THE PRINCIPLE AND THE ELEMENTS:

RAMEAU'S CONTROVERSY

WITH D'ALEMBERT

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Jean-Philippe Rameau and Jean le Rond d'Alembert could hardly have predicted, at the time their paths first crossed, that they would eventually become bitter enemies. Certainly, conditions more propitious for an enduring friendship would be difficult to imagine. The circumstances under which the two men actually became acquainted are not known in any great detail, but the most reliable indications are that the philosopher-mathematician d'Alembert met Rameau through Denis Diderot, with whom he shared the editorship of the Encyclopédie, ou dictionnaire raisonné des sciences. Diderot had been rather closely associated with Rameau for a time, serving as his literary advisor while the great musician was writing his Mémoire, où l'on expose les fondemens du Système de musique théorique et pratique de M. Rameau. D'Alembert, a member of the Académie des Sciences, was on the committee of three which reviewed this work after Rameau read it to the Académie in 1749. This was probably d'Alembert's first exposure to Rameau's theoretical writings.

To judge from ensuing events, it would seem that d'Alembert quickly developed quite an admiration for Rameau, even beyond that indicated by his favorable, though restrained, review of the Mémoire. In the "Discours préliminaire des éditeurs" which appeared in volume I (1751)
of the *Encyclopédie*, d'Alembert included a glowing tribute to Rameau the musician. Rameau's accomplishments as a composer, he noted, were magnificent,

but what distinguishes him more particularly, is that he has reflected with much success on the theory of this same art; that he has found, in the fundamental bass, the principle of harmony and of melody; that by this means he has reduced to simpler and more certain laws a science confined before him to arbitrary rules, or [rules] dictated by blind experiment.²

Even more striking evidence of d'Alembert's high regard for Rameau's work appeared shortly before the end of the year 1750, when d'Alembert sent Rameau a manuscript of his *Elémens de musique, théorique et pratique, suivant les principes de M. Rameau*, accompanied by a short, friendly letter in which he asked Rameau to read the treatise at his leisure and make brief suggestions for revision.³ When the work was published in 1752, Rameau was unstinting in his praise: "The advancement of my art has been the principal reason for my late-night travails. The most gratifying reward that I could imagine is the approbation and esteem of scholars."⁴

Only a few years later, however, Rameau found cause for complaint about the manner in which his theories were being represented—and, in his eyes, obliquely attacked—in other publications. The first five volumes of the *Encyclopédie* included a number of articles on music written by Rousseau; Rameau judged these incorrect on various points and published extensive criticisms of them (*Erreurs sur la musique dans l'Encyclopédie*, of 1755; *Suite des Erreurs*, 1756).⁵ D'Alembert, however, came to Rousseau's defense: first, in the "Discours préliminaire" to volume VI (1756) of the *Encyclopédie*; then in volume VII (1757), in the articles "Fondamental" and "Gamme."⁶ These two articles addressed certain aspects of Rameau's theories in an unmistakably critical manner; and although three years passed before Rameau's reply, he clearly regarded his response as a matter of great importance. The result was the following exchange of letters, all of which appeared in print:

Rameau: *Lettre à M. D'Alembert, sur ses opinions en musique* (1760; bound together with the *Code de musique pratique* and *Nouvelles réflexions sur le principe sonore*)
d'Alembert: *Lettre à M. Rameau* (*Mercure de France*, April 1761)
Rameau: *Réponse à la Lettre de M. D'Alembert, qu'on vient de lire* (*Mercure*, April 1761)
Rameau: *Suite de la Réponse* (*Mercure*, July 1761)
d'Alembert: *Réponse à une Lettre imprimée de M. Rameau* (*Mercure*, March 1762)
The dispute, however, did not end there. D'Alembert subsequently replaced the preface of his *Éléments*, in the new edition of 1762, with a *Discours préliminaire.* Here he restated his position and answered indirectly some of the charges made by Rameau. The new edition also incorporated some significant changes in the text proper, consisting mostly of critical commentary on Rameau's theories; in some cases, d'Alembert supplied alternatives to Rameau's explanations of musical phenomena. Also relevant is Rameau's *Controverse*, which was issued bound together with his *Origine des sciences* (1762), and which answered d'Alembert's second letter.

This is a considerable amount of material, and we might well wonder why such an extensive controversy developed in the first place. To ask this question is really to ask two other, more specific questions: (1) why d'Alembert felt called upon to react at all to Rameau's accusations; (2) why Rameau continually pressed the attack, making an enemy of a man whose friendship he had reason to value highly. Fortunately, most of the historical background to this quarrel has already been unearthed. At the risk of duplicating information readily available elsewhere, we offer the following synopsis:

(1) The position of the Encyclopedists in mid-eighteenth-century France was far from secure. Diderot and d'Alembert were suspected in some quarters of being anti-Church and anti-France, and they had powerful enemies among the Jesuits and at court. These people had already succeeded once in obtaining the temporary suppression of the *Encyclopédie*; in 1755, the year of Rameau's first published attacks on Rousseau, the great enterprise was back in operation but was being watched very carefully. D'Alembert in particular was determined not to let anything stand in the way of the *Encyclopédie*'s progress; he viewed Rameau's fusillade against Rousseau as a real danger mainly, it seems, because certain of the *Encyclopédie*'s detractors saw an opportunity to exploit the situation and drew more attention to the *Erreurs* than it would otherwise have attracted. D'Alembert's anxiety on this score seems to have motivated his rather harsh rebuke to Rameau in volume VI of the *Encyclopédie.* Apparently, d'Alembert hoped that this single, succinctly worded response would serve to discourage Rameau from pursuing the matter any further. D'Alembert may not have realized that his subsequent articles for volume VII would present such a provocation to Rameau; but in any case, during the dispute which followed, d'Alembert evidently saw the fate of the *Encyclopédie* at stake and placed his concern for its survival above personal friendship.

(2) Rameau had aspired to membership in the Académie for some time, probably as far back as the publication of his *Génération harmonique* in 1737. Well aware of his own shortcomings as a writer,
Rameau had secured Diderot's aid in setting forth his ideas in order to give his Mémoire the best possible chance of winning favor with the members of the Académie. Eminence in the world of science was something which Rameau felt was his due, owing to certain features of his theories to be discussed below. When Rousseau and d'Alembert, in their Encyclopédie articles, did not embrace wholeheartedly his conclusions about the power of the principe sonore, Rameau thought that he detected an implicit intention on their part of undermining his scientific reputation, and he reacted vigorously—eventually desperately—in an attempt to salvage his position.

