PYTHAGOREAN ELEMENTS IN WREN'S PROTESTANT ARCHITECTURE

NATURAL PHILOSOPHY MODIFIED: PYTHAGOREAN ELEMENTS IN WREN'S PROTESTANT ARCHITECTURE

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ABSTRACT

A study of the Pythagorean tradition as it evolved during the seventeenth century in England. Concentration on its inter-relationship with some forms of Protestant beliefs but especially in accounting for the cause and character of Sir Christopher Wren's change of vocation from a natural philosopher to a Pythagorean architect.

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PREFACE

Scholarship concerning the reasons behind Wren's change in vocation from a natural philosopher to an architect reveals an hiatus in an otherwise well researched field. For instance, consider the following opinions as to the reason for Wren's receiving the surveyorship: a reward for Royalist loyalty;[1] an alternative avenue to science for securing fame;[2] a result of inherited artistic ability;[3] a consequence of High Court connection;[4] a product of a Renaissance-type universality of interest and

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[1]Viktor Furst, The Architecture of Sir Christopher Wren (London: Lund Humphries, 1956), p. 1. Bryan Little, Sir Christopher Wren (London: Robert Hale, 1975), pp. 34-37. Rudolf Dircks, ed., Sir Christopher Wren, A.D. 1632-1723, Bicentenary Memorial volume published under the auspices of the Royal Institute of British Architects (London: Hopper and Stoughton Ltd., 1923), p. 2.

[2]John Summerson, Sir Christopher Wren, Brief Lives, No. 9 (London: Collins Clear-Type Press, 1953), pp. 59-61.

[3]Ralph Dutton, The Age of Wren (London: B. T. Batsford Ltd., 1951), pp. 21-27.

[4]Harold F. Hutchison, Sir Christopher Wren (London: Victor Gollancs Ltd., 1976), p. 47. Lucy Phillimore, Sir Christopher Wren: His Family and His Times (London: Kegan Paul, Trench and Co., 1881), p. 128. Sir Lawrence Weaver, Sir Christopher Wren: Scientist, Scholar and Architect (New York: Scribner's Sons, 1923), p. 43. Eduard F. Sekler, Wren and His Place in European Architecture (London: Faber and Faber Ltd., 1956), p. 36. James Elemes, Memoirs of the Life and Works of Sir Christopher Wren

ability;[5] a pragmatic frame of mind which could easily deal with construction problems;[6] and finally, one writer has suggested that Wren's architectural appointment appears more a result of a series of "accidents" than of any one of several tentative "reasons".[7] It seems curious that there should be room only for speculation concerning those circumstances which effected Wren's entry into architecture. There occurred a radical change in Wren's livelihood, yet Wren scholarship has been unable to reach a definitive understanding as to why the change occurred at all. Circumstances definitely played a role, that is, Wren had to be known by the King, at least by reputation, perhaps through John Evelyn or the Duke of Buckingham, before being considered for any official appointment. Moreover, an unsullied political background would prove very advantageous in a time of restored monarchy. Furthermore, certain geometric skills would be indispensable to a would-be architect or "ingenious artisan". However, each

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(London: Oxford University Press, 1823), pp. 215-216.

[5]Geoffrey Webb, Wren, Great Lives, No. 77 (London: The Camelot Press Ltd., 1937), pp. 45-46.

[6]Margaret Whinney, Wren (London: Thames and Hudson, Ltd., 1971), p. 19.

[7]Martin S. Briggs, Wren the Incomparable (London: George Allen and Unwin Ltd., 1953), p. 27.

of these circumstances could only be useful to Wren's being an architect if, indeed, he wished to be an architect. Thus, their usefulness comes only after the fact of Wren's personal motivation; a motivation which cannot be explained as an alternate source of fame to a natural philosopher being slowly, but noticeably, eclipsed by Flamsteed, Hooke, Huygens, Pascal, Descartes and Newton. Wren was praised by Newton as one of "the Greatest geometers of our times"[8] in the Principia. He has as many references in Oldenburg's Diary as any other Royal Fellow. Finally, he came to architecture too well-acclaimed by his contemporaries ever to expect anonymity. Consequently, Summerson's assertion that "the opportunities and functions of an architect provided the means [for Wren] to make a figure in the world",[9] must be seriously questioned. Neither does inherited artistic ability offer a complete explanation of Wren's motivation. What

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[8]Sir Isaac Newton's Mathematical Principles of Natural Philosophy and His System of the World, tr. Andrew Motte, Rev. Florian Cajori, 2 vols. (Berkeley: University of California Press, 1934), I, 22.

[9]Summerson, op. cit., p. 60.

caused this artistic ability to lie dormant? What caused it to erupt? Artistic ability and imagination are more nearly symptoms of Wren's decision than they are the sole cause of a sudden entry.

The mention of "Wren's decision" brings me to my speculation; namely, that Wren simply decided he wished to be an architect. The circumstances and necessary skills or talent existed, but Wren decided to employ them in his desire to be an architect. I wish to argue that Wren turned to architecture because of the materialism of modern science; a materialism which separated the natural world from God and from all transcendental perceptions or beliefs concerning the nature of the universe. This was why he practised a type of architecture which shared deep sympathies with Pythagorean number philosophy; these numbers possessed a mystical or religious significance because they represented the existence of a divine order. Natural philosophy was becoming more and more mechanistic and atomistic. Wren countered this radical break with the past by performing an art which would allow him to share in the spiritual heritage of the mediaeval period.

Wren's need or inspiration to change vocation probably exists at too deep a level in his shattered past, both personally and socially, to be uncovered by direct,

explicit evidnece. However, the more immediate causes for this change can be studied in the course of science throughout the latter seventeenth century. I have used the "Battle of the Books" as a ground-level look at this development both because the Royal Society and its members played significant roles, but also because Pythagorean philosophy assumed crucial importance; an importance which separated moderns and ancients, separated those who held that moral philosophy was independent from natural philosophy from those persons, like Wren and Sir William Temple, who held the contrary view. Besides this approach in accounting for Wren's practice of Pythagorean architecture, I believe there is also a connection between Wren's Protestantism and his second vocation. For instance, God to Wren was no mere entity which one could flirt with but still be saved, that is, there is no record of Wren being anti-clerical. Scientific materialism and Wren's religion were not compatible. Wren, I believe, was a Protestant Enthusiast, but an incredibly intellectual one. For Instance, God was the Divine Geometer who "drew the lines, circles and planes [of the universe] no doubt in order to show himself to mortals everywhere".[10] In other words, God existed without

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[10]Wren's Inaugural Lecture to Gresham College in 1665, in Stephen Wren, Parentalia: Memoirs of the Family of the Wrens (reprinted; Farnborough, Hants: Gregg Press, 1965), pp. 120-121.

intermediaries, but could still only be known through geometry. Thus, mathematics, as a liberal art, is here given support by Wren. This is also why Wren stated that only those things based on the "Foundations of Geometry . . . are the only truths".[11] God certainly exists in an egalitarian form, that is, "everywhere", and this appears to be a basic tenet of Protestanism. However, only the intellect brings man close to God in Wren's mind, not the senses.[12] Geometry to Wren still pursues its ancient function ascribed to it by the quadrivium. Consequently, Wren's architecture, because of its intense Pythagoreanism, is simultaneously intellectual and Protestant, simultaneously geometric and what may be called anti-dualistic. In an attempt to strengthen this view I have studied other individuals of the period to observe if the same connection between Pythagoras and Protestantism applies.

Finally, since Pythagorean number philosophy is of such importance, I have included some account of its nature and development.

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[11] Ibid., p. 200.

[12] Wren's low opinion as to the ability of the senses to ascertain Truth accounts for his disrespect for Baroque architecture with its fleshy colours and sensual "Novelties". Cf. pp. 44-48.

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CHAPTER I

PYTHAGOREANISM

The purpose of this chapter is to define what is meant when the phrase "Pythagorean Tradition" is used in the following study. When scholars write about the Platonic tradition during the Renaissance it is generally assumed that what they mean involves their recognition of the humanists' re-interpretation, or adaptation, of an existing body of doctrine, that is, Plato's writings. The converse is true for the Pythagorean tradition. The causes for this are well known. Quite simply, there are no extant writings by Pythagoras. Consequently, there exists no opportunity for re-interpretation in the usual sense of the term "Tradition".

There are several reasons which may offer an explanation of this situation. If Pythagoras, hypothetically speaking, <u>did</u> express his philosophy in writings, most of these records have perished, as would be expected. However, it would be unusual to expect extant writings since it was a characteristic of Pythagoras to transmit his thought orally and in an esoteric manner. Also, what can be called the canonization of the founder of a religiously oriented school precludes critical biography or exegesis on the part

of the schools' adherents. This observation applies to Pythagoras. It is difficult to distinguish Pythagoras' own particular thinking from thoughts ascribed to him by Neo-Pythagoreans. This situation is caused by an excessive veneration for Pythagoras by his "students". Finally, the sources for Pythagoras' thought which exercised influence during the Christian era are either biased, as with Aristotle's various comments on Pythagoreanism,[1] or interpretations of an already existing legend or myth, as with Plato's Timaeus.[2]

Despite these odds, no one, it seems, has ever denied Pythagoras' existence, teaching, or the inner dynamic of his thought. There have been debates over certain issues, such as occurred during the seventeenth century, in England, with the "Battle of the Books". But even persons most skeptical of anything "Pyhthagorean" have admitted to the

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[1]Even though Aristotle was skeptical of Pythagorean ideas he nonetheless detailed them if only in an attempt to ridicule. These references exist in basically two sources: Metaphysics and On the Heavens. The following editions of these works have been used: The Basic Works of Aristotle, ed. Richard McKeon (New York: Random House, 1941); The Works of Aristotle, ed. W. D. Ross, 12 vols. (Oxford: Clarendon Press), II, 19.

