NOTICE

AVIS

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Canada

Architecture and Music
On Rhythm, Harmony and Order

Richard de la Riva
School of Architecture
McGill University
April 18th, 1990

A Thesis submitted to the Faculty of Graduate Studies and
Research in partial fulfillment of the requirements for the
degree of Master of Architecture.

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

Canada

ABSTRACT

This paper examines the relationship of architecture to music in terms of rhythm, harmony and order in both the Greek Antiquity and the early Middle Ages. These basic concepts are crucial because they emphasize 'fullness' of experience and demonstrate the extent to which our own regulating experience of the world has become empirical (or formal). The discussion thus places architectural theory within the movement of ideas between mythical thought and metaphysical construct; it places architectural practice within the movement between bodily experience and reasoning.

Cette thèse examine les liens intimes entre l'architecture et la musique à travers les notions de rythme, d'harmonie et d'ordre dans les périodes de l'antiquité grecque et du haut moyen âge. L'étude de ces concepts de base démontre la 'plénitude' de l'expérience des phénomènes chez les anciens; elle révèle aussi l'étreinte de l'empirisme (ou du formalisme) sur notre propre ordonnance du monde. La théorie architecturale est donc située dans un movement des idées entre la pensée mythique et la construction métaphysique; la pratique architecturale, entre l'expérience corporelle et le raisonnement.

TABLE OF CONTENTS

INTRODUCTION

> Who doubts, then, that our soul having
> become accustomed to see number, space,
> movement, believes this and only this?
> Pascal, Pensée 89.

In the physical scheme of things which has dominated thought since the seventeenth century, the object of science is defined in strictly empirical terms. The subjective diversity which forms the texture of our daily realities is of little significance to the analysis of nature or of our cities. The generation of the world (a building, a city or a scientific model) cannot be reduced to mechanical manipulations unless we make abstractions of the patterns that give meaning to our lives. In the field of architecture, we are more fortunate; despite its naive technicolour form, the myth of creation survives. Ambiguous notions of 'harmony' and 'composition' still dominate our vocabulary and find their way into our projects. We often turn to other fields -- to the arts, to music -- seeking a more profound understanding of the processes of order and disarray that we recognize.

The projection of number into ratio and into geometry carries little symbolic significance in the practice of architecture today. It is therefore difficult for us to understand that this mathematical operation was once profoundly analogous to the projection of whole tones from musical instruments. Both exemplified the continuum between

the physical and spiritual world. The experience of visual and auditive proportions, sense-perception, were not separable. These ideas remained valid in our occidental tradition from the ancient Greek civilization, through the Middle Ages and the Renaissance, right into the early seventeenth century.[1] Reason then began to draw the lines that moved both arts and sciences into the burgeoning specializations of modern man. Our modern inheritance of the architectural figures has become devoid of symbolic content. Laid over the Cartesian grid, their lines suggest negative volumes of 'space'.

The ancient view centred on the realm of living beings -- hot, cold, dry and wet were its states; its numbers and geometry had the value of male and female entities. The experience of life was that of strife and presence in all things. This qualitative grounding made early Greek correspondences meaningful. Pythagorean Harmony simply emphasized and expanded on this aspect of reality in arithmetic, geometric and musical terms. The permutations of the universe were then understood as the most basic of rhythms: the movement of equal and opposite forces, the love and attraction of like for like, the cycle of change -- a dynamic structure of harmony and proportion. In the European Middle Ages, Christian thought and symbolism was conscious of the ancient metaphysical concepts. In the understanding of the basic rhythms of life, the fullness of time and cycle -- the eternity of God -- dominated. Theology expands experience by bringing the contemplative to it. This integration ensures a continuity between thought and thing, between oneself and a hierarchic world.

---

[1] Kepler is often said to be the last great tenant of such a world-view.

Art as making and architecture as building must become immediate and speak of the essence of reality. My aim has been to elucidate some neglected aspects of opaque conceptions that have generated meaningful structures in the past, conceptions that may serve a better understanding of the process of creation. I have particularly focused on how these ideas connect music and architecture through the experience of rhythm and number in the Antiquity and the early Middle Ages. Conceptions such as those of harmony, composition and order may not be reusable in a straightforward way. (We cannot simply copy the works of the past.) Number does not carry transcendental or mystical value in the minds of the many. Revelation lies elsewhere and, within himself, each individual must confront the need for its reappropriation. A first step towards revelation, however, lies in our acknowledgement of the past. The mythical harmony of the celestial spheres has become mute, except through the movement of our thoughts.

> Behind the awareness which is basic for metaphysical renewal, the urgency of the original situation persists, calling, as it were, upon each generation to establish a new link with the eternal and divine.[2]

I would like to thank my professor Alberto Pérez-Gómez for his guidance and insights. I would also like to mention Dr. Marco Frascari for his kind (and enlightened) encouragement. Important writings by contemporary scholars, such as those of Rudolf Wittkower and Otto von Simson have

---

[2] Paul Seligman, The 'Apeiron' of Anaximander: A Study in the Origin and Function of Metaphysical Ideas, London: The Athlone Press, 1962, p. 165.

been influential and have shed much light.[3] It remains however difficult to deal with these concerns in depth, and one does feel that much of the available literature, while descriptively impressive, fails very often to get to the bottom of things. Some very basic questions have oriented my research and, to the extent that they focus on the ontological relationship of architecture to music and the world, they were meant to remain simple and straightforward. The intention of this paper has been to communicate the poetic strength of a world-view. The question it consequently poses is whether our present-day state of affairs requires a more fundamental conciliation into "madness" than the institution or academia of architecture radically addresses. 'Limits' must once again become permeable to the Unlimited.

When architecture meets music meets writing, we can perhaps take 'measure' and consolidate an interesting position -- within the midst of things, an action.
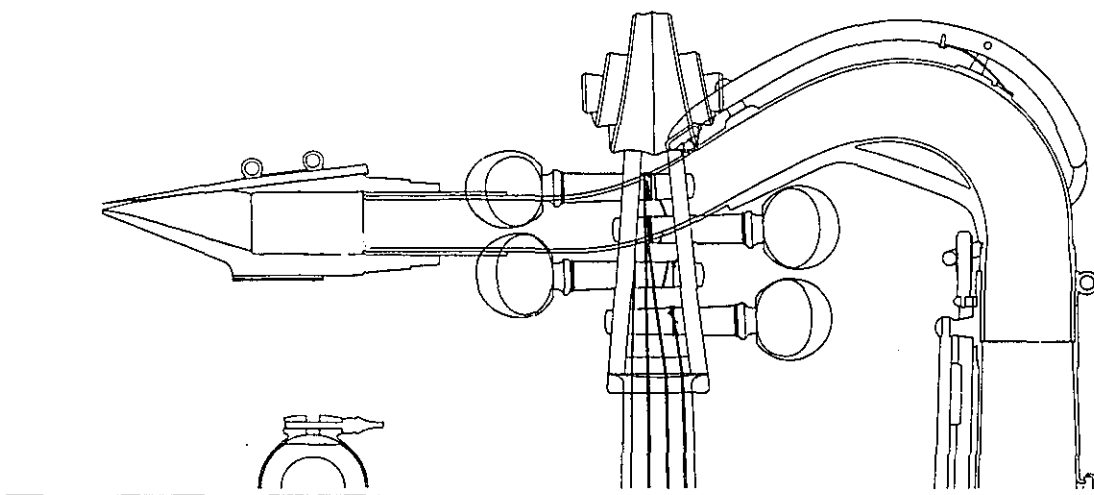
[3] Especially Wittkower's <u>Architectural Principles in the Age of Humanism</u>, London and New York: Academy Editions, (1949) 1988; and von Simson's, <u>The Gothic Cathedral</u>, Princeton: Princeton University Press, (1956) 1988.

I. THE ANCIENT GREEKS: AN APPROXIMATION OF EURYTHMIA

> ...and the ancients, who were superior to us and dwelt nearer to the Gods, have handed down a tradition that all things that are said to exist consist of a One and a Many and contain in themselves the cognate principles of Limit and Unlimitedness.
>
> Plato, Philebus 16c

A. Rhythm and Eurhythm

'Rhythm' is that which characterizes a flux or that which bonds movement. When the word appeared in Ionian philosophy, it was associated with the word 'form' -- the arrangement of parts into a whole. Rhythm becomes form the moment that it is assumed by the moving, the mobile and the fluid. Democritus spoke of the rhythm of the atoms, and of these atoms as constituting a totality; Aristotle spoke of schema. The rhythm that a statue or building embodied was not conceived of in structural, or even metaphorical terms; rather, it spoke of the rapture of life that order represented. The 'schematization' of a movement is in the recognition of its pauses, of its limits and of their measured relations. It occurs when specialized sense-perception falls back upon 'orientation' to establish a common ground for the experience: schema as relationship. We will thus acknowledge rhythm in the movement of the stars or of animals, as in that of music, dance, visual

representation and architecture. We will acknowledge rhythm in the settling of place.[4]

Figure 1. The Music of the Spheres. [5]
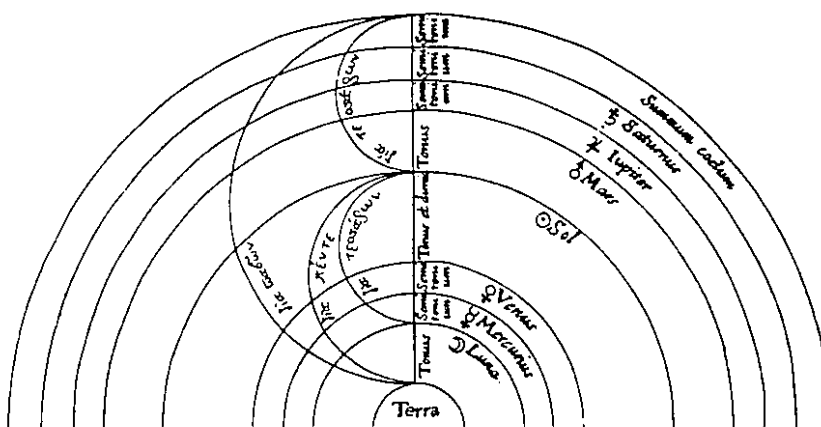
The formulation of the Pythagorean <u>kosmos</u> evolved from this rhythmic understanding of the world. Pythagoras effectively demonstrated the underlying harmony of the movement of the stars through the proportionate relationship of vibrating string lengths to whole tones in music. The movement of the stars was an absolute phenomenon to which man's own imperfect and discontinuous actions were compared.

---

[4] For a further discussion of the original experience of rhythm, see:
        E. Benveniste, "La notion de <<rythme>> dans son expression linguistique", <u>J. de psychologie normale et pathologique</u>, Paris: XLIV, 1951, pp. 401-410.
        P. Fraisse, <u>La psychologie du rythme</u>, Vendôme: Presses universitaires de France, 1974.
        William Sheldon Jordan, <u>Time, Space, and Music: Prologema to the History of Musical Theory</u>, Florida State University, Ph.D., 1976, footnote 37, p. 35-37.
        Marius Schneider, <u>El origen musical de los animales-simbolos en la mitologia y la escultura antiguas</u>, Barcelona: Instituto español de musicología, 1946.

[5] From Stanley's <u>History of Philosophy</u>, 1687.
Through Kenneth Sylvan Guthrie, <u>The Pythagorean Sourcebook and Library</u>, Grand Rapids, Michigan: Phanes Press, 1987, p. 166.

The appropriation of rhythm permitted man's 'measured' involvement with the forces of Nature.

There is a passage in the Ten Books of Vitruvius whose apparent opacity permits certain speculations that may further this discussion. The Roman author effectively sends us back to the Greek tradition to which he was indebted. In the second chapter of the first book, Vitruvius introduces the five constituents of architecture. Along with Ordonnance, Arrangement (or representation), Decor, and Distribution (or economy), he also draws out Eurhythmy and Symmetry. From our preliminary juxtaposition of rhythm to harmonic form, we may address the nature of a relationship more forcefully suggested in 'eurhythmy'. Vitruvius writes:

> Eurythmia est venusta species commodusque in compositionibus membrorum aspectus. Haec efficitur, cum membra operis convenientia sunt altitudinis ad latitudinem, latitudinis ad longitudinem, et ad summam omnia respondent suae symmetriae. Item symmetria est ex ipsius operis membris conveniens consensus ex partibusque separatis ad universae figurae speciem ratae partis responsus. Uti in hominis corpore e cubito, pede, palmo, digito ceterisque particulis symmetros est eurythmiae qualitas, sic est in operum perfectionibus.[6]

> L'Eurythmie est la beauté de l'assemblage de toutes les parties de l'oeuvre, qui en rend l'aspect agreable, lorsque la hauteur répond à la largeur, & la largeur à la longueur, le tout ayant sa juste mesure. La 'Proportion' aussi est le rapport que toute l'oeuvre a avec ses parties, & celuy qu'elles ont séparément à l'idée du tout, suivant la mesure d'une certaine partie. Car de mesme que dans le corps humain, il y a un rapport entre le coude, le pied, la paume de la main, le doigt

---

[6] Vitruvius, De Architectura, Book I, Ch. II, 3,4. From the Harleian manuscript 2767 (8th c.) of the British Museum; along with an English translation by Frank Granger. Cambridge: Harvard University Press, 1970.

7

& les autres parties: Ainsi dans les ouvrages
qui ont atteint leur perfection, un membre en
particulier fait juger de la grandeur de tout
l'oeuvre.[7]

I have juxtaposed an eighth century transcription of
the passage in Latin and a seventeenth century translation
of it into French in order to demonstrate the difficulties
of interpretation that arise. Claude Perrault, to whom we
are indebted for the latter, noted that the word rhithmus
generally referred to the proportion that parts of a
movement may share.[8] He recognized that the notion of
'eurhythmy', as Vitruvius applied the term, was borrowed
from dance and music. It described the measured proportions
of chant and dance steps. However, Perrault did not clearly
differentiate both uses Vitruvius made of eurythmia and
symmetria. In this excerpt, he thus replaced the term
'symmetria' with 'proportion'. Our modern notion of
symmetry as an equality of parts was apparently foreign to
Vitruvius' original intent, which was closer to our
conception of proportion. Both of these words have lost
some of the elemental fullness that they once held; so that
we, like Perrault, may be tempted to dismiss them just as
quickly. We should state that the confusion that is thus
engendered may have been present in Vitruvius himself, or in
the numerous transcriptions his work has known.[9] What is
ultimately relevant, however, is that these precise words,
along with the vague connotations they intimate, remain

---

[7] Vitruve, Les dix livres d'Architecture, translation
and notes by Claude Perrault (1684), Bruxelles: Pierre
Mardaga ed., 1979, Livre I, Ch. II, p. 11.

[8] Ibid, Livre I, Ch. I, note 28, p. 8.

[9] In the last paragraph of this general exposition
(Book I, Ch. I), Vitruvius bids our forgiveness for his
shortcomings in philosophy, rhetoric and grammar, but
assures us of his authority in the 'art' of building.

8

somewhat accessible in the context of Vitruvius'
argumentation.