Under the circumstances, then, it is not difficult to understand the acrimonious nature of the debate. Yet was this simply an occasion for trading insults? Has the controversy no importance other than its political origins and consequences? And is it so obvious, as one contemporary authority would have us believe, that d'Alembert won the exchange? To be sure, Rameau does strike the reader as the less articulate of the two; d'Alembert was a typical académicien in that he strove in all of his writings (including his contributions to a number of other controversies) for the kind of clarity that would make his ideas accessible to as wide an audience as possible. It is also true that d'Alembert resorted less often than Rameau to aspersions concerning his opponent's intellectual capacity, musical acuity, and literary competence. But to depict the controversy merely—or even at all—as an unequal contest between the senile ravings of the musician and the coolly logical pronouncements of the philosopher is to render far too simplistic a judgment. Behind the haze of diatribe, substantive issues were being argued.

Because each letter dealt with a vast range of theoretical matters, a strictly chronological treatment of the episodes in the controversy would not be particularly fruitful. In this discussion the focal points of disagreement will be considered one by one, in an order ranging roughly from general to specific. While the primary material for discussion will be the actual documents of the controversy, we will have occasion as well from time to time to draw on the revised Eléments and some of Rameau's earlier work, in cases where these provide essential background to the present debate. What all of this is meant to demonstrate is that d'Alembert's working assumptions about the nature of musical theory were not at all what Rameau had, apparently, at first taken them to be. By charting the controversy, we will see that d'Alembert's point of view emerged, ultimately, as vastly different from that of the man whose theories he had sought to promulgate.

Rameau and d'Alembert disagreed at some length on an issue which became crucial to other aspects of their dispute: the relevance of mathematics to music and the place of music among the sciences. It was
an area in which Rameau was especially vulnerable, for his opinions on the subject were of a highly speculative nature. He often resorted to sweeping assertions, presented as postulates needing no further support:

Everything had been established in nature, before our reason could exert itself in eliciting any of her secrets; consequently, the sciences already contained these proportions and ratios, of which we could only have received some idea from the effects that we experienced from them; ideas which are the only source of this inquiry.  

Music must have given man his first inkling of the existence of these proportions. he argued, because unlike the other sciences, which are accessible only through the powers of vision, music reaches him through three senses: hearing, touch, and vision. Thus it was (Rameau continued) that Pythagoras, who made such considerable contributions to arithmetic (which in turn made geometry possible), also discovered the numerical ratios which describe the sizes of intervals:

Is not geometry based on arithmetic, and arithmetic upon proportions? Scarceley has a sonorous body sounded, when the ear is struck by a delightful proportion. Soon after, we discover there the proportions upon which alone all of geometry is based.

For Rameau, the relationships between music and other disciplines were not of primary importance in and of themselves. Rather, they were significant to him mainly because the disciplines thus connected with music were sciences; therefore, he reasoned, music itself is based on scientific principles. Accordingly, Rameau devoted considerable effort to establishing beyond the shadow of a doubt that the harmonic series produced by the *corps sonore* is directly given by nature—for, once this had been accomplished, an attempt could be made to prove that everything in music arises inevitably from this single phenomenon.

Taking Rousseau’s part, however, in the quarrel over the articles in the *Encyclopédie*, d’Alembert asserted that his colleague “had proven conclusively, in the article on ‘Consonance,’ that the consideration of ratios is completely irrelevant in explaining the pleasure that consonant chords give us,” and that, furthermore, “the consideration of proportions is no less useless in the theory of music.” Rameau no doubt regarded the first of these statements as beside the point; after all, from his point of view, it was not the enjoyment of music that was at issue, but man’s understanding of why he enjoys it. As for the second, Rameau professed amazement that d’Alembert should cite the *corps sonore* as the source of the perfect triad, only to deny in the same breath the importance of proportions as organizational principles in music.

D’Alembert, for his part, contested the importance of this funda-
mental proportion as a means of eliciting the entire musical system, for
the following reasons. (1) none of the harmonics is actually audible in
the fundamental sound alone; (2) even when the overtones are sounded
artificially, the ear receives no idea of any proportions to be found
between them;17 (3) the intervals produced by a fundamental string
caus­ing other strings to sound are not used, in practice, exactly as given
by nature (that is, temperament is employed to adjust the fifth and
the third). Thus the corps sonore by itself cannot give rise to the musical
system, but can only provide clues to its structure.18

As for the proportions, d’Alembert found no rigorous mathematical
procedure connecting the major triad with the minor triad or any other
chords; for this reason, he saw no point in using three- or four-term
proportions merely for the purpose of chord description (for example,
4:5:6 for C-E-G, 10:12:15 for E-G-B, and so on). Ratios (two terms)
would suffice to identify sizes of the intervals from which chords
could be built. D’Alembert found this revision consistent with his
stated objective in the Elémens: the simplification of Rameau’s
theories.19

The significance of these differences of opinion should not be under-
estimated. They show that, even apart from the political exigencies that
led d’Alembert to criticize his former friend in such scathing terms, a
collision had been inevitable all along. Rameau, however vaguely he may
have been aware of the model that he was emulating, sought in his
later works to impose a Cartesian order upon his theories. Having
established, to his satisfaction, the pre-eminence of a single, general
principle, he then showed, or attempted to show, how all other musical
phenomena could be derived from it. Rameau’s faith in the validity of
this procedure was unshakeable; Cassirer’s description of the Cartesian
view applies well to him:

There is a definite path, a single uninterrupted chain of deduction,
which stretches from the highest and most general causes of natural
events down to the special laws of nature and even to every individual
effect, no matter how complex.20

But d’Alembert, a philosopher of the Enlightenment, could not agree
with the assumption fundamental to such systems: that one could
identify a general principle which would then be used, in fixed and
unchanging form, to explain all individual phenomena. This method of
procedure, so far as d’Alembert was concerned, was questionable even
if the general principle were arrived at through recognition of certain
specific facts. Indeed, in most Cartesian systems individual phenomena
provided some initial indication of what their “highest and most general
cause” might be. But for d’Alembert, as for other philosophers of the
Enlightenment, the formulation of the principle had to be the final,
not the preliminary step. Further, d’Alembert felt that attempts to discover ultimate causes were doomed to failure anyway:

The supreme Intelligence has drawn a veil before our feeble vision which we try in vain to remove. It is a sad lot for our curiosity and our pride, but it is the lot of humanity. We should conclude therefore at any rate that the systems, or rather, the dreams of the philosophers on most metaphysical questions deserve no place in a work exclusively intended to contain the real knowledge acquired by the human mind. 21

This basic philosophical opposition explains why Rameau’s treatise Démonstration du principe de l’harmonie (1750), which was simply a slightly revised version of the Mémoire, became such a source of animosity. D’Alembert took considerable umbrage at Rameau’s continual reference to his theories as “demonstrated;” he reminded Rameau that his treatise had not been submitted to the Académie under the title of “Démonstration,” and that the principles contained therein had not been approved as such (i.e. proven in the scientific sense). 22 Evidently, Rameau could not understand d’Alembert’s objection on this point. He cited the Académie’s statement, which gave his treatise credit for showing that mathematical principles could be applied to music with more usefulness than had previously been thought possible, and found this tantamount to allowing that a scientific basis for music had been established. 23 This earned him a rebuke from d’Alembert:

Do not grant these words an extension of meaning that they do not have, and which this company [the Académie] would repudiate, or rather, which it would have no need to repudiate. 24

The possibility that “perhaps harmony is governed by another, unknown principle, more general than that of the sonorous body” did not deny, for d’Alembert, the real value of Rameau’s work; for this reason he exhorted Rameau to admit that his basic principle did not account for everything in music. 25 But Rameau remained firmly convinced of the importance of that principle and made no such concession. To his mind, there had to be a single generator of the entire musical system, or there could be no theory of music at all.

Failure to agree on the nature and limits of musical theory was bound to have consequences when the particulars of Rameau’s work came up for discussion. Indeed, the difference between Rameau and d’Alembert can be gauged by d’Alembert’s treatment of even such essential matters of general application as the fundamental bass.

This, one of the principal features of Rameau’s theories, deserves a word of explanation. Rameau was the first to postulate an equivalence of function between chords that were identical in pitch content but
which had different bass notes. For example, C-E-G, E-G-C, and G-C-E (in each case spelling from lowest to highest) all had the same fundamental—that is, C. Accordingly, there could be found, separate and distinct from the *basso continuo*, a fundamental bass which was simply a succession of fundamental notes, one from each of the harmonies in a progression. The fundamental bass was not actually played, but in its abstract existence it served, for Rameau, as a representation of the origins of harmonies—for, in each chord, the fundamental note was the generator of the other notes, according to the principle of the sonorous body.

Not only the notes themselves but their order of succession in the fundamental bass as well arose from this principle. Rameau discovered that the interval between two adjacent notes in this succession was commonly a fifth, the next overtone after the octave. For actual music, Rameau could not always make this scheme work without exceptions, but for the generation of major and minor scales, Rameau limited intervals between consecutive bass notes to fifths. Not just any fifths, however: the fundamental bass that generated a scale (one bass note for each note in the scale; each bass note taking its octave, its fifth, or its third) would consist only of tonic, dominant, and subdominant fundamentals. These together comprised the *proportion triple*, expressed numerically as 1:3:9 and derived from the overtone series (dominant above and below the fundamental, e.g. F-C-G). Rameau’s accomplishment was quite impressive, for he seemed to have found a means of producing scales (and thus the entire diatonic contents of keys) from three fundamental notes which embodied the strongest of harmonic relationships, that of dominant to tonic.

D’Alembert, however, did not bother with the *proportion triple*, but instead simply identified the collection of three fundamental notes. He proceeded to defend this formulation by pointing out the logic inherent in its reliance on the fifth (the most important interval in the harmonic series) and in the fact that it described two motions of a fifth. The discrepancy between the two methods of derivation can be explained in part by the considerable changes that Rameau’s theories underwent during his lifetime. D’Alembert’s exposition of the fundamental bass did not, all in all, differ significantly from Rameau’s introduction to the subject in his *Traité de l’harmonie*, published thirty years before the *Elémens*. Throughout the controversy, in fact, d’Alembert frequently espoused theoretical constructs from Rameau’s earlier work that Rameau himself, who had in the meantime become more rigidly “scientific,” had since rejected.

Differences over the fundamental bass played a large role in debate about another central issue: whether or not melody originated entirely in harmony. For Rameau, there had never been any doubt about the
true relationship between the two; his theory about harmony and melody had remained in approximately the same form since the Traité. It may be summarized as follows: Chords are generated, each from its fundamental; and their order of succession and progression likewise is determined by the proportions arising from the sonorous body (or, as set forth in the Traité, from the divisions of a string, which amounted to the same thing). Melody was only a resultant, the outcome of harmonic processes. For this reason, ancient music must have been inferior to the music of the eighteenth century; although the Greeks had known of harmonic ratios, it was a well-documented fact (said Rameau) that their music had consisted only of melody.

D’Alembert agreed with Rameau’s assertion that contemporary music was more perfect than that of the ancients, but he remained skeptical about the claim that harmony always determined melody. Even if, generally speaking, the fundamental bass were the principle of melody and harmony, there were still some features of music that could not be accounted for by means of the fundamental bass; this led d’Alembert to conclude that harmony and melody were, in fact, mutually dependent, one on the other. More specifically, in the article “Fondamental” he held that, while a melody that had only one possible fundamental bass must indeed have been determined by that bass, the same could not be said for a melody with several different possibilities. Rameau attempted to prove his point, said d’Alembert, with the melodic figure G-C as an example, for which he claimed to have found twenty different basses. But “which would be the true fundamental bass among those twenty?” Did not this example show rather that the melody, at least in part, determined its bass? D’Alembert would seem to have been certain of the correct answer to the latter question, given the challenge that he presented to Rameau in his Réponse:

It remains for you to explain, Sir, . . . why persons born with natural ability can compose pleasing songs even without having the least knowledge of harmony.