[2]Plato's Cosmology: The Timaeus of Plato, ed. and tr. F. M. Cornford, International Library of Psychology, Philosophy and Scientific Method, C. K. Ogden, ed. (London: Routledge and Kegan Paul, 1937).

perennial influence of Pythagoreanism. Another irony is the appeal of Pythagoras' teaching. If there exists no definitive doctrinal work, but there does exist an influence, then it may be a case of Pythagoras' appeal which explains the tradition, rather than a case of a literary influence per se. The question now becomes an examination of the possible reasons for his appeal. If we agree that it does not exist absolutely as reactions to expressed doctrine, then it may be argued to exist in the minds or society of individual Neo-Pythagoreans. These individuals may have recognized a utility in Pythagoras' thought, be this thought legendary or not.

Despite the lack of clear evidence that Pythagoras expressed a science of the cosmos which involved the role of mathematics and music, the school which we call Pythagorean definitely came to be associated with these subjects. For instance, in Boethius' The Principles of Music,[3] we read of how Pythagoras discovered musical consonances:

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[3] Boethius' the Principles of Music, an Introduction, Translation, and Commentary, ed. C. Bower (Ann Arbor, Michigan: University Microfilms International, 1967).

In the meantime, by certain divine will, when he passed the workshops of blacksmiths, he overheard the beating hammers somehow resound one consonance from the diverse sounds. Thus in the presence of that which he had long sought, he approached the work amazed. And considering for a while, he thought the strength of the hammers caused the diversity of sounds. Thus, in order to test this theory more clearly, he commanded the men to exchange hammers among themselves. But the property of sounds was not contingent on the muscles of the men, but rather it followed the exchanged hammers. Thus when he observed this, he examined the weight of the hammers. And since perchance there were five hammers, one was found to weigh twice as much as another, and these two resounded a diapason consonance. The one which had weighed twice as much as the second formed the sesquitertian relation of a third, with which naturally it produced a diatessaron. He found the one which weighed twice as much as a second to be the sesquialter relation of a fourth, which was related to it by a diapente consonance. Those two, to which the above one of a double weight was proved to be sesquitertain and sesquialter relation, were discovered in turn to be related by the sesquioctave proportion. The fifth hammer, which was dissonant with all, was rejected.

. . . . . .

And in order that what was said might be clearer for the sake of discourse, the weights of the hammers were written underneath in numbers: 12, 9, 8, 6. Thus the hammers which weighed 12 and 6 pounds resounded, in the duple proportion, the diapason consonance. The hammer of 12 pounds with that of 9, and the hammer of 8 pounds with that of 6 were united by a diatessaron consonance according to the sesquitertion proportion. Indeed, the one of 9 pounds with that of 6, as well as those of 12 and 8 intermingled the diapente consonance. The one of 9 pounds with that of 8 resounded the tone according to the sesquioctave proportion.[4]

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[4] Ibid., pp. 60-62.

This account of how ratios correspond with certain musical consonances can be expressed in the following fashion:

2:1	=	Duple	=	Diapason
3:1	=	Tripla	=	Diapason diapente
4:1	=	Quadrupla	=	Bis diapason
3:2	=	Sesquialtera	=	Diapente
4:3	=	Sesquitertia	=	Diatesseron
5:4	=	Sesquiquarta	=	Diatonus semitonus
8:3	=	Dupla superbipartiens	=	Diapason Diatesseron
9:8	=	Sesquioctava	=	Tonus

This musical system depends upon a special set of simple relationships between the four smallest integers: 1, 2, 3, 4. To Pythagoras, the number ten, the four smallest integers added together, defines the limit of the universe. Proportions between these integers are considered both natural and universal. As W. K. C. Guthrie states:

> Pythagoras found out that those intervals of the musical scale which are . . . called the perfect consonances can be expressed arithmetically as ratios between the numbers 1, 2, 3 and 4. These are the numbers which, added together, make 10, and the number ten . . . was called the perfect number. It was illustrated graphically by the figure called the tetraktys, [that is,] ∴ ⁘ The discovery lay in the existence of an inherent order . . . concerning the nature of the universe.5

The most significant aspect to this "inherent order" is that it is universal. As Cassiodorus states: "The heavens and the earth, indeed all things in them which are

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[5]W. K. C. Guthrie, The Greek Philosophers from Thales to Aristotle (London: Methuen and Co. Ltd., 1967), pp. 38-39.

directed by a higher power, share in this discipline of music, for Pythagoras attests that this universe was founded by and can be governed by music".[6] From Boethius and Cassiodorus we can see that there are basically two aspects of Pythagoreanism: one, the notion that "all is number" since arithmetic is basic to ratio which, in turn, is basic to music; two, the theory concerning the harmony of the spheres since "all things . . . share in this discipline of music". We need to ascertain why these beliefs have exercised an influence throughout history, especially, for our present purposes, for Wren and seventeenth century England.

The notion that "all is number" implies that everything in the universe is geometric and ordered. For Plato, in the Timaeus, the theory of the Five Perfect Solids explains this order:

> To earth let us assign the cubical figure; for of the four kinds earth is the most immobile and the most plastic of bodies.
> . . . . . .
> The one with the fewest faces (pyramid) must be the most mobile, since it has the sharpest cutting edges. . . . Hence, in accordance with genuine reasoning as well as probability, we may take the pyramid as the element . . . of fire; the second in order of generation (octahedron) as that of

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[6] An Introduction to Divine and Human Readings by Cassiodorus Senator, tr. Leshe Webber Jones (New York: Columbia University Press, 1946), p. 190.

> air; the third (icosahedron) as that of water.
> . . . . . .
> And with regard to their numbers, their motions, and their powers in general, we must suppose that the god adjusted them in due proportion, when he had brought them in every detail to the most exact perfection. . . .7

Plato adds that God created these shapes for a particular reason: "Desiring, then, that all things should be good and, so far as might be, nothing imperfect, the god took over all that is visible -- not at rest, but in discordant and unordered motion -- and brought it from disorder into order, since he judged that order was in every way the better".[8]

This portrayal of the Godhead, although Pythagorean, is at variance with the Christian conception of God which holds that "when God made heaven and earth, the earth was without form and void, with darkness over the face of the abyss . . .".[9] To Plato, God ordered chaos. To Christians, God created order from a void. Despite such differences as this, however, the Pythagorean belief in an ordered universe was synthesized with Christian theology through St. Augustine.

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[7]Plato, op. cit., 55D-56C, pp. 222-223.

[8]Ibid., p. 30. We will return to the dodecahedron's significance below.

[9]Genesis 1:2 (New English Bible trans.).

Augustine too believed that without the principate of number the cosmos would be reduced to chaos. In his treatise, On Order,[10] Augustine expressed a belief in the passage from the Wisdom of Solomon; "thou hast ordered all things in measure and number and weight".[11]

Boethius further perpetuated the Pythagorean belief that "all is number". He emphasized the importance of the quadrivium, or the four-way path to truth. These paths were geometry, music, arithmetic and astronomy. These liberal arts possessed the ability to perceive God since God was seen as the divine architect who ordered a universe wherein "all is number". Boethius aptly describes the function of the quadrivium:

> Which then of these disciplines ought to be studied first unless it is that one which holds the first principle and position of a mother, as it were, to the others? This one is indeed arithmetic; for it is prior to all the others, not only because God the Creator of the great universe considered arithmetic first as the model of his reasoning and created all according to it, having rationally forged all things through numbers of assigned order to find concordance, but also because arithmetic is prior by nature.12

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[10]Vernon J. Bourke, Augustine's Quest of Wisdom, Science and Culture Series, Joseph Husslein, ed. (Milwaukee: Bruce Publishing Co., 1945), p. 75.

[11]Quoted in Otto Von Simson, The Gothic Cathedral: Origins of Gothic Architecture and the Medieval Concept of Order, Bollingen Series XLVII (2nd ed.; New Jersey: Princeton University Press, 1962), p. 22.

[12]Boethius, op. cit., pp. 27-28.

Arithmetic, to Boethius, is the fundamental aspect of geometry, music, and astronomy. Similarly, the Pythagorean importance of number is fundamental to arithmetic. This can be seen in Boethius' view of the harmony of the spheres:

> Moreover, the very motion of the stars is resounded in harmonic modulations. Wherefore it is certain that the power of music, which without doubt is naturally superseded by that of arithmetic precedes the courses of the stars in authority.[13]

The notion that "all is number" appealed to seventeenth century natural philosophers immensely. Newton's demonstration that "all is gravity" could be seen as essentially Pythagorean except insofar as the kosmos of melodic ratios has become a kosmos of gravitational law. According to Aristotle, the Pythagoreans believed that since all things "seemed in their whole nature to be modelled on numbers, and numbers seemed to be the first things in the whole of nature, they supposed the elements of numbers to be the elements of all things . . .".[14] Newton, perhaps the entire natural philosophy of the seventeenth century, sought to prove this same conception of the universe. What Pythagoras may have believed because of a mystical union, natural philosophy attempted to prove through the law of gravitation by using mathematics.