Vitruvius wished to outline the sciences necessary to
the practice of architecture. Along with writing, drawing,
geometry, optics, arithmetic, history, philosophy, and
jurisprudence; he included music, medicine and astronomy.
To explain the relevance of such a connection, he equated
the 'proportion' of the movement of blood in veins as
observed in the human pulse to the movement of dancing
feet.[10] Vitruvius thus elevated the fundamental importance
of eurhythmy above that of vacant words. Claude Perrault, a
seventeenth century physician and architect himself, could
only examine this comparison with the understanding that
permitted him to measure the life of organs through the
dissection of dead bodies.[11] His 'modern' speculations on
this text of antiquity applied the same educated
objectivity, and words lost their lifeblood.

Vitruvius' discussion continues. In the same way
that a musician would not be asked to heal wounds or
sickness, a physician cannot be expected to play an
instrument for our pleasure. Both could nonetheless share
an understanding of the _venarum_ _rhithmo_. In the same way
that an astrologer and a musician can speculate on the
sympathies and consonance of the stars in accordance with
their own art, they should be able to exchange ideas among
themselves, or with a geometer.[12] This same essential grasp
of the problem of eurhythmy -- as the **life-rhythms of the**

---

[10] _Ibid_, Livre I, Ch. I, p. 8.

[11] Perrault would eventually die from a disease
contracted in the dissection of a camel.

[12] Vitruvius, _op_. _cit_., Book I, Ch. I, 15-18.

9

universe -- is what Vitruvius expected of the practicing architect.

The place architecture occupied as a mechanical art underlies all of the Vitruvian exercise. This argument is not as straightforward as it may initially appear, for it must address the problem of making. In the Greek tradition the word _techne_, which we translate as 'art', referred to every craft created by man, and included the labours of carpenters and weavers, as well as architects.[13] _Techne_ relied on skill and on experience. But the _architekton_ was a 'master craftsman': his art also dealt with _mimesis_, the representation of reality; and on _poiesis_, the inspired making whose source lay in the divine 'other' outside of oneself. Both _mimesis_ and _poiesis_ issued from mythical thought; but as Georges Gusdorf has observed, myth cannot pronounce its own name.[14] Its passage to _Logos_ is accomplished through the systematization of hidden significance that was waiting to emerge into the light of reflection. The depth of myth is in balance with its immanence; meaning lies just below the surface of things. With respect to the often mitigated authority conceded to Vitruvius (an aging, perhaps sour practitioner?), we may well ask ourselves how a 'mythical' practice of architecture can be reduced to words. We may also ask how its 'theoretical' writing fitted with the learned _enkuklios paideia_ that dominated the Latin curriculum.

The _enkuklios paideia_ was the program of education that had emerged from the Pythagorean-Platonic legacy as it

---

[13] Wladyslaw Tatarkiewicz, _History of Aesthetics_, Vol. I, Mouton, Warsaw: Polish Scientific Publ., 1970, p. 26.

[14] Georges Gusdorf, "Le dialogue du _Muthos_ et du _Logos_"; _Les origines des sciences humaines_, Paris: Payot, 1967.

10

was transmitted into the Hellenistic age of the Romans.[15] It had constituted a series of disciplines of transcendental dignity that were to shed an understanding of the original structure of the universe: arithmetic, geometry, astronomy and music communicated fundamental 'scientific' notions. The oratory arts would then complete these: grammar, dialectic and rhetoric. This program of education would later receive the name <u>orbis</u> <u>doctrinae</u>, or 'circle of knowledge'. Education was believed to be a circular process, this form being complete and perfect.

Vitruvius grappled with these preoccupations through the 'writing' of architecture. In doing so he recognized his own theoretical shortcomings, the shortcomings of a practitioner; but on this basis he also defended another form of knowledge, the mechanical knowledge intrinsic to making and building, <u>praxis</u>. In the words of Socrates, "wisest of all men", Vitruvius wished the hearts of men opened as windows.[16] The merits and defects of the mind could then be tested against the knowledge of the disciplines that is present in the work. These realizations already lie open before our (uncritical) eyes. When the "talent" of the craftsmen is concealed in their breasts, it is difficult to probe the depth of their knowledge.

> Yet those craftsmen themselves would offer their skill who while they lack wealth yet have knowledge based on workshop experience: or indeed when they are equipped with the graceful eloquence of the pleader, they can gain the authority corresponding to their

---

[15] David L. Wagner, "The Seven Liberal Arts and Classical Scholarship"; <u>The Seven Liberal Arts in the Middle Ages</u>, Bloomington: Indiana University Press, 1986.
Gusdorf, <u>op</u>. <u>cit</u>., p. 32.

[16] Vitruvius, <u>op</u>. <u>cit</u>., Preface to Book III, 1.

industry, and have the credit of knowing what
they profess.[17]

The depth of Vitruvius' own knowledge is similarly difficult
to probe. In the midst of 'practice' there was no clear
delineation between _poiesis_ and _techne_, between mythical and
rational thought as we categorize them today.

B.   The Cosmological Grounding of Theory

Vitruvian eurhythmy has led us into a discussion of
the place architecture occupied within the 'circle of
knowledge'. I would now like to draw on the cosmological
background of this theoretical tradition.

In contrast to the Babylonian practice of astronomy
to which it was indebted for its observations and methods,
the Greek _kosmos_ was 'situated' both in physical and
metaphysical terms.   Organization and movements, as
positions, distances and dimensions, occurred according to
geometrical _schema_.   In the sixth century B.C., the
Milesians were the first to work out such a view of the
natural world.[18] Of these, Anaximander wrote a book which
was lost in antiquity, but which was certainly known right
into the fourth century B.C..[19] The ideas he formulated

---

[17] _Ibid_, 1.

[18] Thales, Anaximander and Aniximenes were all three of
Miletus, an Ionian city. They are usually looked upon as
the founders of 'natural' philosophy.

[19] This book would appear to have been known to both
Aristotle and his successor as head of the Peripatetic
School, Theophrastus.   On Aristotle's suggestion,
Theophrastus composed a historical survey of previous
philosophies.   See: Paul Seligman, _The 'Apeiron' of_
Anaximander: A Study in the Origin and Function of

contributed to the establishment of key metaphysical principles.

Anaximander drew a map, a _pinax_, and placed his city at the centre of a cylindrical earth. Aetius later compared the earth of Anaximander to a stone column. Hippolytus would comment: "The form of the earth is moist [or 'concave'], rounded like [the drum] of a stone column."[20] This analogy was later interpreted by the Pseudo-Plutarch as meaning cylindrical in shape; but we should remember that the word 'analogy' comes from the Greek _analogia_, meaning ratio, correspondence. The circular face, constituting the top surface was three times as wide as the drum was high. This was the surface man inhabited. The importance of the number 3 lay in its role as the representative of plurality in general, incorporating beginning, middle and end. The number 1 referred to the original One, or Unity.[21]

Anaximander's conception of the earth was original since it lent itself directly to geometrical representation; "the idea is perfectly expressed by a comparison of the earth to the stocky rounded stones of which a Greek column is composed."[22] This projection is possible through symbolic numerical ratio and the knowledge of the world that the column embodies. Anaximander recovered the column from the field of myth and overlaid a symbolically explicit cosmological _schema_. He did not deal with objects in

_____

Metaphysical Ideas, London: The Athlone Press, 1962, pp. 21-23.

[20] _Analogos_ means proportionate; from _logos_ - speech, ratio.

[21] See: Charles H. Kahn, _Anaximander and the Origins of Greek Cosmology_, New York and London: Columbia University Press, 1960, pp. 55,56,81-84.

[22] _Ibid_, p. 81.

'space' per se, but the earth did rest at equipoise at the centre of the heavens.[23] His column demonstrated the potent signification the act of building carried into the ordering of the world, and that cosmography would inversely carry into the experience of architecture.

For Anaximander, the origin of the world arose from the Limitless, or the apeiron -- the undifferentiated chaos from which all things came into being and back into which all things melted. He understood the vital processes of the sublunary world as a retribution of opposite powers, a rendering of justice; "the primacy of the apeiron guaranteed the permanence of an egalitarian order founded on the reciprocity of relations, an order that was superior to all the elements and governed them equally."[24] We are again reminded of his geometrical model: the cylindrical earth was at rest with no need for support because it was equidistant from all points on the celestial circumference.[25] From this central position, the earth could not fall: it was stationary because it experienced all external dominations equally. Cosmological and human structures enmesh.

---

[23] The earth was surrounded by three tubular wheels of dimensions 9, 18 and 27 (3x3x3) times its diameter of 3. These wheels rotating around the earth were respectively the star, the moon and the sun wheel. See: Seligman, op. cit., pp. 17,18.

[24] Jean-Pierre Vernant, Les origines de la pensée grecque, Paris: Quadrige/Presses Universitaires de France, (1962) 1988, p. 123. For a more comprehensive interpretation, see: Seligman, op. cit.; Kahn, op. cit.. For some astute remarks: Eric Voegelin, Vol. IV of "Order and History"; The Ecumenic Age, Baton Rouge and London: Louisiana State University, 1986, p. 189.

[25] Equidistance is also dealt with in terms of 'symmetry' and 'justice'. Kahn, op. cit., p. 78.

Until this moment, the infinite field underlying experience was characterized in terms of <u>Mythos</u>. With the Milesians, however, we may have a first rationalization of this sacred realm. In their reconstruction of the order of nature, number was understood as a symbol of <u>physis</u> and <u>genesis</u>, thus striving to maintain the whole range of tactile and temporal experiences. It was a living entity encompassing the manifestations of diversity in a unified continuum. Number became the 'situated' origin and the source. The fundamental importance of this discovery entailed the advent of a metaphysical system of thought, and would become the cornerstone of the Pythagorean School.[26]

As the universality of the principle of number elevated it to the divine, things unknown in their <u>mathêmata</u> were regarded as partaking from the irrational. The Pythagoreans would appear to have emphasized this aspect. Against the background of the <u>apeiron</u>, stood Number as Order. From the tempering of the forces of creation, Pythagoras introduced the notion of Limit, <u>peras</u>, and formulated the concept of Harmony. Man, by the study and contemplation of Number, could reproduce a state of harmony in his own soul. The influence music exerted on man, in leisure as in his health, demonstrated this principle most readily.

---

[26] As a young man, Pythagoras studied under a disciple of Anaximander.

Figure 2. Unity, Duality and Harmony. [27]
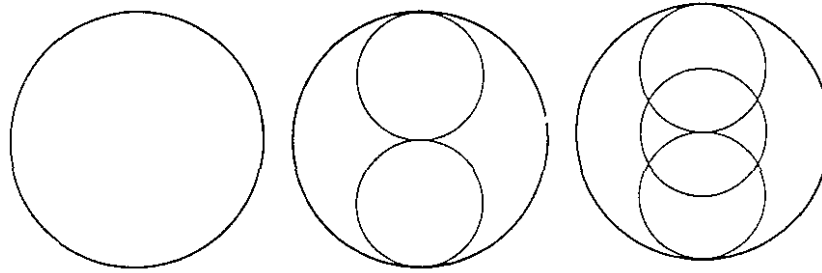
The fact that numerical proportion underlies musical harmony is said to have been discovered by Pythagoras and has since become common knowledge. Nevertheless, the recognition of a musical scale from the infinite continuum of tonal flux remains fascinating. This translation of harmonic sounds into proportionate dimensions can be performed quite simply with a monochord. It demonstrates the pervading power of number, beyond the realm of sound. As David R. Fideler explains:

> A curious phenomenon occurs when a string is plucked. First, the string vibrates as a unit. Then, in two parts, then in three

---

[27] The principle of unity underlying number was expressed in the Monad, also represented by the figure of the circle. One, the Monad, is unity. 1x1=1. Two, the Dyad: the beginning of multiplicity and of matter, therefore strife. With the Dyad emerges the duality of subject and object, and consequently, the possibility of logos. "With the advent of the Triad, however, the gulf of dualism is bridged, for it is through the third term that a Relation or Harmonia ('joining together') is obtained between the two extremes." The Triad thus actualizes the potential existence of logos and, in the process, reflects the nature of the One. The continuum Harmony suggested was a microcosm of the original Unity. For a further discussion of Pythagorean theory see: Kenneth Sylvan Guthrie, The Pythagorean Sourcebook and Library, Grand Rapids, Michigan: Phanes Press, 1987. Introduction by David R. Fideler.

parts, four, and so on. As the string vibrates in smaller parts higher tones are produced, this being the so-called harmonic overtone series. While they are not as loud as the fundamental tone of the entire string vibrating, with practice the overtones can nonetheless be heard. ... Harmonic nodal points occur naturally and innately exist on the string, dividing its length in halves, thirds, fourths, and so on...[28]

This rhythmic weaving of boundless matter into definite form was the revelation of numerical harmony -- an understanding which examined the phenomenal situation of man within the indefinite receptacle of space. It clearly followed the Milesians that the word kosmos, meaning 'order' and 'ornament' (in the sense of the beautifully ordered), was conscientiously applied to the universe. Planetary distances and motion were subsequently thought to be related to the harmonia of the scale, this being the long inviolable "Music of the Spheres".[29] Pythagorean thought effectively established a universal principle that following epochs would attempt to assimilate when studying the physical place humanity occupied within the workings of nature. In the field of architecture, the manifestation of rhythm and proportion -- eurhythmy -- varied with this understanding of Harmony.[30]

---

[28] Ibid, p. 25.

[29] Aristotle on the Pythagoreans; On the Heavens, Book 9, 290b 12.

[30] Harmony, as the material and spiritual actualization of Unity in the world, healed the gap inherent in theory. Inversely, in a world divorced from an encompassing faith, duality would dominate. We would have to wait until the Parallèle des Anciens et des Modernes of the seventeenth century, by Charles Perrault (brother to the earlier Perrault we referred to), for the full force of this dichotomy to be felt with any clarity in architecture. The experience of proportional sound was no longer continuous

This is not to say that Greek thought (from the sixth century B.C. onwards) should be dealt with purely from the standpoint of metaphysics. Theirs was an awe-inspiring world filled with the presence of mythical gods and enigmas that man cannot pretend to fully assimilate. Plato would state that "all things are full of gods."[31] But in contrast to the turmoil, there was the stability of the stars and the recurrence of the seasons as given to reason and revealed in numbers. In contrast to the uncertainty, there was the clear note of the monochord:

> The Greek had little need to simulate passion.
> He sought control and balance because he
> needed them; he knew the extremes only too
> well. When he spoke of the Mean, the thought
> of the tuned string was never very far from
> his mind. The Mean did not imply the absence
> of tension, and the lack of passion, but the
> correct tension which gives out the true and
> clear note.[32]

The new logos prudently moved within this field. Divine revelation and purification, as experienced in the reckless frenzy of Bacchic or Dionysian festivals, no longer harboured absolute truth. Katharsis, as it was 'expressed' by the Greeks, strove to pacify the body and purge the soul by lifting one outside of oneself. Although man partook directly of the divine through these rites, the notion of Harmony as the mean to the extreme passions and destructive force of the apeiron established a 'firmer' ground for

---

with that of visual harmony.
    See: Joseph Rykwert, "Positive and Arbitrary", in The First Moderns, Cambridge: MIT Press, 1980.