Rameau did not respond directly to this, but the answer that he might have given can be gleaned from his statements about Greek music: that the principles of harmony were innately expressed in what the ancients had done (even though they had not actually practiced harmony), as was proved by the fact that their system of two conjunct tetrachords could be generated by the fundamental bass in its purest form (Ex. 1). Thus, by implication, the principles of harmony were embedded in all melodic practice. Further, in an earlier statement Rameau had already dealt with d’Alembert’s related assertion that melody was the principal focus of attention in music. Undoubtedly, Rameau answered, melody was the first “accessory to” harmonic
Example 1

Example 2

Example 3
progression that reached the man whose understanding of music was limited. To admit this, however, was not to deny the existence of an underlying harmonic framework to which melody owed its coherence.\textsuperscript{38}

The general issues discussed so far, while of obvious importance to Rameau and d’Alembert, were certainly not the sole focus of their dispute. In fact, a great deal of attention was devoted to more specific aspects of musical structure. These bear scrutiny as well, not only because of the considerable amount of space allotted to them in the articles of controversy, but also because they provide detailed support for the assertion that the attitudes of d’Alembert and Rameau towards musical theory differed in crucial ways. Reference to such specifics occurred in no particularly orderly fashion; the process of debate was haphazard at best. For our purposes, however, the following categories can be established: (1) the descending form of the minor scale; (2) the origins of dissonance; (3) identification of fundamental chord types; and (4) chords containing chromatic notes. These are discussed, in order, below.

(1) The problem of the “correct” descending form of the minor scale involved the fundamental bass and its application in a limited context. The series of exchanges on this score stemmed, as did many others, from one of the Encyclopédie articles. In “Gamme,” the author stated that it was very difficult to find the fundamental bass for this scale. Using A minor as an example, with available fundamental bass notes D, A, E, and B, he explained that only E could support scale note G, and only D could support F, but that such a stepwise succession in the bass was forbidden by fundamental bass rules.\textsuperscript{39} (In the ascending form, of course, there was no problem, for B would support F sharp.) Rameau, in reply, solved the difficulty by setting B in the bass against the F, justifying the tritone thus formed by identifying the implied harmony as B-D-F-A (see Ex. 2a).\textsuperscript{40}

D’Alembert disliked this solution, though, and thought the tritone unnecessary. Why not keep the F sharp in the descending form, he asked, even if G reverted to natural? Such a scale, he believed, would neither disturb the inner order of the (minor) mode nor produce the forbidden interval of the augmented second (see Ex. 2b).\textsuperscript{41} This solution was repeated in the Éléments; here also, as in the Encyclopédie, d’Alembert attributed to Rameau a third alternative, which Rameau neither mentioned nor commented upon in any of the letters related to the controversy. In this version (see Ex. 3), the seventh scale degree was treated as a passing note.\textsuperscript{42} Rameau seems to have been indisposed to argue against d’Alembert’s scale harmonization; in any case, he did not refer to it in the Controverse.\textsuperscript{43}
(2) For Rameau, the power of the fundamental to generate chords other than the major triad was the means by which dissonance originated. In his theoretical system, the interval of the seventh was the source of all dissonance; it arose from the corps sonore and was supported in harmony by the fundamental bass. Unfortunately, Rameau's work in this area was extremely susceptible to criticism, not only because of his "scientific" approach, but also because he subjected his theories about the origins of the seventh to constant revision.

A short digression is in order here. In the Traité, Rameau derived the seventh from the triad in essentially intuitive fashion: by adding a minor third above this major (perfect) chord, he produced, in the same operation, both the interval of the seventh and the "tonic dominant" (i.e. dominant seventh). Proceeding in similar manner with other kinds of triads, he showed how the other seventh chords could be formed.44 Once he had obtained the seventh, Rameau attempted to explain it as a fundamental interval by identifying it as the inversion of the second—which in turn resulted from harmonic division of the third—and as the square of the fourth.45

Four years later, in Nouveau Système de musique théorique, Rameau presented a new theory on the subject, relying in part on the increased importance that he had come to ascribe to the "subdominant" (formerly referred to merely as the "fourth note"). Rameau pointed out that the dominant seventh included both the dominant and subdominant fundamentals. The tendency of the dominant to progress to the tonic, in his view, gained strength from the union of the two dominants.46

Rameau's increasing involvement with the natural basis of music exerted considerable influence over his explanations in later treatises for the origin of dissonance. In the Génération, Rameau identified the proportion triple (1:3:9) as a major generative force, owing to the co-vibration principle.47 On this basis, Rameau began to make extensive use of proportions ostensibly derived from the proportion triple to represent chords. The dominant seventh was given as 36:45:54:64; all of the terms in this series are multiples of 1, 3, or 9, hence generated by them. This four-term proportion resulted from the addition of a minor third above the major triad; in analogous fashion, the minor seventh chord 27:32:40:48 originated in the addition of a minor third below this same triad.48 Rameau noted in the Génération that the added note in the dominant seventh was the root of the subdominant, but he went no further. Not until Nouvelles réflexions sur le principe sonore did he present his theory of proportions in combination with conjunction between dominant and subdominant fundamentals.49

It should come as no great surprise, then, that adherents to Rameau's theories might have had some difficulty following, from treatise to treatise, the frequent changes in his arguments. But Rameau was
unsparing in his criticism of what d’Alembert had written on the subject of dissonance for the Encyclopédie. Because d’Alembert had ventured to mention that the seventh was the inversion of the second, Rameau accused him of attempting to show the theory of proportions to bad advantage—that is, by placing emphasis upon a fact which Rameau, by the time of this controversy, no longer regarded as being of primary importance. Further, because d’Alembert had cited the union of the harmonic proportion with the arithmetic (i.e. union of dominant with subdominant) as justification for stacking thirds to produce seventh chords, Rameau asked, “Why, Sir, do you dwell upon an accessory fact, neglecting the essential?”—the “essential” in this case being the addition of a fourth term to the three-term proportion which produced the triad.50 Again, the fundamental disagreement mentioned earlier was at issue. In Rameau’s view, the seventh chords were properly explained as derivatives from a single source; d’Alembert, however, presented them only as products of manipulation of component intervals held in common. Hence, he saw the seventh chords as only indirectly connected with one another.