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[13] Ibid., p. 30.

[14] Basic Works of Aristotle, Metaphysics,

Some Protestants, like Pythagoras, desired to prove that the universe was a unified entity, a concord wherein universal laws existed just as with melodic changes. But this is where the similarity ends. For these Protestants, the desire to prove the existence of universal law became a means of showing the existence of intermediaries between the heavens and earth a product of superstition and perhaps even oppression. Although differing in raison d'être, Pythagoras' notion that number is a universal law cannot be disassociated, in essence, from Newton's openly admitted interest in science: "to point out the errors of that 'whore of Babylon'";[15] the "whore" being the Catholic Church. One of the biggest "errors" was of course the denial of universal law and the upholding of dualism which was seen to exist between the heavens and earth.

Sir Christopher Wren, as one-time President of the Royal Society, as a natural philosopher, and as a Protestant, may also have recognized how Pythagorean thought expressed a conception of the universe he shared and was

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985B 34-986A1, p. 698.

[15]Quoted in George Grinnell's "Newton's Principia as Whig Propaganda", in P. Fritz and David Williams, eds., City and Society in the 18th Century, Publications of the McMaster University Association for 18th Century Studies (Toronto: University of Toronto Press, 1973), III, 192.

attempting to validate. According to one seventeenth century writer, Sir William Temple, Pythagoras dealt with a conception of the universe remarkably like that of some of his fellow Protestants: "in natural philosophy Pythagoras held that the world was round . . . that the author of it was a spirit, or a mind that pervaded the whole universe, and was diffused through all parts of it".[16] As Gilbert Burnet expressed it: "Nothing can be more admirable, nor breathe more of the spirit of Christianity, than what Pythagoras taught . . .".[17] Perhaps it was with this connection in mind that Bacon wrote: "The number philosophy of Pythagoras I hold to be full of promise".[18] If Wren did indeed recognize Pythagoreanism and his view of Protestantism as similar in some ways, then perhaps his ideas on architecture were affected? For instance, insofar as all church architecture embodies a conception of the Godhead, the Protestant church, to Wren at least, should exemplify universal law -- the belief, as Newton expressed it, that

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[16]"Ancient and Modern Learning", in Samuel Holt Monk, ed., Five Miscellaneous Essays by Sir William Temple (Ann Arbor: The University of Michigan Press, 1963), p. 43.

[17]Gilbert Burnet, The Sacred Theory of the Earth (London: T. Kinnersley, 1816), p. 605.

[18]"The Masculine Birth of Time", in Benjamin

"God is the same God, always and everywhere"; "He endures forever and is everywhere present"; "In him are all things contained and moved". Significantly, Newton recognized the appeal of Pythagoras' thought for Protestants since he stated, of his view of God: "This was the opinion of the Ancients. So Pythagoras . . . [in Cicero's De Nat. Deor.]".[19] In the case of Wren, this same recognition could be expressed through the ratios of musical consonances, which, as we have seen from Cassiodorus, exist throughout heaven and earth: "in them all things . . . share in this discipline of music" just as God is in "all things contained and moved".

If this argument can be accepted as the scientia of Wren's architecture, then the ars can be demonstrated quite simply. What it involves is identifying ratios in Wren's designs which are the same ratios which produce musical consonances, the means of universal law. As Henry Wotton stated, in 1624, drawing on Alberti and the Renaissance architectural expression of Pythagoreanism:

Farrington, ed., The Philosophy of Francis Bacon: An Essay on Its Development from 1603 to 1609 (Liverpool: Liverpool University Press, 1964), p. 71.

[19]"General Scholium", in H. S. Thayer, ed., Newton's Philosophy of Nature: Selections from His Writings, The Hafner Library of Classics (New York: Hafner Press, 1953), p. 43.

> Leon Alberti (a learned searcher) who from the schoole of Pythagoras . . . doth determine the comeliest proportion betweene breadths and heights; reducing symmetrie to symphonie, and the harmonie of sound, to a kind of harmonie in sight. . . .20

In other words, architects, employing Pythagoras' musical-mathematical philosophy, can create actual structures which partake of the universe's "inherent order". Wren may have designed his buildings so that they could indeed partake of, and embody, this universal harmony.

Perhaps, if we can understand why Pythagoras' identity became such an important issue in the "Battle of the Books", we may learn if Wren's "recognition" was indeed a conscious one, rather than a mere product of an overly inventive M.A. candidate.

The second aspect of the Pythagorean tradition which we shall consider is the theory of "The Harmony of the Spheres" which, throughout antiquity and ever since, has been considered typically Pythagorean.[21] In On the Heavens Aristotle writes:

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[20]Henry Wotton, The Elements of Architecture, London, 1624 (reprinted Amsterdam: Da Capo Press, Thearum Orbis Terrarum Ltd., 1970), p. 53.

[21]J. A. Philip, Pythagoras and Early Pythagorganism, Journal of the Classical Association of Canada, Supplementary Volume VII (Toronto: University of Toronto Press, 1966), p. 123.

> From all this it is clear that the theory that the movement of the stars produces a harmony, i.e. that the sounds they make are concordant, in spite of the grace and originality with which it has been stated, is nevertheless untrue. Some thinkers [the Pythagoreans] suppose that the motion of bodies of that size must produce a noise, since on our earth the motion of bodies far inferior in size and in speed of movement has that effect. Also, when the sun and the moon, they say, and all the stars, so great in number and in size, are moving with so rapid a motion, how should they not produce a sound immensely great? Starting from this argument and from the observation that their speeds, as measured by their distances, are in the same ratios as musical concordances, they assert that the sound given forth by the circular movement of the stars is a harmony. Since, however, it appears unaccountable that we should not hear this music, they explain this by saying that the sound is in our ears from the very moment of birth and is thus indistinguisable from its contrary silence, since sound and silence are discriminated by mutual contrast. What happens to men, then, is just what happens to coppersmiths, who are so accustomed to the noise of the smithy that it makes no difference to them. But, as we said before, melodious and poetical as the theory is, it cannot be a true account of the facts.22

In the Timaeus, Plato, when explaining the harmony of the World Soul, indicates that it is composed according to certain geometric ratios which, predictably, produce musical consonances:

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[22]The Works of Aristotle, Vol. II: On the Heavens, 290B 12-290B32.

> And he began the division in this way. First he took one portion (1) from the whole, and next a portion (2) double of this; the third (3) half as much again as the second, and three times the first; the fourth (4) double of the second; the fifth (9) three times the third; the sixth (8) eight times the first; and the seventh (27) twenty-seven times the first.23

From this quotation we can see that St. Augustine was correct when he approvingly remarked; "Plato teaches that this soul of the universe flows, as it were, in rhythmic waves . . . .".[24]

Boethius also expressed a belief in the harmony of the spheres which is Pythagorean:

> How could it possibly be that such a swift heavenly machine should move silently in its course? And although we ourselves hear no sound -- and indeed there are many causes for this phenomenon -- it is nevertheless impossible that such a fast motion should produce absolutely no sound, especially since the orbits of the stars are joined by such a harmony that nothing so perfectly structured, so perfectly united, can be imagined. For some stars drift higher, others lower, and they are all moved with such an equal amount of energy that a fixed order of their courses is reckoned through their diverse inequalities. Thus there must be some fixed order of musical modulation in this celestial motion.25

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[23]Plato, op. cit., 35 B-C, p. 66.

[24]Saint Augustine, The City of God, T. G. G. Walsh and U. J. Bourke, eds. (New York: Image Books, 1967), p. 284.

[25]Boethius, op. cit., pp. 44-45.

If we consider that over eighty-two manuscripts of The Principles of Music have survived from the mediaeval period, then we can gather a rough impression of its overall influence, and of the influence of Boethius' conception of musica mundana.

The theory of heavenly harmony in the Pythagorean tradition must be seen as distinct from the theory of heavenly harmony in the Aristotelian tradition; the latter being the view which the Jesuits, for example, supported during the seventeenth and eighteenth centuries.[26]

For Pythagoreans there always exists correspondences between the heavens and earth. This point cannot be overemphasized. Aristotle stated that Pythagoreans sought "all the properties of numbers and scales which they could show to agree with the attributes and parts and the whole arrangement of the heavens . . . .".[27] It was in this fashion that Pythagoreans made a practice of bringing to-

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[26]Renaissance Protestants and Catholics certainly shared many common ideas as Tillyard's Elizabethean World Picture has shown. However, the idea which appears to have separated some individual English Protestants and Catholics, at least by the end of the seventeenth century, was the point of disagreement on sublunary-superlunary unity. I have concentrated on this particular disagreement but by no means do I wish to obscure the possibility that there simultaneously existed some degree of common preoccupation among both Catholics and Protestants.

[27]The Basic Works of Aristotle, Metaphysics, 986A-5, p. 698.

gether the correspondences between numbers and concords on the one hand, and on the other, the parts and attributes of the universe and the whole ordered world. In other words, the Pythagorean tradition does not stress any difference between the heavens on one hand, and earth, on the other: all parts and attributes of the universe partake of the consummate order.