    [31] Laws, 899b.9.

    [32] H.D.F. Kitto, The Greeks, Baltimore: Penguin Books, 1970, p. 252.

experience. The "divine madness" that related katharsis to poiesis also became subordinate to this generic principle. A rational intellect could not clearly reduce the authentically poetic to a rule or to a craft; nor could it elevate techne to its level without the presence of the divine. The principle of the Mean or of Measure, however, allowed man to shape these forces into the image of Harmony.[33]

Plato, as Anaximander, dealt with the problem of origin. In his use of the creation motif, he had the Demiurge shaping the sensible world in a likeness of eternal forms: reason and life existed prior to body and physical causation. The soul was thus believed to partake of the same stuff as that of the body of the universe, and was the prime mover of the celestial spheres.[34]

> And when the whole structure of the soul had been finished to the liking of its framer, he proceeded to fashion the whole corporeal world within it, fitting the two together centre to centre: and the soul was woven right through from the centre to the outermost heaven, which it enveloped from the outside and, revolving on itself, provided a divine source of unending and rational life for all time. The

---

[33] Plato, Republic, Book II, 379; Phaedrus, 245; Ion, 533-5.

[34] "To the Greek the most obvious thing about motion was that it needed a force to cause it." According to Plato, the irregularities in the motion of the heavenly bodies were due to their divine nature. Their soul-nature would influence their bodily movement with some independence from the movement of the Different, but it would concur in the Same -- the daily rotation from east to west as carried round by the outer sphere of the stars. See the introduction to Timaeus and Critias, by Desmond Lee, Great Britain: Penguin Books, 1987, pp. 12-15.
    In the Middle Ages, movement also supposed the presence of a regulating soul. It was a widespread belief that the angels were the movers of planets.

19

body of the heaven is visible, but the soul
invisible and endowed with reason and harmony,
being the best creation of the best of
intelligible and eternal things.[35]

In the _Timaeus_, Plato used the power of myth to render the transcendental intelligible, thus epitomizing the intrinsic limitations of metaphysical endeavour. By the same token he endorsed Pythagorean arithmology. The four numbers of the first _tetractys_ dominate his depiction of genesis.[36] Furthermore, he traced the place of a geometrical creation back to its dissolution into the dimension of celestial cycles. "As distinguished from the other variants of reality, the celestial cycles appear to be the very time of their own reality; we approach a limit at which reality becomes time and numbers."[37] His experience of Limit was symbolized in the structuring of matter by geometrical form, through Number, in the cyclical time of the Limitless.

The grand project behind Plato's _Republic_ had been to describe the just city, the unadulterated city, where the preservation of musical order was the manifestation of human order. The 'codification' of the musical modes that occurred must also be understood under this light. How

---

[35] Plato, _Timaeus_, 37.

[36] The _tetractys_ consists of the first four successive numbers (1+2+3+4), the sum of which is ten. Hence, the Decad. Musically, it contains the ratios of the scale. Geometrically, its massing accounts for an equilateral triangle. The _tetractys_ thus symbolized the perfection of Number and of all the elements which comprise it.

```
* * * *
 * * *
  * *
   *
```

[37] Voegelin, _op_. _cit_., p. 82.

20

could one accept changes and innovations in an art that had attained the level of highest philosophy and on whose principles the universe, as the city-state, built its own eternity? Aristotle had observed that man was a "political animal". He furthermore believed (as Plato did) that the identity of a people and its notion of justice were intimately related to a musical tradition: the nómoi are the laws that were sung before man knew scripture.[38] Musical modes were institutionalized as the citizens decided what was conducive to social continuity. This reasoning is particularly clear in the writings of Plato.[39] Justice was perceived as a matter of proportion, and thus accessible to both ethical judgment and sense experience.[40] Architectural orders were similarly fixed into canons of composition and set into treatises.[41] These constituted the models that the city and its institutions must embody: the political space was not at odds with the perceived space of the natural cosmos. In explaining the role logos played in the institutionalization of the polis, the anthropologist Jean-Pierre Vernant emphasises its profound respect of nature and

---

[38] Aristotle, Musical Problems, Ch. XXVIII.

[39] Plato believed that the mixing and the transgressions of the nómoi had brought on the decadence of music, and consequently of theatre, up to a point of general rebellion against the laws of society (Laws, III, 700-1.). He reacted against the foreign influences felt in Athens (Laws, VII, 798e.), and proposed proper musical education (Protagoras, 326 b; Republic, 401-2.).

[40] "This then, is what the just is -- the proportional; the unjust is what violates the proportion. Hence one term becomes too great, the other too small, as indeed happens in practice; for the man who acts unjustly has too much, and the man who is unjustly treated too little of what is good..." Plato, Nicomachean Ethics, 1131 b, 15.

[41] These ancient writings are lost; we know of them through Vitruvius. I will return to this aspect shortly.

its deliberate action on man: "In its limitations as in its innovations, it is a creature of the city."[42]

With Aristotle, the order of the universe was declared eternal and ungenerated. He did not formulate, as his predecessors did, a cosmogony. He did not give any particular attention to the symbolic 'shape' of things. The world simply was. Movement and change are now resolved directly through principles of metaphysics. Aristotle understood katharsis in these terms -- as an outward movement of one's soul. He therefore emphasized the positive effects that music would have on man and remained open to the sensuousness of experience. Insofar as the expression remained proper to the situation, Aristotle was opposed to the censure of musical modes.[43]

Plato would have inscribed over the entrance to his Academy that none could enter without being a geometer. To understand geometry was to have profound knowledge of the ordering principle of the polis. (For aren't all radii of equal influence in a circle?)[44] The sphere as a paradigm of this equilibrium was emphasized in the new cosmologies, as in political schemas. For example, "Hestia, the symbol of the new human order on the agora, could signify for Philolaos the centralized cosmic fire, for other philosophers the earth that sits motionless in the middle of the physical universe."[45] Consequently, the ground for

---

[42] Vernant, op. cit., p. 133.

[43] Aristotle, Politics, VIII, 1342.

[44] Plato, Gorgias, 508a.

[45] Vernant, op. cit., p. 129. In his last chapter, "The New Image of the World", the author discusses the geometrization of the cosmos and of the polis in parallel to the new political realities of the 'democratic' polis.

22

eurhythmy as participatory schema was not lost, but an emphasis on the concept of Harmony (as it issued from Pythagorean-Platonic arithmology) inevitably led to its formalization into the third dimension.

Geometry operated through theoria, the viewing distance of contemplation. Logos was akin to the visual mode of perception in the distance it required from involvement. This development is manifest in the theatre, where man established (or acknowledged) a distance between himself and his world: he did not participate in the group dance but observed from above in order to better understand his role in the greater tragedy of life as dictated by the movements of the Gods.[46] In the chorus, he witnessed an involved representation of himself within the destined schema of things. The notion of Harmony (and that of katharsis) substantiated the experience. The centralized agora required such an involvement, but in the theatre man sat at a distance from bodily participation; he could project himself into the very position initially reserved for the Gods he venerated.

C. Vitruvius on the Theatre

I wish to approach this last discussion in more concrete terms. Vitruvius' pragmatic exposition on the theatre and its acoustics will support this approach. The relevant chapters of his fifth book will permit us to concentrate once again on the essential relationship that both music and architecture share.

---

[46] Greek tragedy had grown out of the "triune choreia", the fusion of dance, song and rhythmic music. From the original choreia, the chorus of theatre.
See: Tatarkiewicz, op. cit., Vol. I, pp. 16,45.

Simply put, the Vitruvian understanding of harmony and of acoustics allowed for the strengthening of a projected sound through sympathetic resonance in the theatre. In the third chapter, Vitruvius emphasized the importance of the site and the circular movement of sound waves. He dedicated the fourth chapter to Aristoxenes' theory on the modulation of the voice and to the listing of his three musical scales. In accordance with these enquiries, he then prescribed the integration of bronze (or even earthenware) sounding vases to solid stone theatres which he believed to be acoustically inept.[47]

> ...bronze vases are to be made in mathematical ratios corresponding with the size of the theatre. They are to be so made that, when they are touched, they can make a sound from one to another of a fourth, a fifth and so on to the second octave.[48]

If the theatre was not too large, these vases, 13 in number, were to be evenly spaced on a transverse line at mid height. The vases were placed upside down in open compartments among the seats of the theatre, their emplacement being in accordance with the tone of the enharmonic scale to which they sounded.

> Thus by this calculation the voice, spreading from the stage as from a centre and striking by its contact the hollows of the several vases, will arouse an increased clearness of

---

[47] He compares these theatres "built of solids, that is of rubble walling, stone or marble which cannot resound", to the theatres of Rome that "have several wooden floors which naturally resound". Vitruvius, op. cit., Book V, Ch. V, 7.

[48] Ibid, 1.

24

sound, and, by the concord, a consonance
harmonising with itself.[49]

For larger theatres, Vitruvius recommended three lines of
vases, in accordance with the enharmonic, the chromatic and
the diatonic scales.   The lowest line, as for the smaller
theatre, was of the enharmonic kind; the second line was
chromatic; the third, diatonic.

> If [the architect] attends to these
> calculations, he will the more easily be able
> to erect theatres adapted to the nature of the
> voice and the pleasure of the audience.[50]

The description is typically Vitruvian -- it is
technical and dry.   Little room is made for metaphysical
speculation.   In the following chapter, however, Vitruvius
described the plan of the Roman theatre:

> The circumference is to be drawn; and in it
> four equilateral triangles are to be described
> touching the circumference at intervals (just
> as in the case of the twelve celestial signs,
> astronomers calculate from the musical
> division of the constellations).[51]

The points of the triangles indicated the seven lower
ascents to the seating and the radial geometrical
construction upon which the 13 sounding vases must be set.
They also directed the layout of the stage.   We may
therefore speculate that the careful correlation of geometry
to celestial signs and to cosmologically tuned devices was
potent.

---

[49] Ibid, 3.

[50] Ibid, 6.

[51] Ibid, 1.

Figure 3. The Roman Theatre. [52]
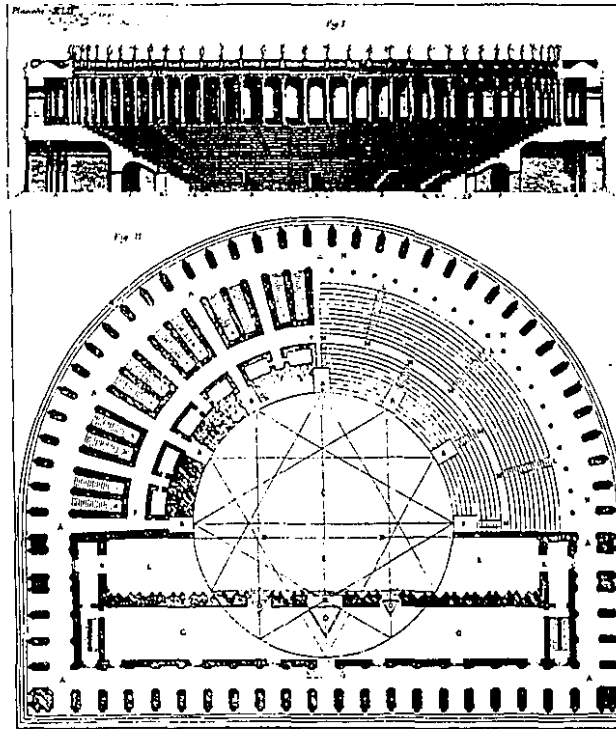
In the world of Vitruvius, the immanence of eurhythmy permitted the elaboration of practical 'harmonic' acoustics for the theatre. The physical propagation of sound was not dissociated from planimetric geometry and musical scale. Consequently, architecture deduced its construction lines from the harmonic principles music revealed. Further to integrating harmonic devices (such as the sounding vases), a building (and in this particular example, the theatre) could be calibrated much as a musical instrument was -- it was understood in its role as an instrument of Harmony.

---

[52] From Claude Perrault's edition: Vitruve, op. cit., p. 173.

Vitruvius also described the planimetric geometry of the Greek theatres: four squares generate the layout, instead of the triangles. See Book V, Ch. VIII.

D. Canons of Composition

The formal relationship between music and architecture can also be dealt with at another level. Both the musical **modes** and the architectural **orders** had their sources in myth; both evolved in parallel towards a more specialized framing of social continuity. Their various origins blended with those of the people. Plato wrote of the following modes: the mixed or tenor Lydian, and the full-toned or bass Lydian -- expressive of sorrow; the Ionian and the Lydian -- soft and drinking harmonies; the Dorian and Phrygian -- expressive of courage and temperance.[53] Each had its particular qualities, and each varied in scale, rhythm, theme and instrumentation. In this sense, each was proper to an occasion, as it was to a state of being. The Greeks associated these modes to the establishment of the nómoi or 'laws' that they strictly observed.

Equivalent to the nómoi in music, were the architectural canons of composition. Vitruvius described the Doric, the Ionian and the Corinthian orders. These orders were ruled by number and proportion, their basic module based on the thickness of the column base.[54]

---

[53] Plato, Republic, Book III, 399-400.

[54] "Further, of these parts, whether for tetrastyle, hexastyle, or octastyle, let one be taken, and that will be the module or unit. And of this module, one will be the thickness of the column. The several intercolumniations except those in the middle will be of two modules and a quarter; the middle intercolumniations at the front and at the back will be severally of three modules. The height of the columns will have a just proportion of modules." Vitruvius, op. cit., Book III, Ch. III, 7.

Vitruvius wrote that

> Proportion consists in taking a fixed module,
> in each case, both for the parts of a building
> and for the whole, by which the method of
> symmetry is put into practice. For without
> symmetry and proportion no temple can have a
> regular plan; that is, it must have an exact
> proportion worked out after the fashion of the
> members of a finely-shaped human body.[55]

Fig. 4. The Vitruvian figure. [56]

---
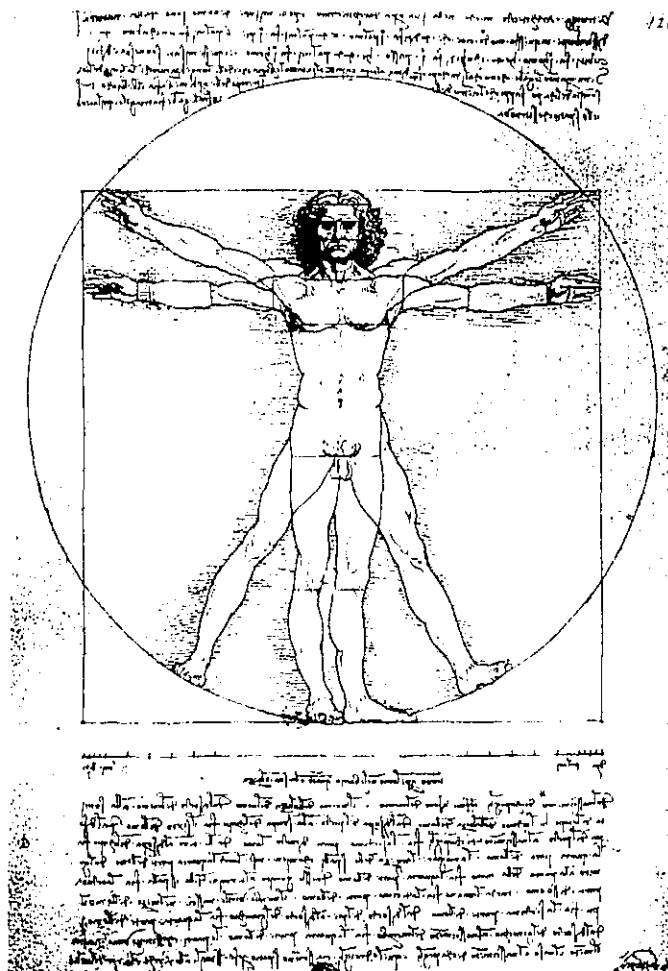
[55] Ibid, Book III, Ch. I, 1.