(3) Lack of agreement about the origins of dissonance also figured in ensuing arguments over the real number of fundamental harmonies. The principal issue here was the nature of the differences between the various kinds of seventh and sixth chords. Rameau identified two fundamental chords only: the perfect, and the seventh.51 D’Alembert counted each of the sevenths (dominant, minor, major, half-diminished, and diminished, to use their modern names) as a distinct fundamental type; adding to these five the major and minor triads, the major and minor sixth chords, and the augmented sixth, he arrived at a total of ten.52 Rameau did not even consider the last of these to be within the harmonic system, because it seemed to rely neither upon the fundamental bass nor upon the principles of supposition for its construction; more on this point appears under (4) below. D’Alembert’s choice of separate categories for the sevenths, and for the major and minor triads, may seem trivial as a difference of opinion; but like d’Alembert’s explanation for the formation of seventh chords, it is another indication of his basically non-generative approach to musical theory.

Chords containing the dissonant sixth were a more complicated issue. Rameau’s “double employment” of dissonance originated in the identification of two different functions for the § chord on the fourth scale degree: one, a subdominant harmony (“chord of the added sixth”) which resolved to the tonic; the other, the first inversion of the supertonic seventh (“chord of the great sixth”) which resolved to the dominant (Ex. 4).53 While Rameau treated these as having the same origin, for the purposes of classification, d’Alembert was quick to point out that, since Rameau referred to the chord of the added sixth as an
Example 4. *Treatise*, pp. 74 and 117

Example 5a

Example 5b
original form, not derived from the supertonic, it should therefore be admitted, on Rameau's list, as a separate type. As for himself, d'Alembert seemed content to regard the added sixth and great sixth as one and the same; his enumeration of ten fundamental types showed a distinction made only between major and minor. Clearly, literal form unqualified by function or presumed origin was his sole criterion for classification; here again, the bias is non-generative.

Rameau's rebuttal to this was feeble indeed; citing d'Alembert's point about distinction between the two sixth chords on the basis of function, he referred to the added sixth chord as only an exception that did not disprove the basic rule. That Rameau need not have answered in this fashion seems evident. He had already stressed, many times over, that all of the seventh chords did have different functions, and that they were not derived one from the other but rather found their origins in a common source. D'Alembert's objection on the specific subject of the sixth chords seems pointless.

(4) From these relatively simple matters, the argument shifted to the nature of the more complex chords containing chromatic notes. In his explanation of the origins and functions of these, Rameau commonly had recourse to the theory of supposition. Because familiarity with this theory is assumed as background to the controversy, the following summary is presented as a prelude to further discussion.

Rameau found that certain chords did not fit readily into the categories of triad and seventh because they could not be arranged in any normative pattern of stacked thirds without exceeding the distance of an octave above the lowest note. To do this was in direct violation of the rule of the octave, which stipulated that anything above that octave boundary had to be a duplication of some note below it. Hence the lowest note in such a chord could no longer function as the fundamental, but instead would be regarded as a sound added below the true fundamental (see Ex. 5a). In Ex. 5b, the chord of supposition is indicated by an asterisk.

Rameau did not consider the note generated below the fundamental in a chord of supposition to be a part of the fundamental chord; therefore, this "supernumerary" note could not participate in any inversions to which the fundamental chord might be subjected. Chords with chromatically augmented intervals, such as the augmented fifth ("chord of the augmented fifth") (Ex. 6a) and the "augmented" (i.e. major) seventh ("chord of the augmented seventh") (Ex. 6b) were also treated as products of supposition. The device of supposition thus provided Rameau with a means of treating a wide variety of vertical configurations independently of melodic considerations. Even though Rameau acknowledged in the Traité that some of the dissonances in these chords were suspensions, he discussed the origins of such dissonances solely

51
Example 6

Example 7
as the products of the fundamental bass and the addition of thirds.\textsuperscript{61}

In quite another category, however—in fact, in a class by itself—was the augmented sixth. Of this, Rameau said:

Such an interval... should not be confused with what we call a fundamental chord; it is subject neither to the fundamental bass nor to inversion; taste alone awards it the privileges that the leading tone has in harmony. It is not even to be compared to supposition, in which the fundamental harmony may be inverted at will by the composer, provided that the supernumerary note always stays below the bass.\textsuperscript{62}

D’Alembert, in his Réponse, raised a question about this description: If the augmented sixth has no fundamental bass, then what is it? Addressing Rameau, he demanded that his opponent “choose, then, either to rank this chord, as I have done, among the fundamental chords; or admit that the fundamental bass does not explain everything.”\textsuperscript{63} If Rameau had an answer for this, he never provided it in print. D’Alembert, in fact, would have done well to cite an example from Rameau’s own Code, in which a chord of the augmented sixth was assigned a fundamental bass note (Ex. 7).\textsuperscript{64} Instead, he contented himself with saying only (in the Elémens) that “it appears difficult to find the fundamental bass for this chord.”\textsuperscript{65}

Rameau may have lost the argument about the augmented sixth; but on the subject of the augmented triad, errors were made on both sides that were nothing but lapses of common sense. Rameau’s initial criticism of “Fondamental” included an attack on his opponent’s defense of the augmented triad as consonant. In this article, d’Alembert found no dissonance in a chord that consisted simply of two thirds, one above the other. He went on to say that the so-called augmented sixth chord was not really a sixth chord at all, for in F-A-B-D sharp, for example, the interval F-D sharp was actually a seventh. Further, he provided a list of chords (together with the augmented triad) that he thought should be admitted into practice, an exercise that produced such unlikely combinations as C-E flat-G sharp-B flat and C-E-G sharp-A.\textsuperscript{66} Rameau countered by insisting that the augmented triad had to be dissonant, because the naturally sounding fifth of C clashed with the G sharp in C-E-G sharp; but d’Alembert quickly dismissed his argument, replying that if this were true, then even C-E-G would be intolerable because of the G sharp generated by E.\textsuperscript{67}

Consonant or dissonant, the augmented triad evidently was little more than a curiosity to Rameau; in regarding it as dissonant, of course, he was perfectly in accord with contemporary practice. Such a chord might seem similar to others, such as C-E-G sharp-B-D, which included the notes of the augmented triad among its own, but in fact
there was a considerable difference between the two. In response to a challenge from d’Alembert, Rameau pointed out that the latter was a chord of supposition, whereas the augmented triad did not exceed the boundaries of the octave.  

