giglio	Knyvett	Knyvett Airs	1813	8		Q	60		60	2	4	*Andante*

Rest gentle youth	Horsley	Horsley II	1804			Q		30	69			
Robin Adair	Knyvett	Knyvett Airs	1813	1		Q	63		63	3	4	*Andante*
See how fair Flora	Horsley	Horsley II	1804			Q		36	63			
See the chariot	Horsley	Horsley II	1804	7		Q		12	108	4	4	
Snowdon on Mona calls	Crotch	Single issue	1815		1	Q		8	133	4	4	*Moderato*
Snowdon	Crotch	Single issue	1815		2	Q		15	97	4	4	*Largo*
Snowdon	Crotch	Single issue	1815		3	Q		8	133	6	4	*Moderato*
Snowdon	Crotch	Single issue	1815		4	H		20	84	4	4	*Allegro moderato.*
Snowdon	Crotch	Single issue	1815		5	Q		28	71	3	4	*Larghetto*
Soft murm'ring bee	Horsley	Op. 3	1806	1	1	Q		24	77	3	4	*Tenderly but not too slow*
Soft murm'ring bee	Horsley	Op. 3	1806		2	Q		18	88	3	4	*With animation*
Sweet bird that sing'st	J.P.	Single issue	1800			E		12	108	3	8	*Andante*
Sweet sylvan scenes	Crotch	Single Issue	1810?			E	100	14	100	3	4	*Larghetto*
Tears o'er my parted Thirza	Webbe	Webbe Post.	1840	19	1	Q	63		63	3	4	*Larghetto*
Tears o'er my parted Thirza	Webbe	Webbe Post.	1840		2	Q	72		72	4	4	*Grave*
Tell me	Horsley	Horsley II	1804	1		Q		15	97	4	4	*Moderately*
There is a mild and tranquil	Attwood	Attwood	1827	9		Q	50		50	4	4	*Larghetto*
There went three kings	Attwood	Attwood	1827		2	Q+	63		63	6	8	*Andantino*
There went three kings	Attwood	Attwood	1827		3	H	108		108	4	4	*Allegro di Molto*
There went three kings	Attwood	Attwood	1827		4	Q+	66		66	6	8	*Andante*

There went three kings	Attwood	Attwood	1827		5	Q	88		88	4	4	*Tempo Primo*
Thou who didst	Horsley	Vocal Harm IX	1807	894	1	Q	60		60	4	4	*Slowly*
Thou who didst	Horsley	Vocal Harm IX	1807		2	Q	76		76	4	4	*With animation (great)*
Thou who didst	Horsley	Vocal Harm IX	1807		3	Q	80		80	3	4	*Moderately*
Thou who didst	Horsley	Vocal Harm IX	1807		4	H	72		72	3	2	*Moderately*
To love thee, O my Emma	Crotch	Single issue	1800			Q		8	133	4	4	*Vivace*
Tourne thee to thie shepster	Horsley	Horsley I	1801	24		Q		24	77	4	4	*Lively but not too fast*
Wake now my love	Horsley	Horsley I	1801	11		Q+		20	84	6	8	*Allegro*
Wassail	King	King 4	1818?	1	1	Q+	95		95	6	8	*Vivace*
Wassail	King	King 4	1818?		2	H	95		95	2	4	*Allegro vivace*
What nature, alas, has denied	Attwood	Attwood	1827	26		Q+	56		56	6	8	*Siciliano*
What sing the sweet birds	Horsley	Horsley II	1804			[Q]		24	77			
When clouds that angel face	Attwood	Attwood	1827	65	1	Q	80		80	4	4	*Moderato*
When clouds that angel face	Attwood	Attwood	1827		2	Q+	66		66	9	8	*Andantino con Espressione*
When gath'ring clouds	Knyvett	Knyvett Airs	1813	16		Q	63		63	4	4	*Andantino*
When 'tis night	Knyvett	Knyvett Airs	1813	21		Q	116		116	4	4	*Moderato*
Whilst with village maids	Knyvett	Knyvett Airs	1813	28		Q	72		72	4	4	*Moderato*
Why does azure deck the sky?	Horsley	Op. 3	1806	14		Q		12	108	4	4	*Lively*

Why gentle shepherd	Horsley	Horsley I	1801	34	Q	24	77	4	4	*Dolcamente [sic]*
Ye banks and braes	Knyvett	Knyvett Airs	1813	12	Q+	88	88	6	8	*Moderato*