[56] Illustration by Leonardo da Vinci; Accademia, Venice.

Proportional relationships were accordingly applied to buildings as a whole, as well as to the parts that constituted it, such as columns, capitals, cornices, friezes, and gables. According to Tatarkiewicz, they were not fixed absolutes but subject to adjustment and evolution.[57] For example,

> ...the relation of the intercolumniations will be observed proportionately. For in the measure by which the spaces between the column grow, the diameters of the shafts are to be increased.[58]

Vitruvius chronologically related the particularities of each order to the myth from which it issued. The "proportion of a man's body, its strength and grace" furnished the Doric column's dimensions: "Finding that the foot was the sixth part of the height in a man, they applied this proportion to the column."[59] The Doric name issued from the memory of Dorian temples the Ionians had imitated. Departing from this initial model, they then applied "the feminine slenderness" to the measurement of the Temple of Diana; the volutes of its "robed" column like "graceful curling hair".[60] The "third order, which is called Corinthian, imitates the slight figure of a maiden".[61] The physical relationship suggested in this depiction of the orders expands on the auditive-mathematical model of the theatre, and directly reintegrates the body of man into our examination of Harmony. Man's belief in the body-soul

---

[57] Tatarkiewicz, op. cit., Vol. I, p. 49.

[58] Vitruvius, op. cit., Book III, Ch. III, 10,11.

[59] Ibid, Book IV, Ch. I, 6.

[60] Ibid, 7,8.

[61] Ibid, 8.

constitution of the world permitted the sympathetic projection of oneself into architectural idea and geometrized matter -- the expression of continuity in the ordering process.

Fig. 5.   Column and capital. [62]

---
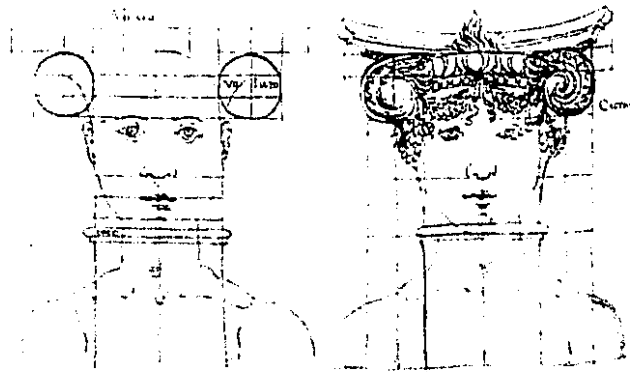
[62] Illustrations from Francesco di Giorgio's rendering of the Vitruvian text, c. 1480. From the <u>Saluzziano Codex</u>, folio 14v; and the <u>Magliabecchiano Codex</u>, folio 33v.

E. Summary

To summarize, the antiquity recognized the primacy of a rhythmic experience from which the architect drew a unified understanding of the world. Rhythm preceded the settling of matter into form; it effectively bonded dance, music and poetry in a single entity inseparable from movement and gesture. Only with time did independent art forms develop. Myth similarly moved in the rhythmic sphere that preceded metaphysical reflection. The discernment which propelled Anaximander's cosmogony to metaphysics issued from this field and would become directly relevant to the Pythagorean formulation of Harmony. The projection of kosmos into harmonic scale and into geometry through Number marked this passage. More than the utilitarian embodiment of an idea, Number recognized a Limit in the Unlimited continuum of experience. As we have seen, this framing of the life-world was dealt with in disconcertingly simple terms through Vitruvius' discussion and application of eurhythmy. The depth of this conception of architectural form -- proportion, symmetry and geometry -- recognized the place the body of man occupied in the continuum.

II. VESTIGES OF ETERNITY
IN THE EARLY MEDIEVAL PERIOD

> Then seek what moves the limbs of the
> artificer himself: it will be number; for
> they too are moved in the rhythm of
> numbers. And if you take away the work
> from the hands, and from the mind the
> intention of making something, and that
> motion is directed toward pleasure, you
> will have a dance. Seek then what it is
> that gives pleasure in a dance; number will
> answer, "Behold, it is I."
> Augustine, <u>On Free Choice</u>, II, 16, 42.

A. <u>Knowledge and Intelligibility</u>

Medieval truth was human truth. It was directly
accessible through the integrity of mystery, and ultimate
knowledge was in the Revelation of the mystery of God.
Reality was felt and reasoned religiously. To understand
this world, we must place ourselves within its realm. Its
culture was founded on the Judeo-Christian presuppositions
and developed according to Hellenic norms of
intelligibility. Latin medieval civilization thus sends us
back to Saint Augustine (354-430 A.D.), where the wisdom of
Christian theology guided the <u>orbis doctrinae</u>.

The pedagogical program of the Middle Ages honoured
the <u>artes sermocinales</u> that composed what we call the
<u>trivium</u>: grammar, rhetoric and dialectic -- the trinity of
the arts of discourse or <u>eloquentia</u>. To these 'human'
disciplines we must add those that bore on the reality of
the material world, from the antique tradition, the

<u>quadrivium</u> -- arithmetic, geometry, astronomy and music.[63]
These would come to be called the seven liberal arts in the
twelfth century.[64] As arts, they represented the knowledge
man could acquire through practice and technique; as
sciences, they referred to the primordial mathematical
relationships guiding the intellect. There was no
separation of the contemplative from <u>praxis</u>. The medieval
intellectual understood his role as that of a craftsman; he
was an artisan of the instruments of the mind and the city
was the construction site.[65] His merchandise was the
science he circulated through his teaching and his writings.
Hugh of Saint Victor had then stated that the whole sensible
world was like a book written by the finger of God.[66]

The <u>quadrivium</u> occupied a privileged place because of
the anagogical interpretation of nature it proposed. The
instruments it provided would uncover the 'vestiges' of
divine will left behind by the hand of the Creator: "these
vestiges were conceived to be principles of cosmic order,
mathematical in character, which ultimately derive from the
unity of the one God."[67] Man, in the image of God, would
conceivably have access to knowledge of the macrocosm
through the principles of divine beauty governing his man-
made microcosm, for the divine was present in all order.

---

[63] Gusdorf, <u>op</u>. <u>cit</u>., pp. 167,168.

[64] Architecture would not be effectively included until
the Renaissance, following Alberti's theory in his <u>Ten Books</u>.

[65] Jacques Le Goff, "Le travailleur intellectuel et le
chantier urbain"; <u>Les intellectuels au Moyen Age</u>, Bourges:
Ed. du Seuil, (1957) 1985, pp. 67-69.

[66] Gusdorf, <u>op</u>. <u>cit</u>., p. 200.

[67] Jordan, <u>op</u>. <u>cit</u>., p. 50.
Christian Pythagoreanism referred to <u>Wisdom</u> 11,
verse 20, to confirm this understanding: "...but you have
disposed all things by measure, number, and weight."

The place music occupied in the quadrivium was of pivotal importance, because music forwarded insight of the invisible movements of the human soul and provided a mathematical model of the cosmos. This insight could lead the mind from the surface of appearances to a deeper contemplation of proportion and geometrical figure.

Augustine had emphasized these aspects; he had emphasized knowledge in the interpretation of signs, of sacramentum. Augustine meant this in the technical and in the spiritual sense, as a sign of something hidden but of penetrating importance. Beauty was not in the sensual per se, but in the order and unity accessible to the intellect, in the beauty of the soul. The underlying distrust that he felt towards figurative art, and indeed all imagery, kindled his appreciation of metaphysical abstraction. He favoured the "non-objective" beauty of both music and architecture. "For him, music and architecture are sisters, since both are children of number; they have dignity, inasmuch as architecture mirrors eternal harmony, as music echoes it."[68] In his De Musica Augustine had conveyed his concept of beauty in musical terms, through the art of number and precise proportion. This applied to both visible and audible harmonies, as they both intimated the same ultimate truth.[69] He asked:

> And since music somehow issuing forth from the
> most secret sanctuaries leaves traces in our

[68] Otto von Simson, The Gothic Cathedral: the Origins of Gothic Architecture and the Medieval Concept of Order, Princeton: Princeton University Press, (3rd edn) 1988, p. 23.

[69] This was however an early work, and in later years his evaluation of art did change. His judgment became more condemnatory of sensuality and falsity, but in his Retractions, he still upheld the basic premises of his philosophy of number.

> very senses or in things sensed by us, mustn't
> we follow through those traces to reach
> without fail, if we can, those very places I
> have called sanctuaries?[70]

Contemplation thus overtook the explication of the origins of the cosmos; it became more important to recognize the 'traces' (or vestiges) of beauty confirming God's presence. The great themes of <u>vestigia</u> and of <u>imago Dei</u> penetrated the medieval understanding of physical reality through Augustine's work, and would only become secondary in the ulterior .development of scholasticism in the thirteenth century.[71]   Aristotle's authority then dominated the intellectual discourse and was conducive to the break from spirituality needed for the eventual advancement of reason into empirical abstraction.

Prior to the Aristotelian resurgence, a second hermeneusis overlaid the Augustinian motif and exercised profound influence on the relationship of man to transcendental reality.   The writings of Dionysius the Pseudo-Areopagite of the fifth century had brought together Christian and Neo-Platonic thought.   The <u>Corpus Dionysiacum</u> had been ascribed to the first bishop of Athens, disciple of Saint Paul, who lived in the first century A.D..[72]   These anonymous writings actually originated in the late fifth century and were brought into France from Rome in the eighth century, after having influenced the Christian East and Byzantium.   Less than a century later, it had become the

---

[70] Augustine, <u>De Musica</u>, Book I; through Jordan, <u>op.</u> <u>cit.</u>, p. 76.

[71] Gusdorf, <u>op.</u> <u>cit.</u>, pp. 197,198.

[72] See: Tatarkiewicz, <u>op.</u> <u>cit.</u>, Vol. II, p. 27;
      von Simson, <u>op.</u> <u>cit.</u>, pp. 103,104.

accepted belief in France that the author of this work was identical with Denis, their Patron.

The Dionysian <u>schema</u> is of the descent of the One into matter. Knowledge was in the symbolic value of things. The symbol revealed itself for what it was, for an accomplishment of both transcendental and physical reality.

> Thus one can create forms suitable for heavenly things even from the most miserable particles of matter, since the very matter, too, deriving its existence from true beauty, preserves in its whole arrangement certain traces of intellectual beauty.[73]

Beauty and goodness are fused in an all-embracing unity. "Being conceived as an absolute, beauty became a perfection and a power; everything is said to derive from it; it contains everything; everything is directed towards it."[74] From the Dionysian philosophy of 'emanation': absolute beauty radiates and gives forth emanation, from which earthly beauty results. The church -- the <u>Ecclesia</u> and the building -- represented the world emanating from God. The 'metaphysics of light' he developed embodied the analogy of the physical world and the mysterious light of God; it merged well with Augustine's theory of the vestiges.

Both Augustinian sign and Dionysian symbol ranked spiritual experience above 'objective reality' as we have become accustomed to. In the ninth century, Johannes Scotus Erigina said that "There is nothing in things visible and corporeal that do not signify something incorporeal and

---

[73] Pseudo-Dionysius, <u>De coelesti hierarchia</u>, II, 4; through Tatarkiewicz, <u>op. cit.</u>, Vol. II, p. 34.

[74] Tatarkiewicz, <u>op. cit.</u>, Vol. II, p. 29.

intelligible."[75]   This anagogical correspondence of the
sensible to the spiritual through the intelligible, its
mystery, is clearly realized in religious architecture.

Figures 6, 7. [76]

---

[75] Gusdorf, op. cit., p. 200.

[76] Fig. 6:   From the Bible moralisée, 13th c., Vienna.
     Fig. 7:   Plate XXXVI of Villard de Honnecourt's
sketchbook. "Here begins the art of the elements of drawing..."

Through the influence of Augustine and the Pseudo-Denis, through the fragments of the _Timaeus_ that they also inherited, the School of Chartres would later dramatize the depiction of God as a master builder, a _theoricus_ creating, by means of an architectural science, that which is essentially mathematical.[77] Towards the end of the twelfth century, this image of the Demiurge evolved to become that of the supreme architect who had built the universe according to the mathematical science of geometry. God was outside of the closed circular space of the world; He held the world in His hand and traced its figure with a compass. The significance of an 'architectural' act of creation sends us back once again to the Greek conception of _kosmos_. From the initial creation of endless matter, the Demiurge established order, or geometrical form -- 'ornament' in _khaos_, or _peras_ from the _apeiron._

B. Motion and Change

It is significant that in the century following Augustine, Boethius (c. 480-525) divided the mathematical discipline of music into three categories: that of the universe (_musica mundana_), that of man (_musica humana_), and that of the instruments (_musica instrumentalis_). The first was "best discerned in all that is in the sky, or in the arrangement of elements, or in the rotation of spheres".[78] It sounded across the two main regions of being -- both the superlunary or ethereal region, that of primordial nature; and the sublunary or corruptible region, called the work of nature. If man experienced the effects of superlunary in

---

[77] von Simson, _op. cit._, pp. 26-31.

[78] Boethius, _De institutione musica_; through Tatarkiewicz, _op. cit._, Vol. II, p. 87.

his sublunary world, inversely, through the study of the 'music of the world', he could develop his awareness of the other reality. The music of man, his second category, "is understood by anyone who descends into the depths of himself." The third, was the harmony produced by the instruments.

The hierarchy deduced from this vertical division of the world, the plenitude also suggested by its soul-nature, were established on an understanding of the life-continuum which went back to the Pythagoreans, and which is foreign to us today. This is perhaps most easily explained through 'motion'. The medieval understanding of motion was associated with a wider concept, that of 'change', for change is life in its immanence. This viewpoint certainly became more explicit (and rigid) with the adoption of Aristotle's physics from the twelfth century on. Aristotelian motion would not be replaced by the mechanistic notion of inertia until the seventeenth century with Galileo.[79]

Aristotle recognized four types of motion: coming-to-be and passing-away, alteration, growth and diminution, and locomotion (local-motion). But, more generally: "The fulfillment of what exists potentially, in so far as it exists potentially is motion."[80] And the motion of a thing was movement to its proper place: a stone, back to the earth; fire, up towards the heavens. This experience of

---

[79] I say 'mechanistic' when a displacement becomes a non-qualitative change of position undergone by a body with respect to other bodies. 'Inertia' has this body preserve its state of rest or of uniform motion, unless acted upon by an external force. Through physical observation, Galileo sought the 'laws', not the causes of things.