Who won, then, after all? While the consensus at the time may well have been that Rameau was defeated—he lost both his bid for membership in the Académie and the friendship of the Encyclopedists—our verdict cannot be so unequivocal. Rameau wrote awkwardly, but he did manage to defend himself well on a number of points. His opponent’s arguments, on the other hand, were by no means impeccable; we have seen that d’Alembert often oversimplified for the sake of clarity. Moreover, the value of what d’Alembert had to say ultimately arose from the strengths of Rameau’s theories. Thus there was no clear winner. The real significance of the controversy lies elsewhere: not in its outcome as a contest, but in what it reveals of the relationship between Rameau’s work and d’Alembert’s explanation of it.

As far as the proposition that music has a scientific basis is concerned, of course, there can be no doubt that the burden of proof rested with Rameau. His inability to provide anything approaching a purely mathematical model for musical structure had plagued much of his work previous to his confrontation with d’Alembert, and its exposure in these letters was perhaps inevitable. But the controversy also displayed Rameau’s powers of observation and formulation, and these were second to none. His procedures for chord generation, his codification of inversion and the subdominant, and his concept of the fundamental bass as a governing factor in harmonic progression were all evidence of an astute and musically informed intelligence at work. His clear understanding of these phenomena in their practical application enabled him, in the course of the controversy, to point out the difference between the augmented sixth and other kinds of chromatic dissonance, to make a functional distinction between a simple chord and a more complicated formation that included the members of that chord among its elements, and even to defend a passage from one of his own operas that appeared superficially to violate voice-leading rules. Rameau’s work can thus be said to reflect an accurate assessment of the conventions of harmonic practice and a firm conviction that they could be accounted for in theoretical terms.

D’Alembert, for his part, acquitted himself very well in the controversy. He was not a musician, and lacking Rameau’s vast experience he was unable to appreciate, in many cases, the range of complexities in real musical situations that Rameau attempted—sometimes successfully, sometimes not—to deal with. Despite this disadvantage, d’Alembert’s keen intellect penetrated to the heart of the matter: he recognized that Rameau’s work was valuable precisely because it was, after all, empirical
in method. D'Alembert chose to ignore the claims made for a single, generative principle and instead presented chord forms and their progressions as phenomena that were connected to one another and to the sounding of the sonorous body, not by exactly defined mathematical procedures, but by the more indirect means of analogy and intuition. In this sense, there could have been no more appropriate choice than *Éléments de musique* for the title of his treatise. D'Alembert bade his readers remember that

> Into the theory of musical phenomena there always enters a sort of metaphysics, which these phenomena implicitly take for granted, and which brings to them a certain natural obscurity.

It is hard to avoid concluding that he was right.
NOTES

The author wishes to express his gratitude to Prof. Claude Palisca of Yale University, who provided many helpful suggestions for revision; and to Mlle. Joëlle Clergue, who assisted with several points of translation.


2. “Discours préliminaire des éditeurs,” *Encyclopédie, ou dictionnaire raisonné des sciences* etc., ed. MM. Diderot & D’Alembert (Paris, 1751–65), I, p. xxxii. “Mais ce qui le distingue plus particulièrement, c’est d’avoir refléchi avec beaucoup de succès sur la théorie de ce même Art; d’avoir su trouver dans la Basse fondamentale le principe de l’harmonie & de la mélodie; d’avoir réduit par ce moyen à des lois plus certaines & plus simples, une science livrée avant lui à des règles arbitraires, ou dictées par une expérience aveugle.” Unless otherwise noted, all translations in this paper are by the author.


5. These appear in *Writings*, V, pp. 195–261 and 309–30. The editors’ first choice for the author of the articles on music was Rameau, but he refused. The job was then assigned to Rousseau, who was expected to follow Rameau’s theories in the preparation of the articles. Unfortunately, Rameau had deeply wounded Rousseau several years before with a contemptuous assessment of some of Rousseau’s music. According to Richard A. Leigh (*Correspondance de Jean-Jacques Rousseau*, II [Geneva, 1965], appendix 95, p. 338), Rousseau believed that the commission from the *Encyclopédie* had given him an opportunity for revenge, but whatever openly disparaging allusions that he may have made to Rameau were probably tempered or even neutralized by d’Alembert, in his capacity as editor. Even in their sweetened form, however, the articles obviously displeased Rameau. Presumably, too, Rousseau’s criticism of French music in *Lettre sur la musique française* (1752) had not helped matters any, for Rameau had taken this pamphlet as a personal insult.

6. There exists some disagreement as to the authorship of these works. Alfred R. Oliver (*The Encyclopedists as Critics of Music* [New York, 1947], p. 108) ascribes the “Discours” of vol. VI to Diderot, but Doolittle’s assignment of responsibility to d’Alembert is more plausible, given what is known of d’Alem-
bert's almost militant attitude about the success of the *Encyclopédie*. As for the articles in vol. VII, Matthew Shirlaw (*The Theory of Harmony* [London, 1917; reprinted New York, 1969], p. 279) claims that these were "probably the work of Rousseau." However, both bear the *marque* of d'Alembert, and he defended them as his own (see *Réponse*, p. 478, p. 486).

7. The *Discours* was first published in the *Mercure de France*, February, 1762 (pp. 117-45).

8. Of some interest as well are two letters, published anonymously (as was the *Origine*) about a month later and apparently written by Rameau: *Lettre de M. — à M. D—* and *Seconde Lettre de M. — à M. —*. However, because these did not reply to anything in particular that d'Alembert wrote, and because they include nothing not found in the *Controverse*, their contents have been excluded from consideration here.

For further documentation of the events leading up to the controversy, consult the following volumes of *Writings*: IV, pp. xiii-xix, xlii-xlvi; V, pp. xxxv-xliv; VI, pp. xix-xxii, xxx-xxxv.


10. Rameau's name was not mentioned; d'Alembert made reference simply to the author of the *Érreurs*, which had been published anonymously.