The music of the spheres is thereby determined by the same laws of proportion as is the music of the seven-stringed lyre. Boethius goes far in this denial of duality when he states, concerning the laws of musical proportion, that the "order of musical modulation in . . . celestial motion" also joins "together the diversities and contrary qualities of the four elements".[28] Plato's theory of the Five Perfect Solids involves, in an important respect, a similar denial. For instance, after explaining the figures of the four elements, Plato added: "There still remained one construction, the fifth; and the god used it for the whole . . .".[29]

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[28]Boethius, op. cit., p. 45.

[29]Plato, op. cit., 55C, p. 218.

Despite the fact that this fifth solid cannot be constructed from either of the elementary triangles which make up the other solids, the common quality which all share with the dodecahedron is that of envelopment: "and the god used it for the whole". Cornford's explanation is helpful and requires full quotation:

> Socrates in Phaedo 110B says that the spherical Earth, seen from above, would resemble "one of those balls made of twelve pieces of leather" marked out in a pattern of various colours. "To make a ball, we take twelve pieces of leather, each of which is a regular pentagon. If the material were not flexible, we should have a regular pentagon; as it is flexible, we get a ball." So here Plato imagines a flexible dodecahedron expanding into spherical shape.[30]

The dodecahedron is the perfect solid which corresponds to the shape of both the heavenly planets and earth: "God used it for the whole, making a pattern of animal figures thereon".[31] Cornford interprets this passage as meaning that the whole sky, being covered with "animals", that is, other constellations, is likewise made up of this fifth solid. Plato's view of the earth as a star, like all other stars, sharing in universal modulation, formed out of geometry for eternity, is essentially antithetical to an Aquinian or an Aristotelian cosmology in its

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[30] Ibid., p. 219.

[31] Ibid., 55C, p. 218.

Pythagorean denial of duality.[32]

For Aristotle, and his student, St. Thomas Aquinas, the case concerning the harmony of the spheres was reversed in an important aspect: the heavens are still undoubtedly perfect, but the sub-lunary sphere bears no correspondence to this perfection. In the Summa Theologiae, Aquinas states the following on luminous bodies:

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[32]Admittedly, the question concerning Plato's position vis-a-vis sublunary-superlunary unity is debatable. However, I have relied on Cornford heavily and, if I am interpretating this critic correctly, Plato appears to be expressing Pythagorean ideas. This Pythagoreanism may account for why the slave boy, in the Meno dialogue, discovers the Pythagorean theorem, that is, there exists a unity between the slave's soul and the soul of the universe. R. E. Allen, "The Socratic Paradox", Journal of the History of Ideas, also concludes that in Plato the conflict between the senses and knowledge derived through reason, between the heavens as a manifestation of pure geometry and the earth with its ever-changing corruption, are reconciled by Plato's belief in the existence of a consummate unity. As an example of this reconciliation Allen offers an interpretation of what Socrates' dictum, Virtue is Knowledge, means:

> [Plato] argued that to know what we ourselves are . . . we must know the Self Itself . . . , plainly a universal in which individual selves are grounded and from which they derive their nature. [Moreover] Socrates' ethics . . . assumes that men, in seeking their own self-perfection, seek a universal and ideal harmony in which struggle and contention are reconciled.

Allen concludes:

> Plato's continual comparison of the mind to the eye, of intelligence to sight, is most significant: it is fruit of the assumption that the primary function of both lies in direct and immediate apprehension. But the object of self-knowledge,

> Even following those who hold that the heavenly bodies are similar to the four elements, there is no special difficulty, because there is place for theorizing that they were formed, like animals and plants, from some pre-existing matter.33

Despite this pretense that there exists "no special difficulty" concerning the Pythagorean belief that the heavens and earth share fundamental qualities, Aquinas continues:

> But to follow those who maintain that the heavenly bodies are different in nature from the elements and are by nature incorruptible is necessarily to hold that the substance of the luminous bodies was created in the beginning, but that, first lacking form, they then received it on the fourth day of Creation.[34]

Aquinas believes that a distinction does exist between the heavens and earth. He resolves the "Chronological" problem concerning Creation by associating luminous

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> in so far as it may be called "object," is not merely seen: it is possessed. The unity of the soul's vision is inextricably associated with a unity of life.

[33]Thomas Gilby, ed., St. Thomas Aquinas, Summa Theologiae, tr. Timothy McDermott, 60 vols., Vol. X: Existence and Nature of God (London: Eyre and Spottisosoode, 1964) (1A.70,1), p. 111.

[34]Ibid.

light with God's first light by agreeing with Augustine: "Granted Augustine's interpretation, this difficulty does not arise. The light that was mentioned on the first day was for him a spiritual light, whereas now a corporeal light comes into existence".[35] Thus, the stars shine with God's light and this leads Aquinas to assert that "the luminous heavenly bodies are superior to earth".[36]

Obviously, there exists a duality for Aquinas in the nature of the universe. This duality is also known as a hierarchy of intermediaries or "the scale of nature,"[37] to use the phrase Aquinas chose. It may be true that God exists in some respects for Aquinas other than as "First Mover", but this "Omnipresence" is realized not as substance, which some Pythagoreans, Neo-Platonists, or Protestants held, but as "Presence":

> God exists in everything; not indeed as part of their substance or as an accident, but as an agent present to that in which its action is taking place. For unless it acts through intermediaries every agent must be connected with that upon which it acts, and be in causal contact with it: compare Aristotle's proof that for one thing to move another the two must be in contact. Now since it is God's nature to exist, he it must be who properly causes existence in creatures, just as it is fire itself sets other things on fire. And God is causing this effect in things

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[35] Ibid.

[36] Ibid. (1A.70,2), p. 115.

[37] Ibid. (1A,70,3), p. 119.

> not just when they begin to exist, but all the time they are maintained in existence, just as the sun is lighting up the atmosphere all the time the atmosphere remains lit. During the whole period of a thing's existence, therefore, God must be present to it, and present in a way in keeping with the way in which the thing possesses its existence. Now existence is more intimately and profoundly interior to things than anything else, for everything as we have said is potential when compared to existence. So God must exist and exist intimately in everything.38

The omnipresence of God to Aquinas is actually the omnipresence of a Prime Mover. God does not exist as substance, but as the cause of substance. Since God causes substance, he does exist in that which is created; but never directly, only as the creation's final cause. Aquinas' support of dualism can also be seen from his Aristotelian descriptions of the universe which illustrate how even physical bodies share in the spiritual hierarchy of God's "Presence":

> according to Artistotle, the stars are fixed in their spheres and actually move only with the movement of the spheres. The senses, however, perceive only the movement of the celestial bodies, not that of the spheres.39

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[38]Thomas Gilby, ed., St. Thomas Aquinas, Summa Theologiae, tr. William A. Wallace, Vol. XI: Cosmogony (London: Eyre and Spottiswoode, 1967) (1A.8,1), pp. 111-112.

[39]Ibid., X (1A.70,1), p. 113.

Aquinas' point is clearly communicated: the stars express a dualistic nature since the spheres are spiritual, whereas the stars themselves are visible: "The sun and the moon and other heavenly bodies are nobler than the bodies of plants and animals and so have a nobler form".[40]

The word, "nobler", may have been used to express the same distinction as was made when Aquinas stated: "the heavenly bodies are different in nature from the elements and are by nature incorruptible". This type of argument Aquinas characterizes as using "negatives to define simple things . . . because our mind first of all grasps composite things and cannot come to know simple things except by denying compositeness of them".[41]

With Aquinas, then, we can certainly observe that the heavens are perfect, their "movement is one coming from an inward source", a "knowing substance":[42] God. But the heavens are separated from earth, and the latter does not share in the others' "incorruptibility", Aquinas' definition of perfection, and of God.

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[40] Ibid. (1A.70,3), p. 119.

[41] Ibid., XI (1A.10,1), p. 137.

[42] Ibid., X (1A.70,3), p. 119.

This rigidly dualistic view of the universe, as mentioned above, was promulgated by the Jesuits following the Council of Trent as can be seen from a reading of their Ratio Studiorum:

> All members of our Order shall follow the teaching of St. Thomas in scholastic theology, and consider him as their special teacher; they shall centre all their efforts in him so that their pupils may esteem him as highly as possible.43
>
> In matters of any importance let him not depart from Aristotle unless something occurs which is foreign to the doctrine which academies everywhere approve of; much more if it is opposed to the orthodox faith, and if there are any arguments of this or any other philosopher against the faith, he will endeavor earnestly to refute them according to the Lateran Council.44
>
> In the second year he will explain eight books of the physics, the books De Coelo and the first book of De Generatione. In the eight books of the physics the text of book six and seven will be given in summary and also the text of the first book from that part which deals with the opinions of the ancients. In the eighth book let him not take any disputation about the number of intelligences or about liberty or about infinity of the prime mover, but these matters will be discussed in metaphysics, and only according to the opinion of Aristotle.45

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[43]Edward A. Fitzpatrick, ed., St. Ignatius and the Ratio Studiorum (New York: McGraw-Hill Book Co., Inc., 1933), p. 160.

[44]Ibid., p. 168.

[45]Ibid., p. 170.

and solely from God; that the heavens, as the quintessence, existed independently from earth; the matter consisted of four elements; or that the heavens consisted of concentric spheres with the earth at their centre.