[80] Aristotle, Physics 201a, 10. He reformulates this in his Metaphysics, Book XII; "The Prime Mover", Ch. II.

motion explains some of the fascination with verticality and height found in the Gothic cathedral: 'potentially', the proper place of the cathedral is in the heavens; its motion is upwards. The word 'anagogy' itself is from the Greek anagoge, a 'lifting up'.[81]

For Aristotle, the motivation behind this phenomenon was the love of the outermost sphere, the primum mobile, who is unloving and unmoved.[82] In the Middle Ages the 'prime mover' became a loving God. "Beauty is the principle of all as an efficient cause," stated the Pseudo-Dionysius, "setting all in motion and joining all in love of real beauty. It is the limit of all things, an object of love and a final cause..."[83] Consequently, change was not arbitrary but integrated an ordered system whereby all things tended towards their accomplishment. Echoing Dionysian thought, Erigina wrote:

> God -- because He is the cause of every love; and because He is diffused through all existent; and because He collects all things into one, and returns to Himself in an ineffable retrogression while terminating in Himself the amatory motions of the whole creature (the universe) -- is correctly called love.[84]

---

[81] From the Collins Dictionary of the English Language, second edn., London & Glasgow: Collins, 1988.

[82] Aristotle developed a concept already present in Plato. The actuality of (intentional) substance or form always presupposes another in time, right back to the primum mobile. Metaphysics, Book IX, Ch. VIII.

[83] Pseudo-Dionysius, De divinis nominibus, IV, 7; through Tatarkiewicz, op. cit., Vol. II, p. 34.

[84] Johannes Scotus Erigina, De divisione naturae; through Jordan, op. cit., p. 70.

In his _Metaphysics_, Aristotle stated that essence is substance in its immanence.[85] He explained that the latter, being the cause of being -- as that which makes a thing what it is -- must encompass the principle of structure whose presence renders the whole organized. Matter can be recognized as substance, but "it is matter which underlies change", in respect of place, size and quality.[86] It is therefore the essence of the potential sphere which causes a thing to become actual, as it is from the actual sphere to be produced from a potential one. In such a way he distinguished matter and form, "the first of which is potentially and the other actually."[87] Unity can accordingly be said to lie in this essential movement (or dynamics) of matter towards form (and recognition). Such an understanding, I believe, brings us back to our earlier discussion of the primordial ground of _eurythmia_, that which concerned itself so much with the 'becoming' of form. The capacity for motion therefore lay in the deeper nature of the body and in its relationship to place.[88] In the field of geometry,

> ...potentially existing constructions are discovered by being brought to actuality; the reason is that the geometer's thinking is in actuality; so that the potency proceeds from an actuality; and therefore it is by making constructions that people come to know them

---

[85] Aristotle, _Metaphysics_, Book VIII; "Substance: Dynamic Considerations of Change", Ch. I.

[86] _Ibid_, Ch. I.

[87] _Ibid_, Ch. VIII.

[88] The _apeiron_ is thus pushed in the direction of matter, as form is placed in time. See: Voegelin, _op. cit._, p. 189.

(though the single actuality is later in
generation than the corresponding potency).[89]

'Potentiality' or 'end' cannot be dissociated from the
principle of unity because the substance of the world
requires this involvement.

> ...numbers can be described as substances only
> in so far as they have a principle of unity
> which keeps their parts together; not, as some
> hold, in so far as they are mere aggregates of
> units.[90]

And everything that comes into the world moves towards a
principle, i.e. an <u>end</u>.

> When in some cases the end consists in the
> exercise of a faculty (e.g. seeing is the end
> of sight, which issues in nothing else but
> seeing), in others it is some external product
> (e.g. the builder's art produces a house as
> well as the act of building). Nevertheless,
> the actuality is in the former case the end
> and in the latter it is more of an end than is
> the mere potency. For the act of building is
> in the thing being built, and comes to be (and
> is) simultaneously with the house.[91]

Accordingly concepts such as those of void, or of infinity
-- that will so alienate modern man -- are also rebuffed.

> ...the infinite does not exist potentially in
> the sense that it will ever have separate and
> objective existence: it is separable only in
> knowledge. For the fact that the process of
> division never comes to an end ensures that
> this activity always exists potentially, but

---

[89] Aristotle, <u>Metaphysics</u>, Book IX, ch.9.

[90] <u>Ibid</u>, Book VIII, Ch. III.

[91] <u>Ibid</u>, Book VIII, Ch. VIII.

not that the infinite exists as an accomplished fact.[92]

C. The Experience of Time

Inseparable from the medieval understanding of movement was one's experience of time. The place mortal man occupied at the centre of a geocentric cosmos did not permit him to take quantitative measure of the encircling bodies of eternity. A harmonic rendering of their rhythmic quality was emphasized. The depiction of time was crucial to the exploration of man's finiteness through art. Man took measure of his own mortality against his fascination with eternity. Over many generations, the task of the great cathedrals would thus be carried by the enlightened fortitude and flesh of a community. As they emerged from the live oral tradition of the many (and of God) into scripture and notation, music and 'literature' were conceived of as ordered motion subject to number and proportion in time.[93] Plato had already stated that "time is a moving image of eternity."[94]

The flesh of man, just as the stones he lays, is weight. His place is that of time. Number measures both weight and time, and more -- the vital music of those changeless spheres. Number is accessible through sensation,

---

[92] Ibid, Book IX, Ch. VI.

[93] Dante's writings, for example, attest to this. A gradual unfolding of the rhythmic cycle of time dominates the structure of his work. It communicated Love and Knowledge as it was imminently present in the experience of life -- be it through Beatrice's eyes (The New Life), or through the music of the cosmos.

[94] Plato, Timaeus, 37.

memory and judgment: "memory gathers, _explicit_, not only the carnal movements of the mind, _animi_, that constitute the rhythm of which we have just spoken, but also the spiritual movements..."[95] Augustine thus embraces Pythagorean ideas; numbers are fundamental to salvation. The arithmetical nature of the immutable, as that of all perishable things, is supported by the soul-nature of the universe through the will of the Maker. Spirituality restores "delight in the Rhythm of Reason".[96] Making requires this movement towards realization, a time of reflection. It permits man's participation in Eternity. Often we will speak of the contemplative quality of this period that seemingly evolved outside of time. We now realize, quite to the contrary, that the work was immersed in the inner contemplation of Eternity.

> The higher things are those in which equality resides, supreme, unshaken, unchangeable, eternal; where there is no time, because no mutability; whence, in imitation of eternity, times in our world are made, ordered, and modified, as long as the circling sky continually returns to its place of starting, recalling thither the heavenly bodies ... So earthly things are subject to heavenly things, seeming to associate the cycles of their own

---

[95] Augustine, _De Musica_, Book VI, xii.34.
"...the nature of number is apprehended by man through an experience at first physical (felt number or rhythm), then intellectual (the number of thought and memory), and finally innate number (the judgment of the soul by means of a harmony bestowed upon it by God)." See the introduction to Augustine by Albert Hofstadter and Richard Kuhns in _Philosophies of Art and Beauty; Selected Readings in Aesthetics from Plato to Heidegger_, Chicago: University of Chicago Press, 1964, p. 173.

[96] Augustine, _De Musica_, Book VI, xi.33.

durations in rhythmic succession with the songs of the great whole, <u>universitatis</u>.[97]

Implicit in Augustine's treatise <u>De Musica</u> was the fact that the domain of time and change were but fictions provided by God to enable us to comprehend the material finiteness in which our souls were trapped. Of course, time could be measured, but chronometry imperfectly rendered the passing of the present. In his <u>Confessions</u>, Augustine went further: time should not be equated to the movement of the spheres, or to the motion of a body, for motion was one thing, duration another.[98] He grappled with the notion of time as "extension".[99] To dwell in **time** was to move in the Presence of God. Hence, the experience of eternity became one of fullness.[100] Time became the image of eternity in the work of art.

A point of fundamental significance underlies Augustine's argument for the 'musical' model: the precedence of temporal dispersion over spatial dispersion to a God of eternity.

---

[97] <u>Ibid</u>, Book VI, x.29.
I am dealing with Augustine's description of the 'experience' of time, which is somewhat different from his discussion of historical or eschatological time where unilinear history came to its meaningful end in the duality of the realm of God and his city on Earth. In the <u>City of God</u>, for example, he criticized cyclical time (XII, 13-15.). Through his numerous writings, Augustine approached the question from different angles, "For what is time? Who can explain it easily and briefly?" (<u>Confessions</u>, XI,14.17.)
Also see Voegelin: "If, in a more contemplative mood, one permits time to be the lasting of reality itself, one will expect as many modes of time to appear as there are modes of reality experienced." <u>Op</u>. <u>cit</u>., p. 78,79,172.

[98] Augustine, <u>Confessions</u>, XI, 14.17-30.40.

[99] <u>Ibid</u>, XI, 14.32.

[100] Augustine, <u>City of God</u>, XI, 5,6.

> Anything which the ministry of carnal
> perception can count, and anything contained
> in it, cannot be furnished with, or possess,
> any numerical rhythm in space which can be
> estimated, unless previously a numerical
> rhythm in time has preceded in silent
> movement.[101]

Augustine compared this operational rhythm to the necessary
bodily movements that the craftsman (_faber_) makes according
to intervals of time and to the structure of the wood. And
even if the numerical structure of a tree is spatial, "it
must be preceded by a numerical or rhythmic structure which
is temporal", as in that of all growing things.[102] Our own
experience of the ever moving space of the stars is but a
mark of finiteness. If we remove the authority of
mathematical structure from the universe, nothing remains.
Even the tiniest particles as they "distend" beyond the size
of an indivisible point, the elements themselves, are made
from nothing. From an initial creation of brute matter, the
Demiurge unifies and distributes vertically: "a vital
movement, agile with temporal movements" penetrates the
substance of the world. Earth, water, air and sky. Divine
Order:

> Its numerical structure is undistributed into
> intervals of time: the durations are supplied
> by potentiality; here, beyond, _supra quam_,
> even the rational and intellectual rhythm of
> blessed and saintly souls, here is the very
> Law of God by which a leaf falls not, and for
> which, _cui_, the very hairs of our head are
> numbered...[103]

---

[101] Augustine, _De Musica_, Book VI, xvii.58.

[102] _Ibid_, Book VI, xvii.57.

[103] _Ibid_, Book VI, xvii.58.

46

Augustine's philosophy of measuring time, of
modulatio, was fundamental to the conception of a temporal
order. His "Rhythm of Reason" leans, as the fullness of
rhythm of the ancients did, towards a dualistic apprehension
of the process of creation. Potential matter is separate
from form in its intentionality, if not in its essence. The
first principle is an expression of Eternity.

Again with respect to motion, as for the Greek
philosophers before them, the power of the circle embodied
the analogy of melody, thought and cosmos. The beginning of
one process was the end of another, and all things in nature
blended into the unity from which they derived. The cyclic
process was proper to all created things.

> For the end of the whole movement is in its
> beginning, since it is terminated by no other
> end than its first cause, from which it begins
> and to which it constantly desires to return
> to find rest. And this motion is true not
> only of the sensible world, but of the entire
> universe. Its end is its beginning, which it
> desires.[104]

Circular (i.e. perfect) movement would furnish an
understanding of the practice of plainchant. A piece would
begin on a certain tone, be set in motion (modulated) around
the prescribed consonances specific to that mode and,
realizing the potential of the first tone, be resolved
(concluded) in the very first tone it had departed from,
"since the total power and potency of music are derived in

---

[104] Erigina, De divisione naturae; through Calvin
Bower, "Natural and Artificial Music: the Origins and
Development of an Aesthetic Concept", in Musica Disciplina,
Vol. XXV, 1971, p. 30.

its very beginning."[105]   Each of the eight musical modes would follow particular rules of modulation and rhythm.

This interest in circular movement and in the self-containment of truth would be later forwarded through scholasticism and its structure of argumentation.   The experience of time was not solely linear; the rhythmic cycle of eternity impregnated the work.   Liturgical practice, prayers and festivities are integrated to the recurrence of the days and of the years, as they are regulated by the calendar.

D.   Descent and Uplift

As the propagation of knowledge turned from an oral legacy to the implementation of scripture, the emphasis shifted from the 'speculative' towards the 'practical' in the twelfth century.   To this effect, the relationships so clearly established in Augustinian thought between musical and visual form needed to find a more definite expression. The Dionysian writings fully recognized the inherent value of things and provided the needed impulse.   In view of the technical evolution of musical notation and drawing that would occur in the following centuries, the emphasis placed on the manifestation of sacred order had allowed an important place to praxis.   Philosophically, the critique of religious dogma itself would become institutionalized in the disputatio, through scholasticism.[106]   Musically, traditional plainchant evolved towards a more heavily

---

[105] Ibid, p. 31.

[106] See Erwin Panofsky's, Gothic Architecture and Scholasticism, New York: The New American Library, Inc., (1951) 1976.

structured (and annotated) polyphony. In terms of
architecture, this epoch witnessed the birth of the Gothic
cathedral.

Developments in applied harmony in the ecclesiastical
musical culture were important stepping stones to the
refinement of such ideas. The classification of music into
musica naturalis and musica artificialis is particularly
revealing. This classification has been commonly attributed
to Regino de Prüm (d. 915). Explanations have held that
natural music corresponded to Boethius' musica mundana and
musica humana; that artificial music was equivalent to his
musica instrumentalis. In an article on the subject, Calvin
Bower convincingly argues that the distinction between both
existed prior to Regino and that, though similar to
Boethius' classification of music, it was essentially
independent.[107] He further contends that it was rooted in
the concept of the celestial and ecclesiastical hierarchies
as exposited by Dionysus the Pseudo-Areopagite and Latinized
by Erigina (d. 810-886). Because Dionysian symbolism was
concerned with all aspects of the physical world, the model
developed by Erigina did not only treat metaphysics, but
also its manifestation in the corporeal substance of sound.

On one level, natural music embraced the music of the
spheres, the harmony of human body and soul, and the holy
hymns, canticles or psalms sung to the praise of God: man
harmonizes with the voices of the angels, movers of the
planets.

> Natural music is that which is made by no
> instruments nor by the touch of the fingers,
> nor by any touch or instigation of man; it is
> modulated by nature alone under divine

---

[107] Bower, op. cit., pp. 17-33.

> inspiration teaching the sweet modes, such as
> there is in the motion of the sky or in the
> human voice.[108]

On another level, artificial music, in the tradition
of _musica instrumentalis_ which preceded it, was not
instrumental music as we have come to understand it since
the Renaissance. Rather, it was about 'making the invisible
visible'. Invented by human genius, it had to do with the
visual demonstration of the hidden coherence of _musica
naturalis_ (and audible harmony) through specific
instruments.