12. Rameau, *Lettre à M D'Alembert*, in *Writings*, IV. p. 269. "Tout étoit établi dans la Nature, avant que notre raison pût s'exercer sur aucun de ses secrets; par conséquent les sciences contenoient déjà les proportions & les rapports, dont on n'a pu recevoir d'idées que des effets qu'on en a éprouvés; idées qui sont les uniques sources de cette spéculation . . ."


15. D'Alembert, "Fondamental," in *Encyclopédie*, VII (1757), p. 62. "... a très-bien prouvé, au mot CONSONANCE, que la considération des rapports est tout-à-fait illusoire pour rendre raison du plaisir que nous font les accords consonants; la considération des proportions n'est pas moins inutile dans la théorie de la Musique." The portion of this quotation following the semicolon was also cited by Rameau in his *Lettre à M. D'Alembert*, p. 268.


19. Ibid., p. xii.

22. Discours, p. xvi.
24. D'Alembert, *Réponse*, in *Writings*, VI, p. 480. "... ne donnez pas à ces paroles une extension qu'elles n'ont pas, & que cette Compagnie désavouerait, ou plutôt qu'elle n'aurait pas besoin de désavouer."
25. Discours, p. xvii. "... l'harmonie a peut-être quelqu'autre principe inconnu, plus générale que celui de la résonnance du corps sonore." D'Alembert's opinions about music in this respect square precisely with the more general expressions of his views found elsewhere in his writings. For the philosophers of the Enlightenment, principles were no longer absolute, but rather of only relative validity. D'Alembert gave voice to a general consensus when he stated that "the principles from which we proceed are themselves perhaps scarcely more than very remote derivations from the true principles which are unknown to us, and that, accordingly, they would perhaps merit rather the name of conclusions than that of principles. But it is not necessary that these conclusions be principles in themselves; it suffices that they be such for us." ("Éléments des Sciences," in *Encyclopédie*, V (1755), p. 493; quoted in Cassirer, p. 22.)
26. In his article, "Major-Minor Concepts and Modal Theory in Germany: 1592-1680" (*Journal of the American Musicological Society*, XXX [summer, 1977]), Joel Lester identifies Otto Siegfried Harnish (c. 1568-1623) and Johann Lipsius (1585-1612) as theorists predating Rameau who dealt with music in harmonic terms and who recognized a connection between the triad in "root position" and its "inversions." However, no theorist of that time, whatever attention he might have devoted to harmonic concerns, would have been willing to take the crucial step that Rameau did: of drawing *equivalences* between such chords, in terms of their function in a progression. This, after all, was the real significance of the fundamental bass. For Harnish, Lipsius, and others, these chords were no doubt related, but not in any sense equivalent. The idea of function, in fact, would have been entirely foreign to them.
27. In the original version of this theory, set forth in the *Traité*, Rameau referred, not to the sonorous body and its overtones, but rather to the string and its divisions. The first allusion to the sonorous body occurred later, in the *Génération harmonique* of 1737. As Philip Gossett points out, however, this did not reflect any fundamental change in the theory itself: "Only the 'natural' justification is changed. Here [in the *Traité*] the 'natural principle' is the undivided string; there it is the sonorous body. Here the chords and notes are derived by division of the string; there through the perception of overtones." (Rameau, *Treatise on Harmony*, translated, with an introduction and notes, by Philip Gossett [New York, 1971], p. xxi.)
28. See, for example, his analysis of the monologue "Enfin est-il en ma puissance" from Lully's *Armide*, which Rameau included in his treatise *Nouveau Système de musique théorique* (Writings, II, pp. 90-100), and which d'Alembert appended to his *Eléments*. In this analysis, the fundamental bass for the entire monologue is discovered and written out in full: it appears in score with the recitative itself, below the *basso continuo.*
29. Besides this essentially intuitive derivation, Rameau had a more "mathematical" justification for introducing the *proportion triple*: that is, the geometric
proportion 1:3:9, serving as an explanation for the progression of chords, complemented the arithmetic proportion 1:3:5, which was embodied in the major triad and explained the generation of chords.

The reliance on the dominant below, however, constituted a problem, for this “sub-dominant” could not be found in the overtone series in its natural form. See Joan Ferris, “The Evolution of Rameau’s Harmonic Theories,” in Journal of Music Theory, III/2 (November, 1959), pp. 231–56.

31. In the Lettre à M. D’Alembert, p. 278, for example, Rameau made his position clear by saying, of melody and harmony respectively, that “. . . il étoit impossible que des produits eussent plus de puissance sur leur générateur, que celui-ci sur eux.”
32. Controverse, p. 313.
33. Discours, p. v.
34. D’Alembert, Réponse, p. 484, p. 488.
35. “Fondamental,” pp. 60–61. Rameau’s twenty basses can be found in Nouveau Système, pp. 54–57.
36. D’Alembert, Réponse, p. 488. “. . . il vous resteroit à expliquer, Monsieur, . . . comment des personnes nées avec un gout naturel composent même des chants agréables, sans avoir la moindre teinture d’harmonie.”
37. Controverse, p. 318. Example 1 is taken from Rameau’s Nouvelles réflexions sur le principe sonore, in Writings, IV, p. 225.
38. Lettre à M. D’Alembert, p. 277 f.
39. “Gamme,” p. 464. D’Alembert was following Rameau in making use of four notes in the fundamental bass for scale generation, rather than the three of the proportion triple originally designated for this purpose (see pp. 12–13). The problem with three terms was that even for the major scale the fundamental bass could not be arranged so that it would move only by fifths; one succession had to occur otherwise. In the Traité Rameau tolerated this apparent anomaly, but in later treatises he sought to eliminate it. An alternate solution was proposed in the Démonstration which effected a “disjunction” between G and A in the scale (example below taken from the Démonstration, in Writings. III. p. 183: Planche CV):

Here, the acquisition of a fourth term was explained as “impingement” upon another key, a borrowing which Rameau identified by the word adjoint. In Nouvelles réflexions Rameau offered additional explanation, noting that the scale derivation given in the Démonstration “admits a fourth term to the proportion (1, \(\frac{1}{3}\), \(\frac{1}{9}\), \(\frac{1}{27}\)) (i.e. for C major: F, C, G, and D) in order that the entire diatonic succession C D E F G A B C be enclosed within the span of an octave of its governor [C], which begins and ends it.” (Nouvelles réflexions, p. 222: “. . . admet un quatrième terme à la proportion (1, \(\frac{1}{3}\), \(\frac{1}{9}\), \(\frac{1}{27}\)) pour que toute la succession diatonique, ut, ré, mi fa, sol, la, si, ut puisse se renfermer dans l’étendue de l’octave de l’ordonnateur, qui la commence & la termine.”) Rameau thus seemed to feel that it was this strongly felt need for the scale
to fill the span of an octave that demanded the addition of a fourth term to the fundamental bass.