The Pythagorean tradition which had, however, existed in Plato and Boethius, which had been revived during the twelfth century and again during the fifteenth in Florence, now experienced another revival, in the late sixteenth and throughout the seventeenth century, especially in England.

Perhaps part of its raison d'être existed in how antithetical the Pythagorean tradition was vis-a-vis the Jesuit position. As Aquinas had remarked:

> 1. Universals and the ultimate matter of things are indeed everywhere but not with one and the same existence.
>
> 2. Number, being an accident, is not essentially in place but only happens to be there. Nor is it complete in each numbered thing, but partly exists in each. So one cannot conclude that number is everywhere outright and essentially.
>
> 3. The whole world is everywhere piece by piece, not whole in every place, and so not everywhere outright.47

This is Aquinas' criticism of Pythagoreanism. He asserts that "number" is actually "an accident" since "the whole

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[47] The Basic Works of Aristotle, Metaphysics, 986A 8-7, p. 698.

world is . . . not whole in every place". Number, like the four elements, partakes only to a limited degree in "the ultimate matter of things". Aquinas' criticism of Pythagoras is obvious from a reading of the following statement:

> Two opposing positions have been adopted by those who identify the unity equivalent with existing and the unity initiating number. Pythagoras and Plato, seeing that the unity equivalent with existing adds nothing to existing but simply signifies the existent substance undivided, thought this also true of the unity initiating number. And since number is composed of unities, they believed number to be the substance of all things.
> . . . . . .
> Now this is clearly false, for everything is one of its very substance.48

In short, with Aristotle, Pythagoras was incorrect and overly eager "so as to make his whole theory coherent".[49] With Aquinas, however, Pythagoreanism became heretical.

Pythagoras' appeal to seventeenth century England, a Protestant country par excellence, may have partly originated as a reaction to an association of Papists with Jesuits who were, in turn, associated with Aquinas and Aristotle. We have considered a possible appeal on the part of natural philosophy for Pythagoras' dictum that "all is number". We have now only to consider the possible reasons

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[48] Ibid. (1A.11,1), p. 159.

[49] The Basic Works of Aristotle, Metaphysics, 986A 8-7, p. 698.

for a similar appeal to some Protestant "scientists" for the Pythagorean view of the harmony of the spheres. This purpose brings us to a consideration of Kepler's The Harmonies of the World, especially Book Five.

Johannes Kepler's belief in the harmony of the spheres is basically a reconciliation of Pythagoreanism with Copernicus' astronomical theory. Indeed, the Pythagorean belief that fire is the centre of the universe is easily glossed, with Kepler, as meaning "the body of the sun".[50] Kepler describes how exactly "the Earth is one of the planets and moves among the stars around a motionless sun":[51]

> perfect consonances are found: between the converging movement of Saturn and Jupiter, the octave; between the converging movements of Jupiter and Mars, the octave and minor third approximately; between the converging movements of Mars and the Earth, the fifth; between their perihelial, the minor sixth; between the extreme converging movements of Venus and Mercury, the major sixth. . . .[52]

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[50]Johannes Kepler, The Harmonies of the World: V, ed. Robert Maynard Hutchins, tr., Charles Glenn Wallis, Great Books of the Western World, 54 vols. (Toronto: Encyclopaedia Britannica, Inc., 1952), XVI, 1081 and 1083.

[51]Ibid., p. 1015.

[52]Ibid., p. 1033.

The role of Plato's Five Perfect Solids and the role of Boethius' view of music is here repeated: Kepler too supports the view that there exists no dualism between the heavens and earth. In fact, earth is now seen to harmoniously exist in the heavens, in the quintessence.

Significantly, neither is Kepler's thought conditioned by an experimental method; rather, the source of this knowledge rests in religious belief; "The very nature of things, in order to reveal herself to mankind, was at work in the different interpreters of different ages, and was the finger of God . . .".[53] This God, in turn, is "the source of all wisdom, the everlasting approver of order, the eternal and superexistent geyser of geometry and harmony".[54] Kepler has here associated Christian beliefs, with the Pythagorean tradition. He has taken the Platonic stress on geometry, the quadrivium's stress that "all is number", and has related geometry to God in such a way that they have, once again, become the same thing.

Another Pythagorean element in Kepler's "scientific theology" is his belief that harmony is a universal law which exists by virtue of the creator. Universal law, as a creation by God, necessarily portrays God. This Kepler

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[53] Ibid., p. 1010.

[54] Ibid., p. 1081.

calls finding "of what sort [God is] in goodness".[55] The reader first finds out what God is not, that is, God does not exist as in the Thomistic-Aristotelian world view, what Kepler refers to as "a superstitious mob in sensible things".[56] Kepler also refuses to believe in "God-intelligences with Aristotle".[57] Instead, according to Kepler, we are to "seek divinity"[58] by the belief that God exists within us and surrounding us, that he exists without dualism since the "true light . . . lighteth every many coming into this world . . .".[59] Kepler adds:

> For as the sun rotating into itself moves all the planets by means for the form emitted from itself, so too -- as the philosophers teach -- mind, by understanding itself and in itself all things . . . , makes everything to be understood.60

In other words, harmony and divinity also exist within man: "mind, by understanding itself and in itself all things".

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[55] Ibid., p. 1009.

[56] Ibid., p. 1081.

[57] Ibid., p. 1083.

[58] Ibid., p. 1081.

[59] Ibid.

[60] Ibid., p. 1084.

If this is not the case, asserts Kepler, then how does man "make everything understood" concerning universal harmony, concerning the omnipresence of God? Kepler refuses to entertain any other alternatives, and thus the question becomes rhetorical. Thus, the reader becomes more persuaded that Kepler is relating celestial phenomena to man so that God is seen in both as universally present.

Having defined the Pythagorean elements in Kepler's work, we are now required to suggest an account of their origin in the writer's thought. What we are asking is for an answer to the question: "Why does Kepler, using his own words, take 'a fairly liberal draught from the bowl of Pythagoras which Proclus gives to drink from',[61] in his attempt to deny Aristotelian or Thomistic dualism?"

One of Kepler's biographers, Arthur Koestler, accounts for this vehement interest in celestial harmony by considering it as an antithesis to the chaos evident in Kepler's life, especially the disorder which existed concurrently with the writing of Harmonies of the World:

> The work was completed in 1618, three months after the death of his daughter Katherine, and three days after the defenestration of Prague.
> . . . . . .
> If one reads the book concurrently with his letters

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[61] Ibid.

> about the witch-trial, his excommunication, the war, and the death of his child, one has the impression of being abruptly transported from one play by his Stratford contemporary to a different one.62

Koestler is comparing Kepler's state of mind and work by representing them as split between the torments of King Lear and the romanticism of Lorenzo from The Merchant of Venice. Admittedly, the experience of chaos usually drives creative geniuses to an attempt at expressing the eternal and enduring essence of things but Koestler does not consider Kepler's own words regarding why this vehement interest existed:

> As regards that which I [Kepler] prophesied two and twenty years ago, . . . as regards that of which I was firmly persuaded in my own mind before I had seen Ptolemy's Harmonies, as regards that which I promised my friends . . . : finally, as God, the Best and Greatest, Who had inspired my mind and aroused my great desire . . . , finally, I say, I brought it to light and found it to be truer than I had even hoped. . . .63

The source of Kepler's motivation does not lie quite so neatly in the Newtonian law that every action has an equally strong reaction. Immediate psychological factors are important, but according to Kepler, not crucial. Kepler may only have viewed his adversities as strengthening

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[62]Arthur Koestler, The Watershed: A Biography of Johannes Kepler, Science Study Series (New York: Anchor Books Doubleday and Co., Inc., 1960), pp. 213-214.

[63]Kepler, op. cit., p. 1009.

an already existing tendency; a tendency which he hints originated somewhere back in the experiences of the middle 1590's.

Significantly, it was around this time that Kepler was enjoying a position he was offered as Mathematicus at the Protestant school at Gratz. Previous to this date Kepler had progressed through the various levels of Wuertemburg Protestant education from the time he was thirteen. By 1594 he was in his fourth year in the Protestant theological faculty at the University of Tuebingen. Evidently, ". . . the Protestant universities in Wittenburg and Tuebingen were the intellectual arsensals of the new creed . . .".[64] When Kepler changed from a student of theology, per se, at Tuebingen, to a Professor of mathematics and astronomy, at Gratz, there existed very little need, perhaps none at all, to change his Protestant views; views which had been formulating for close to a decade. At Tuebingen, he could study Protestant theology. At Gratz, he could now apply his knowledge of mathematics and astronomy in such a way that they might reflect or support a Protestant world-view.

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[64]Koestler, op. cit., p. 26.

Koestler misses this insight into Kepler -- an insight which one of his contemporary "made", but nonetheless viewed it as ironic -- namely, that Kepler professed Calvinist views, yet defended Copernicus in a public disputation.[65] As Kepler himself stated:

> I believe Divine Providence arranged matters in such a way that what I could not obtain with all my efforts was given to me through chance; I believe all the more that this is so as I have always prayed to God that he should make my plan succeed, if what Copernicus had said was the truth.66

This "plan" is to "touch the seven-stringed harp of the Creator's wisdom"[67] in such a fashion as to show how the harp's harmonic qualities are universally distributed throughout Copernicus' astronomical theory. Pythagoras, Copernicus, and Protestant theology all seem to share in the "scientific" work Kepler achieved.