> ...though natural music is far superior to
> artificial music, no one can know the power of
> natural music except by the study of
> artificial. That is why no matter how much
> the learned discussion of our argument begins
> with the natural, we must end in the
> artificial, so that we can prove things
> invisible by things visible.[109]

The statement that music exists on two levels
concerns the ontological levels of physical reality. The
two levels of music are links in a chain of Being. As in
the demonstrative use of the monochord by Pythagoras, the
analogy between the organization of a piece of plainchant to
that of the sacred superlunary world could be 'revealed'.
Harmonic continuity, in its most basic physical

---

[108] From Regino de Prüm's _Epistola de harmonica
institutione_; from the "expanded" text added to the original
letter of Regino; through Bower, _op. cit._, pp. 20,21.
   The definition further divided natural music
according to three classifications: celestial, human and
irrational music, the third being attributed to the voice or
sound of the irrational creatures (the animals and the
insects).

[109] From the "expanded" _Epistola_; through Bower, _op.
cit._, p. 22.

manifestation, was that of the proportional string lengths in accordance with the whole tones that one could hear. "This theory places considerable emphasis on corporeal music found in actual sound, for only by coming to know the corporeal music can one come to know the incorporeal."[110]

Music and harmony were present and active in all of nature. To come to a further understanding of this order, one turned to the liberal, or as Erigina renamed them, the "natural" arts. He used the discipline of geometry to illustrate the relationship of material form to sensible image in the mind: "which is more excellent," he asked, "the figure of the triangle or the triangle which the perceivable one reflects"?[111]

The material concerns of the builders of the great cathedrals can be understood in terms of the naturalis / artificialis relationship. The cathedral is the instrument of God on earth and man's sounding vessel towards the superlunary regions. Numerical ratio and proportion, visual rhythm and height, the metaphysical light of God -- all play a role in the mysterious becoming of the built institution. In the same way sacred music, sung by men in a sublunary world, can move in the realm of the angels and blend with the celestial choir, the Gothic cathedral is also 'uplifted'. The cathedral is the house of God made visible on earth.

---

[110] Bower, op. cit., p. 22.

[111] Erigina, De divisione naturae; through Bower, op. cit., p. 29.

Fig. 8. An angel-musician.

Suger (1081-1151) was ordained Abbot of St-Denis in
1122.   Amongst his many tasks, he devoted himself to
rebuilding his church and to the written description of his
oeuvre.   Von Simson called this new edifice the first Gothic
building completed and a model for future cathedrals in
France; and indeed, Suger was pleased to hear from
travellers returning from the East that his abbey compared
favourably with the treasures of Constantinople and the
ornaments of Hagia Sophia.[112]   The Dionysian influence was
remarkable throughout his work.   For example, he had
sculptors depict the Passion and the Ascension of Christ
"with great cost and much expenditure" on the main doors.[113]
Onto these, he had the following verses inscribed in copper-
gilt letters:

_____

[112] Abbot Suger, "The Book of Suger", XXXIII; A
Documentary History of Art, Vol. 1, Elizabeth Gilmore Holt
ed.,   excerpt   translated   by   Erwin   Panofsky,   Princeton:
Princeton University Press, 1981, p. 30.

[113] Ibid, "Of the Cast and Gilded Doors." XXVII, p. 24.

> Whoever thou art, if thou seekest to extol the
>   glory of these doors,
> Marvel not at the gold and the expense but at
>   the craftsmanship of the work.
> Bright is the noble work: but, being nobly
>   bright, the work
> Should brighten the minds, so that they may
>   travel, through the true lights,
> To the True Light where Christ is the true
>   door.
> In what manner it be inherent in this world
>   the golden door defines:
> The dull mind rises to truth through that
>   which is material
> And, in seeing this light, is resurrected from
>   its former submersion.[114]

Suger's text spoke clearly of the symbolic ascension of man his work was meant to influence. The doors to the church were a gateway to the <u>sanctum</u> of heaven; the gold and its brightness were attributes of Christ which set the mind in motion, "transferring that which is material to that which is immaterial".[115] Similarly, the tombs of patron saints in the upper apse ensured this bridge, their physical presence drawing the beseecher after them.[116]

> ...then it seems to me that I see myself
> dwelling, as it were, in some strange region
> of the universe which neither exists entirely
> in the slime of the earth nor entirely in the
> purity of Heaven; and that, by the grace of
> God, I can be transported from this inferior
> to that higher world in an anagogical
> manner.[117]

---

[114] <u>Ibid</u>, XXVII, p. 25.

[115] <u>Ibid</u>, XXXIII, p. 30.

[116] <u>Ibid</u>, "Of the Golden Altar in the Upper Choir." XXXI, p. 26.

[117] <u>Ibid</u>, XXXIII, p. 30.

E. Summary

The medieval age moved in the 'space' of eternity: from a rhythmic experience of matter and time -- as initially accessed through the senses, then through memory and thirdly through judgment -- a vertical hierarchy of the kosmos was laid. This understanding issued from a Christian appropriation of the Hellenic philosophical tradition that preceded it. The experience of audible music was pervasive in the relationship established between Harmony, number and geometry; but a visible demonstration of the invisible would come to be emphasized. God could even be portrayed as the Supreme Architect using the specialized implements of the geometer. From the naturalis\artificialis dichotomy, the inscription of architecture to the domain of the instruments and of musica mundana naturally ensued.

I have necessarily simplified many aspects of a question whose intricacy is beyond the scope of this paper. The metaphysics of light, iconography, music as emblem and its relationship to the verbal arts of the Trivium are all facets, amongst others, that deserve closer scrutiny. I chose to emphasize the Pythagorean understanding of number due to its obvious connection with the evolution of Harmony and Eurhythmy.

Figure 9. The Divine Monochord. [118]

[118] From Robert Fludd's <u>History of the Macrocosm and Microcosm</u>, 1617.

CONCLUSION

> ...we must reachieve a notion of being
> which is _act_ rather than _form_, living
> affirmation, the power of existing and of
> making exist.
>
> Ricoeur, _History and Truth_ [119]

In the midst of chaos, Anaximander recognized the continuity and equilibrium of a generative background, the _apeiron_, from which all things were born and back into which they melted.   From this initial intuition, future metaphysical thought recognized 'limits' (_peras_) within which it could build -- 'ornamental' models of the universe, musical scales and modes, canons of composition and harmonic proportion, the Vitruvian man. These limits were not fixed, but dynamic. They moved, as the pulse of man, to the rhythm of the Unlimited.

Saint Augustine spoke of the Unlimited in terms of an eternal God. God was thus beyond time, and time preceded space; hence the fullness of His Presence.   Augustine explained this through the primary concepts of rhythm and number -- divine Harmony -- as their traces or 'vestiges' were accessible in every experience, and revealed through reason.   Their partial 'presencing' was initiated through sensation, then it dwelled in memory, and only in the end did 'enlightened' judgment reveal the greater mystery of Presence.   The relationship of one's own finite flesh to reason, soul and the Absolute remained at the centre of

---

[119] Paul Ricoeur, _History and Truth_, Evanston: Northwestern University Press, 1965, p. 328.

these concerns.   Through flesh and recollection, reason allowed a 'glimpse' into the continuum, a vision of the field of Eternity man bore within himself.

We can listen to an interpretation of Gregorian chant, to an instrumental dialogue of the Renaissance, or to last week's synthetic 'top ten' on the radio: the 'time' (the city)   that is peculiar to each remains accessible to us.   We probably have more difficulty with the 'cacophony' of the contemporary oeuvre, as we do with critical art in general.   Truth requires conciliation when it deals first hand with chaos.

To project and build anew, today. How does one, how can one, make?   Mathematical and geometrical constructs remain at the centre of our architectural modes of operation, but 'instrumentalized' as they are, they no longer have the power to 'situate' and give 'measure' to our work.   We have so much difficulty in recognizing the continuity the world and our instruments suggest; abstraction and mass-production have left us largely indifferent. If our desire for unity remains, we must reconsider the knowledge of the world that the instrument contains.   For there is knowledge in making, the act: in making we set bearings.   The medium of contemporary practice still carries the potential for discovery -- a Presencing, perhaps.

To build, the movement of my limbs in time -- a rhythmic wavering of matter towards form.

Fig. 10, 11.
Le Corbusier and his sculpture <u>Totem</u>. [120]
View over the courtyard at Sainte-Marie-de-la-Tourette. [121]

---
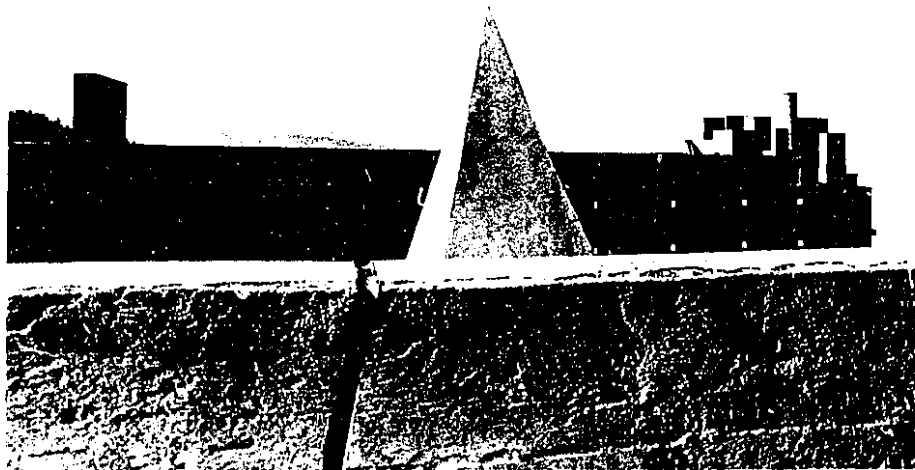
[120] Lucien Hervé photographer; Boulogne-sur-Seine, 1951.

[121] Jacqueline Salmon photographer; <u>Le Corbusier et l'architecture sacrée</u>, Lyon: La Manufacture, 1985, p. 99.

Appendix 1: A Personal Project

      Two aquarelles fathom the problem of architectural genesis. The first, entitled <u>The Making of the World-Soul</u>, deals with the Demiurge's manipulation of the primal elements, a movement of matter towards live geometrical form. The second painting, <u>Realigning the Horizon</u>, is the line on which our experience of the world coalesces. Sticks of brute matter (brush strokes) constitute a ground of the sort which we nevertheless recognize. In the lower right corner of the painting, the primal elements reappear waiting for the horizon to solidify. The sticks suggest the vague silhouette of a compass in the sky.

Two line drawings carry the cosmogonic themes into the realm of the tools. The first drawing, black ink on white Strathmore paper, is a precise scientific rendering of two musical instruments, an 'objective' two-dimensional mapping of their surfaces. The cello, drawn in the scale one to one, is depicted in a frontal and in a lateral elevation. The saxophone, in the scale 1.5 to one, is depicted in a longitudinal section and in a series of four transversal sections. The elevations and the sections are equal in size and partially overlay one another. The crispness of the drawing was countered by the contact the measurement required; 'vestiges' of this physical contact remains, especially when the drawing is vertically apprehended in relationship to our own body. Desire brings both the cello (female) and the saxophone (male) together, but the abstract emptiness of the white surfaces nevertheless take a fascinating autonomy from the original instruments. We are reminded of Pascal's "The eternal silence of those infinite spaces frightens me."[122]

The second drawing, sanguine chalk on rice paper, is a straightforward representation of the world suggested in the first drawing. Bodily parts and tissue are assembled according to the hierarchy of one's own embodied memory of and desire for the instrument. Simultaneity of interpretation is apparent in the end result: a layering of ideas into which the imperfections of the textured rice paper participate.