40. Lettre à M. D'Alembert, p. 276.

41. D'Alembert, Réponse, pp. 482-83.

42. “Gamme,” p. 465; Élémens, pp. 71-72 (part I, chapter 9). D'Alembert referred as well to this version of the descending minor scale in his Réponse (p. 482); as a source, he cited p. 77 of Rameau's “Mémoire présenté à l'Académie.” Evidently Rameau suppressed this solution when he revised the Mémoire and brought it out as the Démonstration.

43. Rameau did not reiterate his theory, propounded in the Génération, that the lowered sixth degree in the descending minor scale was necessary to prevent the ensuing dominant from sounding like a tonic. (Writings, III, p. 82.) In any case, chances are that it would not have occurred to Rameau to look for a solution in which the raised sixth was used; he was obviously well aware that, in practice, the sixth reverted to natural in the descending scale.

44. Treatise, pp. 42-53 (book I, chapters 8-9). Because Rameau did not yet recognize the diminished triad as a fundamental chord, the seventh constructed on the second scale degree in minor had to be generated by placing a minor third below a minor triad (thus creating a chord by supposition; see (4) below).


47. In the Génération, Rameau claimed to have seen this “principle of co-vibration” demonstrated scientifically. In the experiment in question, a fundamental sound had seemed to generate, besides its 12th and 17th above, the same intervals below as well (see example). Unfortunately, it turned out later that an error in observation had been made; indeed, such a principle, if verifiable, would have contradicted the already well-established principle of overtones. Rameau issued a retraction of his co-vibration theory in the Démonstration.


49. Nouvelles réflexions, in Writings, IV, p. 234.

50. Lettre à M. D'Alembert, pp. 271-72. “Pourquoi vous arrêter, Monsieur, à un accessoire, en négligeant l'essentiel?”

51. Ibid., p. 272.

52. D'Alembert, Réponse, p. 485; also “Fondamental,” p. 58.

53. Treatise, pp. 110-11 (book II, chapter 16); Rameau placed additional emphasis on the independent character of the added sixth chord in book II, chapters 7 and 17.

The meaning of the term “double emploi” varied with its context in Rameau's theoretical works. Its specific reference in the case of the sixth chords was to the sixth scale degree, as Rameau informed his readers in Nouvelles réflexions de M. Rameau sur la Démonstration du principe de l'harmonie (1752). That is, in the key of C, for example, A in F-A-C-D was the third of an added sixth chord and the fifth of the great sixth chord. (Ferris, p. 243.)

55. In a footnote in the *Eléments*, d’Alembert noted Rameau’s tendency to regard this 3 as both an original and a derived chord, and he remarked that “it seems that this great artist has not expressed himself on this point in an adequately consistent or precise manner.” (p. 80; part I, chapter 12: “... il semble que ce grand Artiste ne s’est pas exprimé sur ce sujet d’une maniere assez uniforme ni assez précise.”) Yet d’Alembert oversimplified here by insisting that the chord had only one meaning.


57. *Treatise*, pp. 88–91 (book II, chapter 10). Example 5a is a composite of Rameau’s examples III.85 (p. 294; book III, chapter 30) and III.91 (p. 299; book III, chapter 32); example 5b reproduces Rameau’s example II.12 on p. 91.

58. See the musical examples in book III, chapters 30–33 of the *Treatise*, in which the added note always appears in the *basso continuo*.


60. Shirlaw (pp. 87–90) discusses this theory, but he sows considerable confusion by referring to the added note as “supposed” itself, apparently equating “supposed” with “subposed”. This was not Rameau’s meaning. The relevant passage reads as follows: “If a fifth sound can be added to the seventh chord at all, it can be added only below and not above. This added sound will suppos the fundamental, which will be found immediately above it.” (*Treatise*, p. 88; emphasis added) Ferris, following Shirlaw’s lead, falls into the same error.

61. *Treatise*, pp. 292–300 (book III, chapters 29–32). This distinction between theory and practice was maintained in later works, such as the *Code de musique pratique* (1760).

62. *Lettre à M. D’Alembert*, p. 273. “Un pareil intervalle... ne doit pas se confondre avec ce qu’on appelle accord; il n’est susceptible de B.F. ni de renversement, le goût seul l’autorise en faveur des droits que la note sensible a dans l’harmonie, il ne peut même se comparer à la supposition, ou l’harmonie fondamentale se renverse au gré du compositeur, pourvu que la note sur-numéraire reste toujours au-dessous de la basse...”


64. *Code*, booklet of examples, p. 4, ex. L no. 2. See also p. 15, ex. K no. 8; and p. 18, ex. N.

65. *Eléments*, pp. 175–76 fn. (part II, chapter 11). “Il paroit difficile de trouver à cet accord une base fondamentale.” A previous reference, however, to the augmented sixth in the *Eléments* shows clearly that d’Alembert viewed this chord in a fashion similar to that illustrated by Rameau’s example above. Speaking of C-E flat-G-B as a chord that “has no place in harmony,” because of its excessively dissonant character, d’Alembert compared it to other chords, among them B-D sharp-F-A. This one was discussed in detail; even though it was “not particularly grateful to the ear,” said d’Alembert, “we will see, nevertheless, in the second part that use is sometimes made of this chord.” (pp. 90–91 fn.: “... peu agréable à l’oreille; nous verrons néanmoins dans la seconde Partie qu’on fait quelquefois usage de cet accord.”) He meant the augmented sixth; notice, however, that he has referred to it in an “inverted” form. To his mind, then, the augmented sixth chord must have been invertible, at least theoretically.
70. *Discours*, p. xiii. "Il entrera toujours dans la théorie des phénomènes musicaux une sorte de Métaphysique, que ces phénomènes supposent implicitement, & qui y porte son obscurité naturelle."