Protestantism, then, accounts for Kepler's life-long obsession in illustrating how geometry, music, and

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[65] Ibid., p. 33.

[66] Quoted in Koestler, ibid., pp. 44-45.

[67] Ibid., p. 49.

astronomy can demonstrate religious belief. As Kepler stated in a letter to the Catholic Chancellor of Bavaria: "I am a Christian, the Lutheran creed was taught me by my parents, I took it unto myself with repeated searchings of its foundations, with daily questionings, and I hold fast to it . . . I am earnest about faith and I do not play with it".[68] Thus, by perpetuating the Pythagorean conception of the harmony of the spheres, by reconciling this harmony with a heliocentric universe, and by defining the universality of harmony to exist within man, Kepler shows us one source of Pythagoras' appeal: an adaptation of anti-Aristotelian and anti-Thomistic ideas to a "proof" of the Protestant belief that the earth and man share in the universal law of heavenly presence.

Before closing this chapter, however, it should be pointed out that we must see Wren's interest in Pythagoras as consistent, in some respects, with the existing Pythagorean tradition dating from Plato to Alberti, but more importantly, consistent also with the Protestant-inspired revival of Pythagoreanism in the seventeenth century. We have already quoted various thinkers of the period in an

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[68] Ibid., p. 82.

attempt to define the motives behind this revival. We have now only to consider Sir Thomas Browne and John Milton.[69]

One would be hard pressed to deny the Protestantism, even it it is viewed as unconventional Protestantism, of Milton's Paradise Regained.[70] For instance, paradise, to Milton, is a psychological frame of mind through which an individual becomes as "one" with God. For Milton, salvation does not exist through intermediaries, representative of a celestial hierarchy. Milton's conception of salvation is worked out in the poem. For example, the person who enters the desert is a confused "pilgrim":[71]

> O what a multitude of thoughts at once
> Awak'n'd in me swarm, while I consider
> What from within I feel myself, and hear
> What from without comes often to my ears,
> Ill sorting with my present state compar'd.[72]

It is only by being continually tested and only by recognizing that God "exists" within that Christ becomes

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[69]Those persons involved in "The Battle of the Books" will be studied in the third chapter.

[70]Merritt Y. Hughes, ed., John Milton: Complete Poems and Major Prose (Indianapolis: The Odyssey Press, 1957), pp. 483-530.

[71]Ibid., IV, 427.

[72]Ibid., I, 196-200.

the Son of God as opposed to merely being one of many Sons of God. As Satan remarks:

> All men are Sons of God; yet thee I thought
> In some respect far higher so declar'd.
> . . . . . .
> Therefore to know what more thou art than man,
> Worth naming Son of God by voice from heav'n,
> Another method I must now begin. . . .73

Satan's final method is to place Christ in such a position that his human frailty is exemplified. Consequently, either the senses will prove victorious through Christ's death, or will be, in turn, vanquished by a psychological state of mind. As Milton states, "To whom thus Jesus. Also it is written, / Tempt not the Lord thy God; he said and stood".[74]

Gone from Christ's pilgrimage is the confusion evident in Book I. Confusion has been replaced by fortitude: Christ "stood". Significantly, Christ does not save himself from the obvious danger, but is rescued by "Angels on full sail of wing".[75] However, the rescue, or intercession, comes after the act of faith, comes after Satan's demise. Both achievements were individually attained. Indeed, it was only because Christ lacked the

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[73] Ibid., IV, 520-521, and 538-540.

[74] Ibid., 561-562.

[75] Ibid., 582.

supernatural power to reach the top of the pinnacle that he also lacked the ability to safely descend and thus required only bodily rescue. Perhaps this portrayal of Christ suggests how he was but a mortal in Milton's eyes; a mortal who _became_ the chosen Son of God through faith; faith being, to some Protestants at least, the belief that God exists within man just as he exists everywhere:

> True Image of the Father, whether thron'd
> In the bosom of bliss, and light of light
> Conceiving, or remote from Heaven, _enshrin'd_
> In _fleshly Tabernacle_, _and human form_,
> _Wand'ring the Wilderness_, _whatever place_,
> _Habit_, _or state_, _or motion_. . . .[76]

God, to Milton, is "enshrin'd" in human forms as well as being in "whatever place, / habit, or state, or motion".

This same vindication of "justification by faith alone" may also have been expressed in John Bunyan's _The Pilgrim's Progess_,[77] especially when the narrator states, "the very sight [of the host] was, to them that could behold it, as if heaven itself was come down to meet them".[78] In other words, to Bunyan, heaven does not exist only in the quintessence, but also here on earth. Moreover,

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[76] _Ibid._, 596-601. Emphasis added.

[77] John Bunyan, _The Pilgrim's Progress_, ed. Louis L. Martz (New York: Holt Rinehart and Winston, 1949).

[78] _Ibid._, p. 165.

Bunyan suggests that this idea concerning the existence of the "heavenly host" is an "as if" proposition; an idea having an appeal which is psychological in the same sense of the word as we have read Milton's use of it; namely, Christian finds his union with God in the same individual fashion as Christ became the "Saviour"[79] in Paradise Regained. Both, it may be argued, are defining the possibility of an individual finding union with God without the intercession of clergy, saints, or angels. This individualism may be called psychological in nature.

We have glanced at Paradise Regained in this fashion because of one of Milton's Prolusions entitled On the Harmony of the Spheres.[80] In this short speech Milton expresses unabashed veneration for Pythagoras: "But if only fate or chance had allowed your soul, O Father Pythagoras, to transmigrate into my body . . .".[81] The obvious question is: "Why is Milton saying this?"

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[79]Milton, op. cit., Fourth Book, L. 636, p. 530.

[80]Don. M. Wolfe, ed., The Complete Prose Works of John Milton, 7 vols. (New Haven: Yale University Press, 1953), I, 234-239.

[81]Ibid., pp. 236-237.

Perhaps the answer lies, once again, in Pythagoras' appeal. Milton, like some of his contemporaries, may have seen in Pythagoras' philosophy of "correspondences" a pedigree of Protestant theology in that both stress universalism vis-a-vis God and natural philosophy. This may well account for Milton's treatment of Pythagoras as being a sort of heaven-sent messenger:

> if indeed he was not rather some good spirit and denizen of heaven, sent down perchance by the gods' behest to instruct mankind in holiness and lead them back to righteousness; at the least, he was assuredly a man endowed with a full meed of virtue, worthy to hold converse with the gods themselves, whose like he was, and to partake of the fellowship of heaven. Therefore I wonder not that the gods, who loved him well, permitted him to share the most secret mysteries of nature.[82]

What, then, does this particular Prolusion tell us? I think it does more than suggest that Milton, like Burnet, conceived Pythagoras' philosophy "to breathe more of the spirit of Christianity"; the "spirit" being, in seventeenth century England, Protestantism. Perhaps this is why Milton states that Pythagoras can "instruct mankind in holiness and lead them back to righteousness".

Sir Thomas Browne's Religio Medici[83] begins with an admission of faith: "I am of that reformed new-cast

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[82] Ibid., p. 238.

[83] Sir Thomas Browne, Religio Medici, ed. James Winny (Cambridge: University Press, 1963).

religion",[84] namely, the Church of England. It is with this admission in mind that we should read Browne's statement on Pythagoras:

> I have often admired the mystical way of Pythagoras, and the secret magic of numbers . . . for in this mass of nature there is a set of things which carry in their front -- though not in capital letters, yet in stenography and short characters -- something of divinity, which to wiser reasons serve as luminaries in the abyss of knowledge, and to judicious beliefs as scales and roundles to mount the pinnacles and highest pieces of divinity.[85]

Browne seems to be associating Pythagorean number theory with "the pinnacles and highest pieces of divinity". Perhaps Browne's conception of "divinity" relates to the "new-cast religion". If it does, and there seems little cause to deny this possibility, then we have yet another instance of the religious motive behind the revival of Pythagoreanism which occurred during this author's life-time.

Conclusion

What does this study of the appeal of the Pythagorean tradition as shown in the writings of Bacon, Burnet, Kepler, Newton, Milton, and Browne suggest? Regarding Wren, I think it leads us to an appreciation that the question of Wren's

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[84] Ibid., Part 1, Section 2, l. 26, p. 3.

[85] Ibid., Part 1, Section 12, ll. 15-23, p. 14.

possible interest in Pythagoras does not have to be an aberrant one, but may have been a part of a Protestant milieu which was manifested in literature, poetry, science, and architecture.

CHAPTER II

WREN'S PYTHAGOREANISM

This chapter's thesis is the assertion that Wren's architecture, where he was not forced to compromise the architectural ideals evident in the Great Model or Trinity College Library,[1] is essentially Pythagorean.[2] My argument follows the approach recommended by Rudolf Wittkower:

> It is true, that in trying to prove that a system of proportion has been deliberately applied by a painter, a sculptor or an architect, one is easily misled into finding those ratios which one sets out to find. In the scholar's hand dividers do not revolt. If we want to avoid the pitfall of useless speculation we must look for unmistakable guidance by the artists themselves.3

What Wittkower is saying is that the writings of, say, Wren, must provide the theoretical framework within which a study of proportion in Wren's architecture may be reasonably placed. Accordingly, our first task will be a close textual analysis of Wren's Tracts, Discourse on Architecture, and

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[1]This is the opinion of the editors of The Wren Society, 20 vols. (Oxford: University Press, 1924), V, 32.