---

[122] Pascal, "De la nécessité du Pari"; Pensée 206.
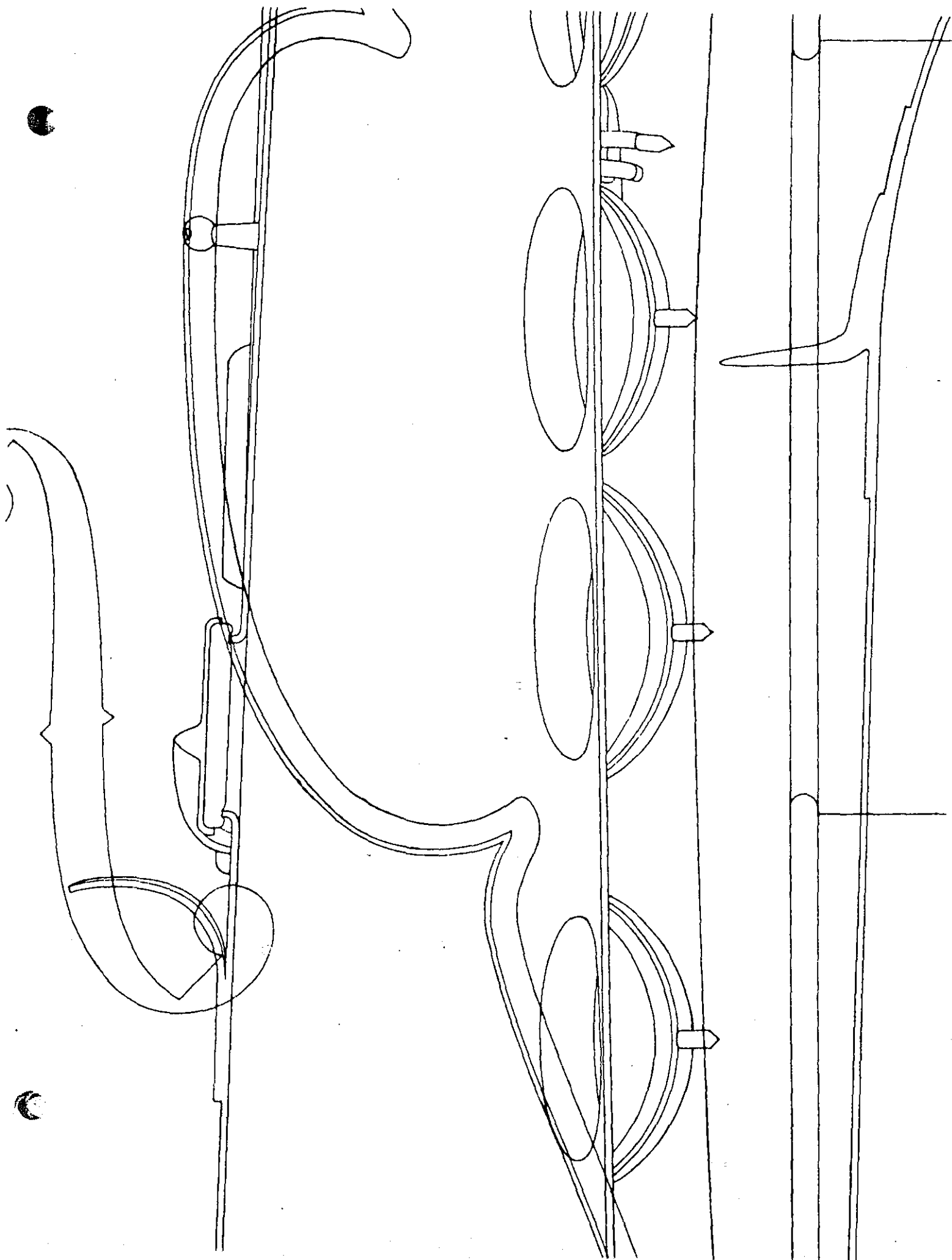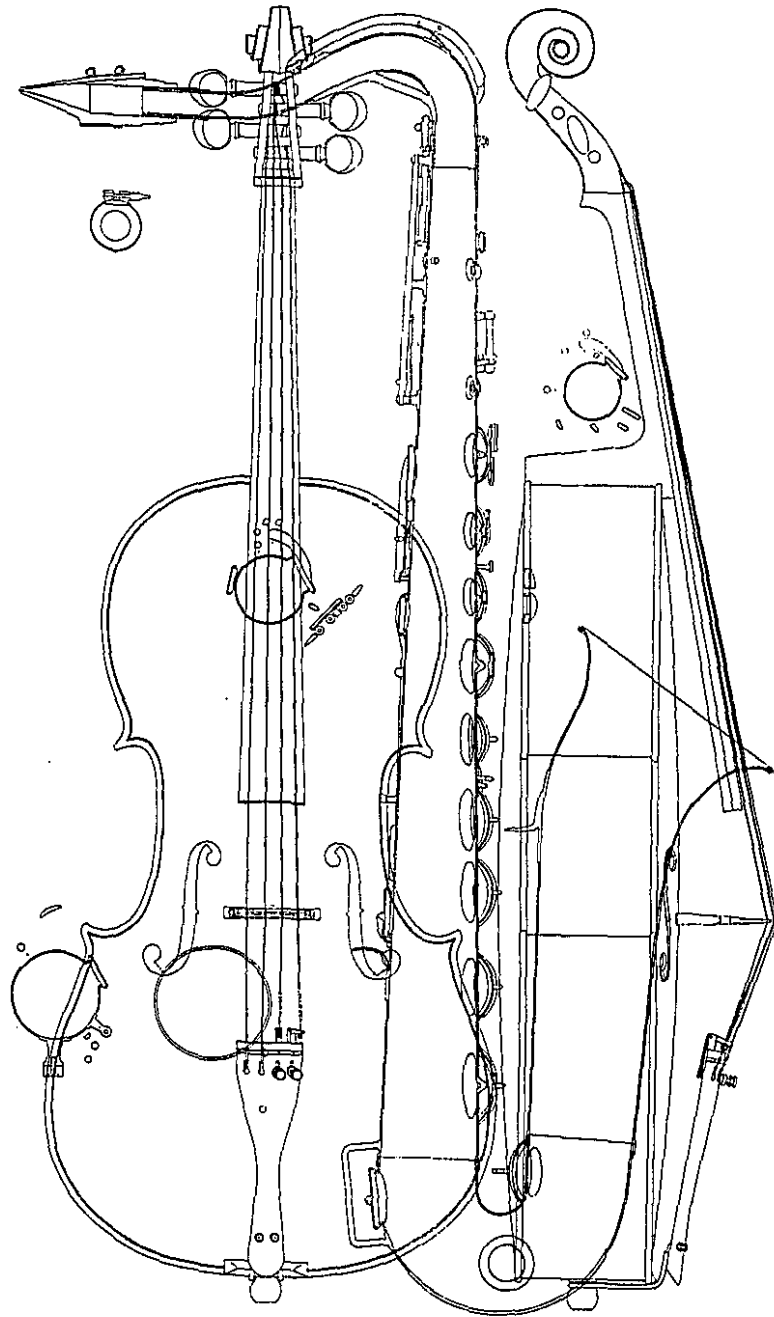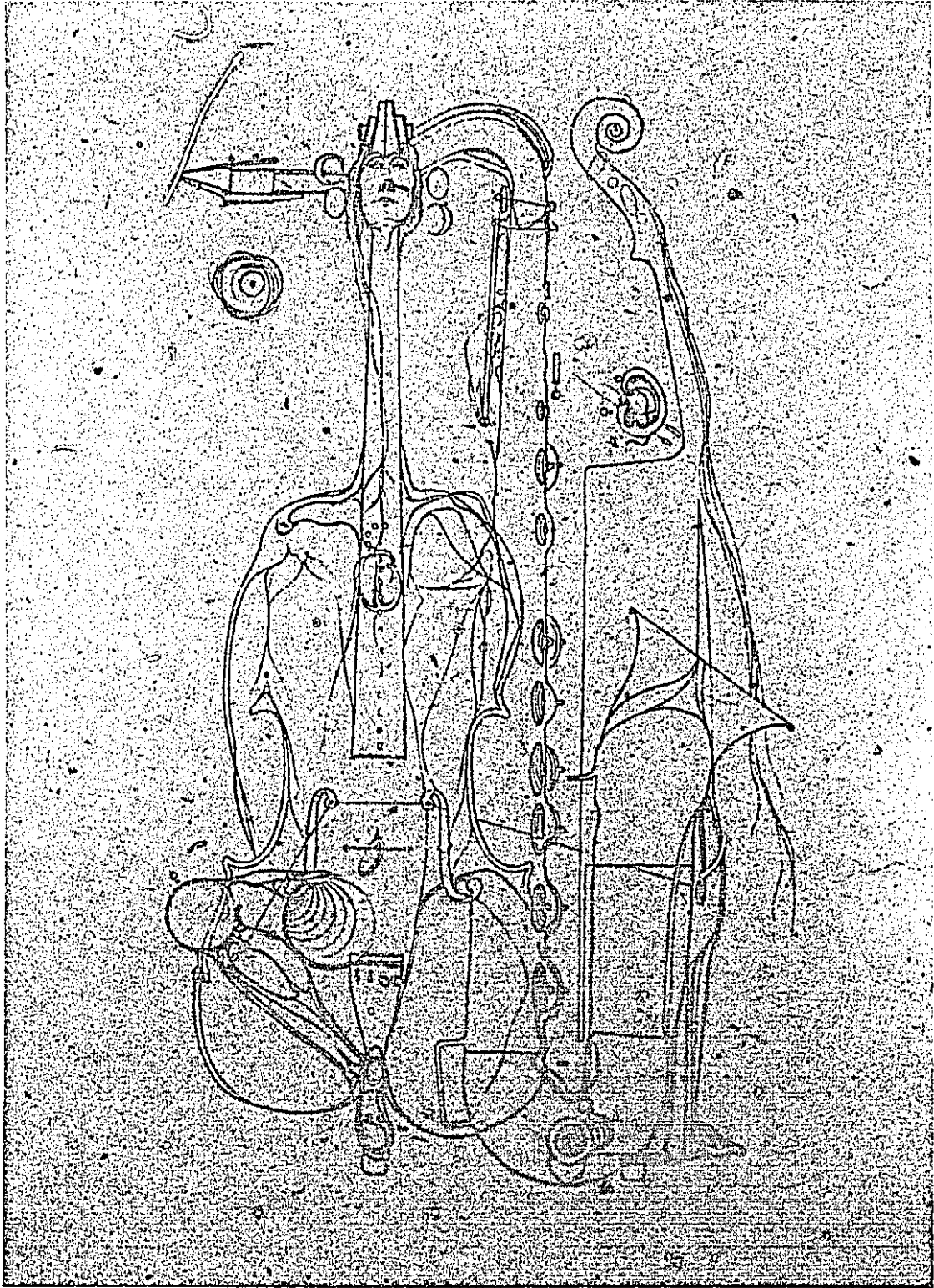
The built work gathers on all of these themes. A violin is laid over a bed of masonry, the ground. The newly found horizontality permits the sacrificial sectioning of the classical instrument and its taking on a second life. It is, at the time, a skeletal body revealed, a boat and sail, an architectural instrument. Steel wiring holds the wooden pieces together. A welded steel frame holds the masonry. At the head of the bed, at the top of one of the posts, a shiny metallic sphere acts as intermediary between the tuning key of the instrument and the earth; a very thin wire joins the three.
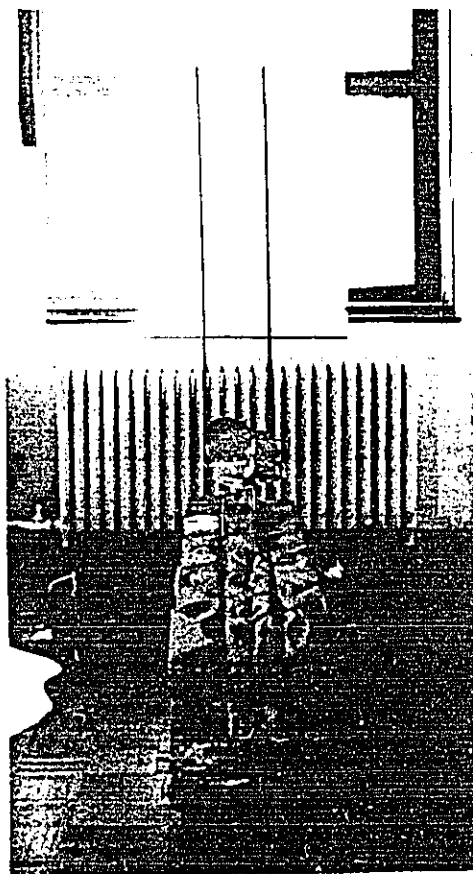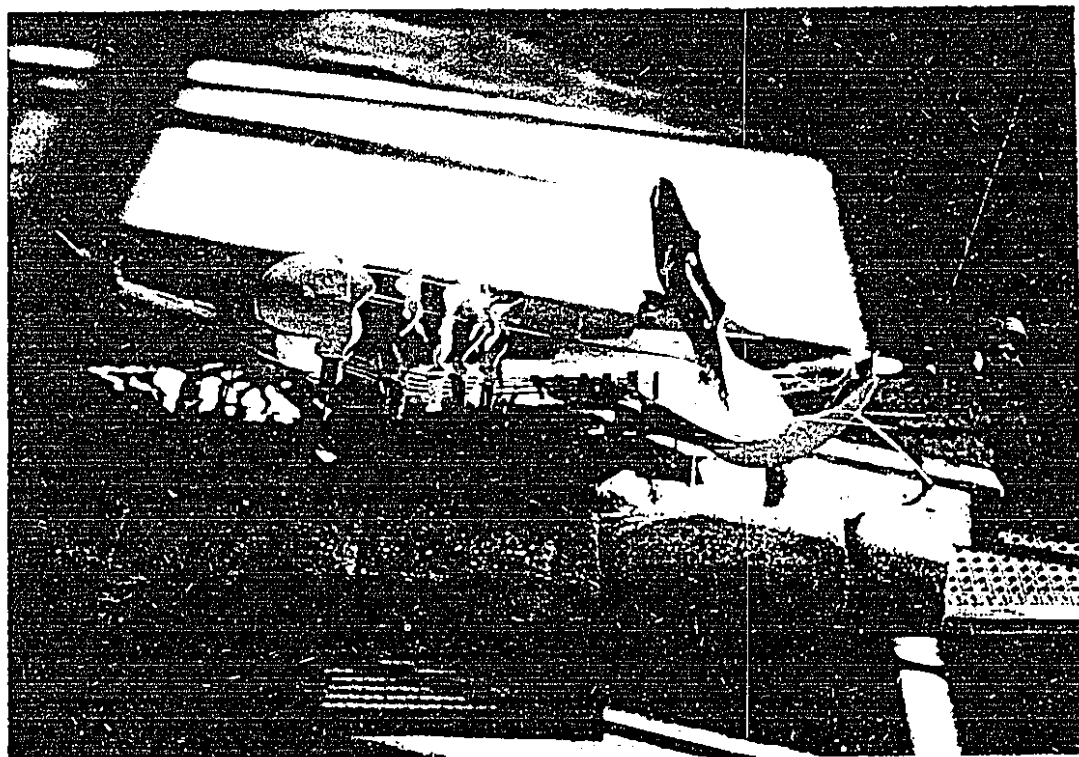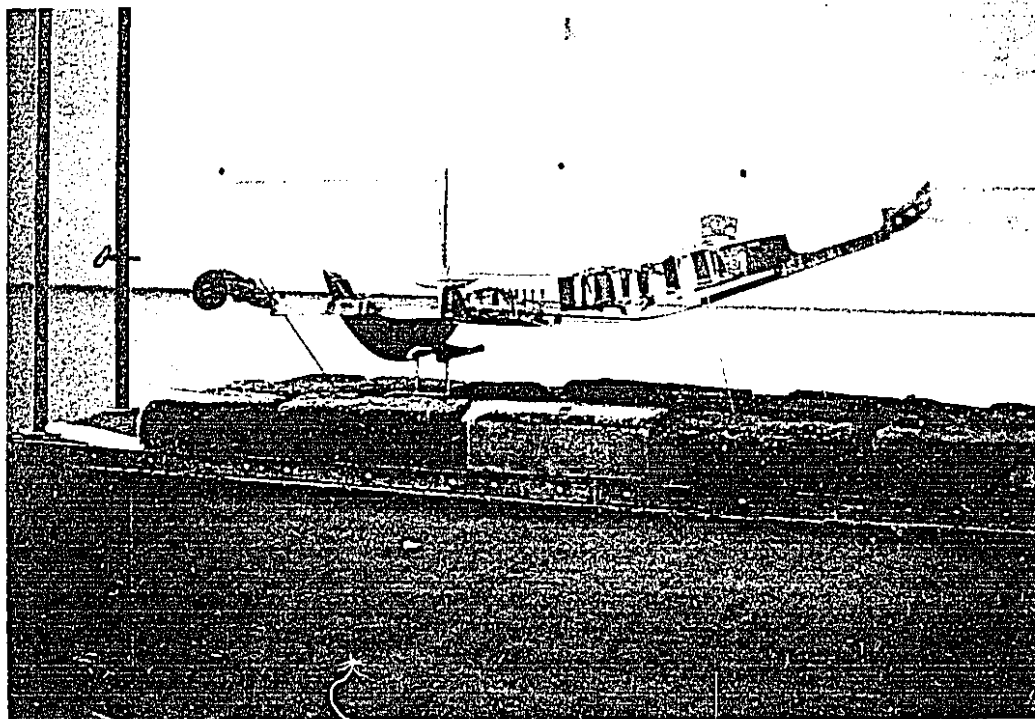
Appendix 2:   A Brief Résumé of the Material
              Evolution of Medieval Plainchant
              Towards Polyphony

When Charlemagne set out to unify Europe politically,
a single repertory of religious plainchants was imposed
throughout his realm.   The chosen music was basically Roman
in origin and was associated by legend to Saint Gregory the
Great, from which came the name 'Gregorian Chant'.[123]
Plainchants had passed from generation to generation through
oral memory until then.   The problem of diffusing a fixed
music encouraged the development of an elementary musical
graph, with no specific pitches but with an annotation of
neumes.   One had to be acquainted first hand with the melody
in order to interpret them.

From circa 900 to 1200, monophony evolved towards
polyphony, from the singing of two parallel voices
distinguishing themselves in the register, to two or more
melodies of identical rhythm, to variable rhythm.   In the
twelfth century, composers overlay up to four imitative
voices.   Various methods of structural imitation came into
play from then on.   All this time, these works continued
referring back to a cantus firmus, from the initial
Carolinian repertory.   The cantus firmus became the binding
reference behind an increasingly complex work timidly
departing from it.