[2]The meaning of this word involves only the study of those ratios produced from Pythagoras' musical scale. Cf. pp. 4-5 and 12-13.

[3]Rudolf Wittkower, Architectural Principles in the Age of Huamnism (4th ed.; London: Academy Editions, 1973), p. 126.

selected correspondence. Following this are inductive analyses of some examples of our architects' designs.

I

In one of the opening sentences of Tract I, Wren states that "Architecture aims at Eternity; and therefore [is] the only Thing uncapable of Modes and Fashions in its Principals . . .".[4] This statement seems simple, but it has two subtle inconsistencies: one, to "aim" at eternity is not the same as realizing the eternal; two, architecture, because of its "earthly" nature, is not "the only Thing uncapable of Modes and Fashions in its Principals". What, then, does Wren actually mean to say? What are these "Principles" of architecture?

Wren states that "Beauty, Firmness, and Convenience, are the Principles; the two first depend upon geometrical Reasons . . . . ; the third only makes the Variety".[5] Moreover, "Variety is commendable, provided this Variety transgress not the Rules of . . . Geometry".[6] Versailles, according to Wren, "transgressed" these rules:

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[4] Wren Society, op. cit., XIX, 126.

[5] Ibid.

[6] Ibid., p. 127.

> The Palace, or if you please, the Cabinet of Versailles call'd me twice to view it: the Mixtures of Brick, Stone, blue Tile and Gold make it look like a rich Livery: Not an Inch within but is crowded with little Curiosities of Ornaments: the Women, as they make here the Language and Fashions, and meddle with Politicks and Philosophy, so they sway also in Architecture; Works of Filgrand, and little Knacks are in great Vogue. . . .7

What is crucial to Wren is "Beauty". This concept is primarily "a Harmony of Objects . . . from Geometry, consisting in Uniformity (that is Equality) and Proportion".[8] This definition is amplified so that "Beauty" becomes harmonious geometry; "Geometrical Figures are naturally more beautiful than other irregular; in this all consent as to a Law of Nature. Of geometrical figures, the Square and the Circle are most Beautiful; next, the Parallelogram and the Oval.[9] Moreover, that Wren was familiar with harmonious geometry, that is, Pythagorean ratios in architecture, can be reasonably inferred from a comment he made upon the Sepulchre of Mausolus ; "The Artists being contemporary with the school of Plato, I know not but they might have some-

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[7] Ibid., XIII, 41.

[8] Ibid., XIX, 126.

[9] Ibid. Emphasis added.

thing to practise from thence, in this harmonick Disposition".[10] From our above analysis of the Pythagorean elements in Plato's thought, we can see that Wren is approvingly recognizing Plato's Pythagoreanism, and its effect, on architecture. This conception of "Beauty" is also closely allied to architects and architecture of Wren's time; "It seems very unaccountable, that the Generality of our late Architects dwell so much upon this ornamental, and so slightly pass over the geometrical, which is the most essential Part of Architecture".[11] "Variety" and "Convenience" are entirely subordinate to Wren's theory of proportion. Consequently, "Architecture aims at Eternity" through an informing principle of geometry, not because it exalts "novelties":

> An Architect ought to be jealous of Novelties, in which Fancy blinds the Judgment; and to think his Judges, as well those that are to live five Centuries after him, as those of his own Time. That which is commendable now for Novelty, will not be a new Invention to Posterity, when his Works are often imitated, and when it is unknown which was the Original; but the Glory of that which is good of itself is eternal.12

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[10] Ibid., p. 139.

[11] Ibid., p. 130. Emphasis added.

[12] Ibid., p. 126.

This last sentence, "the Glory of that which is good of itself is eternal", seems to be expressing a basic sentiment of Pythagoreanism if we consider Boethius' comment on the fundamental feature of this philosophy; "Pythagoras was the first man to call the study of wisdom 'philosophy'. He held that philosophy was the knowledge and study of a thing which is considered true and real . . . which [is] not changed by any accidents".[13] Boethius is saying that Pythagoras studied that which is eternal, or what is called elsewhere in the Principles, "immutable".[14] Geometry was considered one, if not the most important, aspect of this study. Wren seems to be appreciating this virtue of geometry since he is condemning "novelties" and giving his fullest support to "geometrical figures". This condemnation occurs in Wren's conception of "Natural Beauty" as opposed to "Customary Beauty". The latter is public-supported "Novelty" to Wren; "Customary Beauty is begotten by the Use of our Senses to those Objects which are usually pleasing to us for other Causes, as Familiarity or particular Inclination breeds

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[13]Boethius, The Principles of Music, tr. C. Bower (Ann Arbor, Michigan: University Microfilms, 1967), p. 105.

[14]Ibid., p. 24.

a Love to Things not in themselves lovely".[15] "Geometrical figures", in turn, are to be basic to architectural design and practice. Thus, the eternity of Pythagorean number philosophy or the eternity of Plato's Five Perfect Solids are counterparts to the eternity of Wren's "geometrical figures", especially the square and circle. This seems to be why "Architecture aims at Eternity"; the bricks of the building will eventually decay, but its form, the "geometrical figures" of the design, will endure forever.

Having informed us of his Philosophy of Architecture, Wren moves on in his History of Architecture to describe certain edifices which he either venerates or denigrates.

A question worth bearing in mind is "Why did Wren 'endeavour' to write his very incomplete and unpolished 'History'"? The Tracts are mere fragments, although the Discourse may possess a discernible thesis:

> I judge it not improper to endeavour to reform the Generality to a truer taste in Architecture by giving a larger Idea of the whole Art, beginning with the reasons and progress of it from the most remote Antiquity; and that in short touching chiefly on some things, which have not been remarked by others.16

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[15] Wren Society, op. cit., XIX, 126.

[16] Ibid., p. 140.

Presumably, the Tracts are the author's preliminary researches into this thesis. If this is true, then it may account for why some material in the Tracts is duplicated in the Discourse.[17] These writings can also be seen as Wren's attempt to define Pythagoreanism through an analysis of selected buildings of antiquity. Through this approach it may have been intended to give the theory of proportion a historical pedigree in some ways greater than the tradition of Gothic architecture; the latter tradition being one which Wren disliked on the Pythagorean grounds that "it valu'd not exactness".[18]

To some extent, Wren appreciated the pyramids, although at one point they are derogatorily referred to as "Gothick".[19] They were not considered perfect, that is, neither cubic nor circular, but the pyramids did conform to one of Wren's principles of "Beauty":

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[17]This is the view of the Wren Society. Cf. XIX, 134.

[18]Stephen Wren, Parentalia: Memoirs of the Family of the Wrens (reprinted; Farnborough, Hants: Gregg Press, 1965), pp. 273 and 307. Cf. the Wren Society, op. cit., XIX, 140 and 130.

[19]Wren Society, op. cit., XIX, 127.

> There are only two beautiful Positions of strait Lines, perpendicular and horizontal: this is from Nature, and consequently Necessity, no other than upright being firm. Oblique Positions are Discord to the Eye, unless answered in Pairs, as in the sides of an Equicrural Triangle. . . .[20]

The pyramids, obviously, afforded this answer of concordant "Pairs". Consequently, our architect had to slightly appreciate, at the least, these structures. Moreover, according to T. L. Heath, it was an admitted point of this period that the Egyptians were familiar with particular instances of the Pythagorean Theorem, both in their architectural triumphs and in their land surveying techniques.[21] Wren may have been aware of this since he knew that the Sepulchre of Mausolus, King of Caria, had a "Breadth at the lower Steps to the whole Heighth of 3 to 4, which is the sides of Pythagorick rectangular Triangles".[22] In other words, his knowledge of the role of the Pythagorean Theorem in the Sepulchre does not preclude his knowledge of a similar role that the theorem also performed in the construction of pyramids. Furthermore, Wren's thesis on the method by which work was organized in the construction of pyramids suggests a Pythagorean interest in music:

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[20] Ibid., p. 126.

[21] Euclid, The Thirteen Books of the Elements, tr. and ed. T. L. Heath, 3 vols. (2nd ed.; New York: Dover Publications, 1956), I, 349-369.

[22] Wren Society, op. cit., XIX, 139.

> the difficulty was in mustering the men to move in order under proper Officers, and probably with Musick, as Amphion is said, much about the same Age, to have built the walls of Thebes with his Harp; that is Musick made the Workmen move exactly together. . . .23

This remark by Wren brings to mind Boethius' dictum "that music is so naturally a part of us that we cannot be without it, even if we so wished".[24] To Pythagoreans, architecture would not be considered outside of this "natural" order, especially when orchestrated by the lyre, the consonances of which define the paradigm for harmonious proportion. Furthermore, we know that Wren was familiar with the role of harmonious proportion in architecture from a letter he wrote to Bishop Sancroft concerning his design for St. Pauls:

> I was putting an end to all things that might stay me heer or elsewhere when Your Letter found me, and intend as soon as I can possibly to wait on you. . . . I have with a great deale of paines finished the designes for it, if they might be useful, if it happen they bee not thought soe I shall not repent the great satisfaction and pleasure I have taken in the contrivance, which aequalls that of . . . compositions in musick.25

The pyramids are "Wonderful",[26] but they are not "Beautiful", to use Wren's word. Consequently, their proto-

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[23] Ibid., p. 141.