Because all the monophonic chants needed for liturgy
had been already composed in principle, the melodic voices
accompanying them were meant to enhance their effect.   New

---

[123] In fact, Gregory had not been a musician although
he had been Pope from the year 590 to 604.

68

music, an _organum_, was built over and around the original _cantus_ _firmus_ and would eventually bury it. The ability of the pipe organ to sustain this choral background explains its appearance and popularity at this time. The culmination of modal and contrapuntal practice in the High Middle Ages would nonetheless reveal the complexity of the superimposition of many melodies onto a fixed modal system. Harmonic aggregation became a problem.

A more emphatic and regular rhythm facilitated coordination and became favoured. Notation, however, played the increasingly crucial role in the structuring process. The nature of the modal system would thus come to be questioned.[124] Notation does permit the closer study of the harmonic inconsistencies of the church modes; but, by the same token, it subjects the cosmological foundations of harmony (as Unity) to a dialectical analysis, and to the (meaningful) projection of text. This had been perhaps foreseeable from the moment scripture replaced the timeless oral legacy, and that the work would no longer be anonymous.

---

[124] The question is pertinent, even some 500 years later. See René Leibowitz's material analysis: "The History of Modal Music"; _Schoenberg and His School: the Contemporary Stage of the Language of Music_, New York: Da Capo Press, 1979.

BIBLIOGRAPHY

Ackerman, James S. **Palladio.** New York: Penguin Books, (1966) 1986.

Ackerman, James S. "Ars sine scientia nihil est"; **Art Bulletin.** XXXI, 1949.

Adorno, Theodore W. **Philosophy of Modern Music.** Translated by Anne G. Mitchell and Wesley V. Blomster. New York: Continuum Publ., 1973.

Alberti, Leon Battista. **On the Art of Building in Ten Books.** Originally published in 1450; translated by Joseph Rykwert, Neil Leach, Robert Tavernor. Cambridge and London: MIT Press, 1988.

Argan, Guilio C. **The Renaissance City.** Translated by Susan Edna Bassnett. New York: George Braziller, 1969.

Aristotle. **Metaphysics.** Ed. and translated by John Warrington. New York: Everyman's Library, 1961.

Aristotle. **The Basic Works of Aristotle.** Ed. with an introduction by Richard McKeon. New York: Random House, 1941.

Attali, Jacques. **Bruits: essai sur l'économie politique de la musique.** Paris: Presses universaires de France, 1977.

Barbaro, Daniele. **La pratica della perspettiva.** Originally published in Venice, 1569. Sala Bolognese: Arnaldo Forni Ed., 1980.

Benveniste, E. "La notion de <<rythme>> dans son expression linguistique"; **Journal de psychologie normale et pathologique.** Paris: XLIV, 1951, pp. 401-410.

Biot, François et Perrot, Françoise. **Le Corbusier et l'architecture sacrée.** Lyon: La Manufacture, 1985.

Bonhôte, Jean-Marc. "Résonnance musicale d'une villa de Palladio"; **Musica Disciplina.** Rome: American Institute of Musicology, Vol. XXV, 1971, pp. 171-178.

Bourke, Vernon J., ed. **The Essential Augustine.** Indianapolis: Hackett Publ., 1985.

Bower, Calvin. "Natural and Artificial Music: the Origins
    and Development of an Aesthetic Concept"; Musica
    Disciplina. Rome: American Institute of Musicology,
    Vol. XXV, 1971, pp. 17-33.

Cage, John. **Silence.** Middletown, Connecticut: Wesleyan
    University Press, 1973.

Calvino, Italo. **Cosmicomics.** Translated by Jean
    Thibaudeau. Paris: Ed. du Seuil, 1988.

de Candé, Roland. **Histoire universelle de la musique,**
    Tome 1. Tours: Ed. du Seuil, 1978.

Couliano, Ioan P. **Eros and Magic in the** Renaissance.
    Chicago: University of Chicago Press, 1987.

Daidalos. Berlin Architectural Journal. No. 17, Sept.
    1985.

Dante. **OEuvres complètes.** Translation and commentary by
    André Pézard. France: Ed. Gallimard, 1965.

Deliège, Celestin. **Invention musicale et idéologies.**
    Mayenne: Christian Bourgeois Ed., 1986.

Direction de l'Architecture et l'ENSBA. Filippo
    Brunelleschi: La naissance de l'architecture moderne.
    Fontenay-sous-Bois: L'Equerre, 1978.

Erickson, Carolly. **The Medieval Vision.** New York: Oxford
    University Press, 1976.

Faure, Elie. **L'esprit des formes.** France:
    Ed. Jean-Jacques Pauvert, 1966.

Frankfort, Henri et al. **Before Philosophy; The Intellectual**
    Adventure of Ancient Man. Penguin Books, (1946) 1972.

Fraisse, Paul. **Psychologie du rythme.** Vendôme: Presses
    Universitaires de France, 1974.

Frankl, Paul. "The Secret of the Medieval Masons";
    Art Bulletin. XXVII, 1945.

Fubini, Enrico. **Les philosophes et la musique.** Paris:
    Honoré Champion, 1983.

Gadamer, Hans-Georg. **The Relevance of the Beautiful and**
    Other Essays. Translated by Nicholas Walker; ed. with an
    introduction by Robert Bernasconi. New York: Cambridge
    University Press, 1986.

Gros, Pierre. "Vitruve: l'architecte et sa théorie"; Aufsleig und Niedergzng Der Romishen Welt. II, 30.1, 1982.

Gusdorf, Georges. **Fondements du savoir romantique.** Paris: Payot, 1982.

Gusdorf, Georges. **Mythe et métaphysique.** Paris: Flammarion, 1984.

Gusdorf, Georges. **Les origines des sciences humaines.** Paris: Payot, 1967.

Guthrie, Kenneth Sylvan, compilation and translation. The **Pythagorian Sourcebook and Library.** Ed. with an introduction by David R. Fideler. Grand Rapids, Michigan: Phanes Press, 1987.

Handschin, Jacques. "The <<Timaeus>> Scale"; Musica Discipina. Rome: American Institute of Musicology, Vol. IV, 1950, pp. 3-42.

Heidegger, Martin. **Chemins qui ne mènent nulle part.** Translated by Wolfgang Brokmeier. Saint-Amand: Ed. Gallimard, 1987.

Heidegger, Martin. **Language, Poetry, Thought.** Translated by Albert Hofstadter. New York: Harper & Row, 1975.

Hofstadter, Albert and Kuhns, Richard, ed. **Philosophies of Art and Beauty: Selected Readings in Aesthetics from Plato to Heidegger.** Chicago: University of Chicago Press, 1964.

Holt, Elizabeth Gilmore, ed. **A Documentary History of Art.** Vol.I: **The Middle Ages and the Renaissance.** Princeton: Princeton University Press, 1981.

de Honnecourt, Villard. **Carnet.** Presented and commented by Alain Erlande-Brandenburg. Paris: Stock, 1986.

Howard, Deborah and Longair, Malcolm. "Harmonic Proportion and Palladio's <u>Quattro Libri</u>"; **Journal of the Society of Architectural Historians.** Vol. XLI, No. 2, May 1982, pp. 116-143.

Jay, Martin. **Adorno.** Cambridge: Harvard University Press, 1984.

Jordan, William Sheldon. **Time, Space, and Music: Prologema to the History of Musical Theory.** Ph.D., Florida State University, 1976.

Journal of the Columbia University School of Architecture,
    Planning and Preservation. "Architecture and Music";
    Precis 6. New York: Fall 1985.

Jung, Carl G. Aion: Researches Into the Phenomenology of
    the Self. Translated by R.F.C. Hull. Princeton:
    Princeton University Press, 1979.

Jung, Carl G., et al. Man and his Symbols. Garden City,
    N.Y.: Doubleday, 1964.

Kahn, Charles H. Anaximander and the Origins of Greek
    Cosmology. New York and London: Columbia University
    Press, 1964.

Karp, Theodore. "Rhythmic Architecture in the Music of the
    High Middle Ages"; Medievalia et Humanistica. Cleveland &
    London: No. 1, 1970, pp. 67-80.

Kinkeldey, Otto. "The Music of the Spheres" (extract);
    Bulletin of the American Musicological Society. 1948,
    p. 30.

Kitto, H.D.F. The Greeks. Baltimore: Penguin Books, 1970.

Koyre, Alexandre. Du monde clos à l'univers infini.
    Saint-Amand: Ed. Gallimard, (1957) 1973.

Kristeller, Paul Oskar. Renaissance Thought and Its
    Sources. New York: Columbia University Press, 1979.

Le Goff, Jacques. Les intellectuels au Moyen Age. Bourges:
    Ed. du Seuil, 1985.

Leibowitz, René. Schoenberg and His School: The
    Contemporary Stage of the Language of Music. Translated
    by Dika Newlin. New York: Philosophical Library, 1949.

Levin, David Michael. The Body's Recollection of Being:
    Phenomenological Psychology and the Deconstruction of
    Nihilism. London: Routledge & Kegan, 1985.

Levy, Kenneth. Music: A Listener's Introduction.
    New York: Harper & Row, 1983.

Lippman, Edward A. Music and Space: A Study in the
    Philosophy of Music. Ph.D., Columbia University, 1952.

Lomazzo, Giovan Paolo. Idea del tempio della pittura,
    Vol. 1&2. Originally published in Milan, 1590.
    Translation with commentary by Robert Klein. Florence:
    Istituto nazionale di studi sul rinascimento, 1974.

Lowinsky, Edward E. **Tonality and Atonality in Sixteenth-Century Music.** Foreword by Igor Stravinsky. Berkeley: University of California Press, 1962.

Lowinsky, Edward E. "The Concept of Physical and Musical Space in the Renaissance"; **Papers of the American Musicological Society.** 1941 (publ. 1946), pp. 57-84.

Martin, David F. **Art and the Religious Experience: The "Language" of the Sacred.** New Jersey: Associated University Press, 1972.

Maury, Jean-Pierre. **Comment la terre devint ronde.** France: Gallimard, 1989.

Mazzaro, Jerome. **The Figure of Dante: Essay on the Vita Nuova.** Princeton: Princeton University Press, 1981.

Meir, Bernhard. **The Modes of Classical Vocal Polyphony.** New York: Broude Brothers Ltd, 1988.

Merleau-Ponty, Maurice. **Phénoménologie de la perception.** Saint-Amand: Ed. Gallimard, 1945.

Merleau-Ponty, Maurice. **L'Oeil et l'Esprit.** Mayenne: Ed. Gallimard, 1964.

Miller, Clement A. "The <u>Dodecahordon</u>: Its Origins and Influence on Renaissance Musical Thought"; **Musica Disciplina.** Vol. XV, 1961, pp. 155-166.

Palladio, Andrea. **The Four Books of Architecture.** A replication of the 1738 Issac Ware English edn.; originally published in 1570. New York: Dover Ed., 1965.

Palmer, Richard E. **Hermeneutics.** Evanston: Northwestern University Press, 1985.

Panofsky, Erwin. **Gothic Architecture and Scholasticism.** New York: The New American Library, Inc., (1951) 1976.

Panofsky, Erwin. **La perspective comme forme symbolique.** Paris: Ed. de Minuit, 1975.

Perez-Gomez, Alberto. **Architecture and the Crisis of Modern Science.** Cambridge: MIT Press, 1985.

Perez-Gomez, Alberto. "The City As a Paradigm of Symbolic Order"; **Carleton Book.** Ottawa: Carleton University Press, 1986.

Plato.   Timaeus and **Critias**.   Great Britain: Penguin Books,
    1987.

Plato.   **The Collected Dialogues of Plato**.   Edith Hamilton
    and Huntington Cairns, editors.   Princeton: Princeton
    University Press, 1982.

Reiss, Edmund.   "Number Symbolism and Medieval Literature";
    Medievalia et Humanistica.   Cleveland: New series, No. 1,
    1970.

Ricoeur, Paul.   **History and Truth**.   Evanston: Northwestern
    University Press, 1965.

Rykwert, Josef.   **The First Moderns**.   Cambridge: MIT Press,
    1983.

Schneider, Marius.   **El origen musical de los animales-
    símbolos en la mitología y en la escultura** antiguas.
    Barcelona: Instituto Español de Musicología, 1946.

Schoenberg, Arnold.   **Style and Idea: Selected Writings**.
    Translated by Leo Black.   London: Faber and Faber Ltd,
    1975.

Seligman, Paul.   **The Apeiron of Anaximander**.   London:
    The Athlone Press, 1962.

Steiner, George.   **In Bluebeard's Castle; Some Notes Towards
    the Redefinition of Culture**.   New Haven: Yale University
    Press, 1971.

Steiner, George.   **A Reader**.   New York: Oxford University
    Press, 1984.

Steiner, George.   **Real Presences**.   Chicago: University of
    Chicago Press, 1989.

Tatarkiewicz, Wladyslaw.   **History of Aesthetics, Vol. I&II**.
    Ed. by C. Barrett.   Mouton, The Hague, Paris: PWN-
    Polish Scientific Publ., Warszaw, 1970.

van den Berg, J.H.   **Things: Four Metabletic Reflections**.
    Pittsburgh: Duquesne University Press, 19⁻0.

Vernant, Jean-Pierre.   **Les origines de la pensée grecque**.
    Paris: Quadridge/Presses Universitaires de France,
    (1962) 1988.

Vitruve. **Les dix livres d'architecture.** (approximately of the 1st century B.C.) Translated by Claude Perreault, 1684. Bruxelle: Pierre Mardaga Ed., 1979.

Vitruvius. **On Architecture.** Edited from the Harleian manuscript 2767. Translated by Frank Granger. Harvard University Press, Massachusetts, 1970.

Voegelin, Eric. **The Ecumenic Age.** Vol. IV of "Order and History". Baton Rouge and London: Louisiana State University Press, 1986.

von Simson, Otto. **The Gothic Cathedral:** The Origins of Gothic **Architecture** and the **Medieval Concept** of Order. Princeton: Princeton University Press, (1956) 1988.

Wagner, David L., ed. **The Seven Liberal Arts in the Middle Ages.** Bloomington: Indiana University Press, 1986.

Warren, Charles W. "Brunelleschi's Dome and Dufay's Motet"; **Musical Quarterly.** New York: Vol. LIX, no. 1, Jan. 1973, pp. 92-105.

Webern, Anton. **The Path to the New Music.** Translated by Leo Black. Pennsylvania: Theodore Presser Comp., 1963.

Wittkower, Rudolf. **Architectural Principles in the Age of Humanism.** London: Academy Edns, (1949) 1962, 1987.

Wittkower, Rudolf. **Art and Architecture in Italy,** 1600 to 1750. Baltimore: Penguin Books, 1958.

Wittkower, Rudolf & Jaffe, Irma B. **Baroque Art:** The Jesuit Contribution. New York: 1972.

Zarlino, Gioseffo. **On the Modes.** Part IV of "Le istitutionni harmoniche", 1558. Translated by Vered Cohen, ed. with an introduction by Claude V. Palisca. New Haven: Yale University Press, 1983.