[24] Boethius, op. cit., p. 43.

[25] Wren Society, op. cit., XIII, 45.

[26] Ibid., XIX, 141.

Pythagoreanism is played down. Instead, a discussion of the relationship between demography and state-supported construction creates a red herring.[27] In what may have been a last bid to "protect" Pythagoras' "originality", Wren deliberately under-estimates the building expertise of the Egyptians; "great Multitudes were therefore imploy'd in that which requir'd no great Skill, the Sawing of Stone Square to a few different scantlings, nor was there any need of Scaffoldings or Engins, for hands only would raise them from Step to Step . . .".[28]

In discussing the Temple of Diana, at Ephesus, our writer concentrates on the relationship of its various dimensions. These are given as 2:1 being its length to its breadth: 3:2 being its internal against its external distribution of columns: and 2:1 being the breadth of its vaulting against its longitude.[29] Significantly, these given ratios are Pythagorean. The Surveyor General repeats this staccato view of Pythagoreanism in an analysis of the Temple of Peace, Mars Ultor, and as already mentioned, the Sepulchre of Mausolus, King of Caria. With the Temple of

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[27] Ibid., XIII, 141.

[28] Ibid.

[29] Ibid., pp. 134-135.

Peace, the point of abrupt emphasis is again the existence of Pythagorean proportion; "The Greatness of this Temple, the most magnificent of old Rome is prodigious; it is longer than our Westminster Hall, and the middle Nave only, besides the Ailes, is more than a seventh Part broader; in Heighth it exceeds the highest Cathedral now in the World."[30] Besides the comparison which implicitly demeans Gothic architecture, the point of this statement would seem intended to emphasize the ratio of the Temple's length to width which is 3:2.[31] Wren also mentions that "it rises to be equal in Heighth to Half the whole Breadth between the side Tribunals [that is, 2:1] and a Line drawn from the Key of the Vault of the Nave, to the Key of the Arch of the Aile, determines the Breadth of the Aile [that is, 1:1]".[32] Wren concludes by asserting that this interpretation is correct despite there being "criticks in Architecture who will scarce allow this Temple to be accurate",[33] or, in other words, "exact", or proportionate.

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[30] Ibid., p. 135.

[31] Ibid.

[32] Ibid., p. 136.

[33] Ibid.

When our historian begins to discuss Mars Ultor, the point of abrupt emphasis is its use of the circle, an enduring "geometrical figure" important in the Pythagorean tradition, if also in many other traditions:

> In this Court we have an Example of Circular Walls; and certainly no Enclosure looks so gracefully as the circular: 'tis the Circle that equally bounds the Eye, and is every where unfiorm to itself; but being of itself perfect, is not easily joined to any other area, and therefore seldom can be used: a semi-circle joining to an Oblong, as in the Tribunal at the End of this Temple, is a graceful composition.34

This discussion of the circle bears a remarkable similarity to Sir Henry Wotton's sentiments on the same:

> Now the exact Circle is in truth a Figure, which for our own purpose hath many fit and eminent properties; as fitnesse for Commodity and Receipt, being the most capable; Fitnesse for strength and duration, being the most united in his parts; fitnesse for beauty and delight, as imitating the celestiall Orbes and the universal Forme. And it seems, besides, to have the approbation of Nature, when she worketh by Instinct; which is her secret School: For birds to build their nests Spherically. But not with-standing these Attributes, it is in truth a very unprofitable Figure in private Fabricks, as being of all other the most chargable. . . .35

Both the veneration and the reservation concerning the circle, as it occurs in Wotton, is repeated by Wren.

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[34] Ibid.

[35] Henry Wotton, The Elements of Architecture (London, 1624; reprinted Amsterdam: Da Capo Press, 1970), p. 37.

According to one art historian, Sir Henry Wotton belonged to Inigo Jones' circle who, in turn, was "a true descendent of the Humanist Tradition [establishing] his theoretical deliberations on the metaphysical belief in the universal efficacy and beauty of numbers".[36] Perhaps Wren had read Wotten; he had read Inigo Jones.[37]

It is in connection with this possibility concerning Wren's intellectual association with Wotton and Jones that we should digress for a moment and take note of Wren's mention of the architectural disciples of the Pythagorean tradition. In the Tracts and Discourse Vitruvius is cited seven times, whereas Palladio is cited thrice. Alberti is cited once; similarly for Inigo Jones.[38] In contrast to his attention to Vitruvius, Wren also subscribed, that is, assisted in the publication costs, to Colin Campell's 1715 Vitruvius Britannicus.[39]

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[36]Wittkower, op. cit., p. 143.

[37]Wren Society, op. cit., XIX, 128.

[38]Ibid., XIX, 126-145.

[39]Colin Campell, Vitruvius Britannicus, 2 vols. (reprint; New York: Benjamin Blom, Inc., 1967), I, 10.

Wren's mention of these individuals suggests that they were of some importance; their importance being, I think, that they were representatives of the kind of architecture that Wren was interested in. But unlike Henry Wotton, for instance, Wren was no mere "gatherer and disposer of other mens stuffe".[40] Indeed, on several occasions, Wren criticizes the "Masters" which distinguishes Wotton's "pedantry" from Wren's emulation:

> Modern Authors who have treated of Architecture, seem generally to have little more in view, but to set down the Proportions of Columns, Architraves, and Cornices, in the several Orders, as they are distinguished into Dorick, Ionick, Corinthian, and Composite; and in these Proportions finding them in the ancient Fabricks of the Greeks and Romans, (though more arbitrarily used than they care to acknowledge) they have reduced them into Rules, to strict and pedantick, and so as not to be transgressed, without the Crime of Barbarity; though, in their own Nature, they are but the Modes and Fashions of those Ages wherein they were used. . . .41

Wren may have understood that he was following a tradition, but there must exist a reservation in our minds concerning the exact nature of such a relationship; namely, what Geoffrey Webb stated on the question of the intellectual antecedents of Wren's architecture: "Every Master finds in

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[40] Wotton, op. cit., Preface.

[41] Wren Society, op. cit., XIX, 128.

existence a body of practice and opinion on which he impinges from his own special angle".[42] Wren's "special angle", I believe, is the relationship between Protestant beliefs and architectural tastes; that is, both embody an anti-dualistic view of the universe. We shall return to this important aspect below. Presently, however, let us return to Wren's "History".

When Wren moves into Biblical architecture, his attempt to define and give Pythagoreanism a pedigree is given an added support: the "Word" of God concerning architecture possesses great authority. "The Arke of Noah" is described as "a work very exactly fitted".[43] The "exactness" of the Ark is specified: its breadth to its height is given as 5:3, the windows' breadth to height is 1:1, the length of the Arke to its height is 6:1.[44] Only one of these ratios is Pythagorean and Wren considers it unfortunate that many of the details of this "first Peece of Naval Architecture" were either omitted entirely, or

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[42]Geoffrey Webb, "The Architectural Antecedents of Sir Christopher Wren", Royal Institute of British Architects, XL, Series 3 (May 27, 1933), 573.

[43]Wren Society, op. cit., XIX, 140.

[44]Ibid.

"only mention'd".[45] Perhaps Wren felt that if a full inventory of the Ark's proportions were available, then he could argue that God himself was familiar with, and supportive of, Pythagorean ideas. As it is, however, Wren argues from implication:

> It has a Window of a Cubit Square is only mention'd; but many things sure were of necessity to be contrived for Use in this Model of the Whole Earth.
>
> First, One small Window was not sufficient to emit the Breath of all the Animals; It had certainly many other Windows as well for Light as Air. It must have Scupper-Holes and a large Sink and an Engin to Pump It. . . . There must be Places for Insects, the only Food of some Birds and Animals. Great Cisterns for Fresh Water not only for Land Animals, but for some Water fowl and Insects. Some Greens to grow in Tubs. . . . I need not mention Stairs to the several Stories, with many other things absolutely necessary for a year's Voyage for Men and Animals, tho not mention'd in the Story, and providence was the Pilot of this Little World. . . .46

Wren may be seen as being extremely rhetorical here. He begins by talking about proportion, but suddenly delves into Protestant exegesis asserting, among other Protestant beliefs, the impossibility of their being such a things as "spontaneous generation".[47]

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[45] Ibid.

[46] Ibid.

[47] Ibid.

The pertinent question is this: Why has an architect, in the middle of an architectural tract, elected to consult the Bible, elected to seek in the Bible a justification for his architectural views? Was Wren a Protestant Fundamentalist who believed in going to the word of God for ultimate answers, even answers concerning architecture? Is Wren seeking God's word on the type of architecture preferred by the Creator? Hoping it coincides with his own stress on the importance of geometry? One cannot answer these questions definitively. However, they do not seem far-fetched if we consider how Wren, as a Protestant, as a Protestant Architect, would be concerned with embodying the Protestant conception of the Godhead in architecture; a task which would be all the more successful if Wren could argue that God too shared a preference for a type of ratio which would symbolize universal law, which would symbolize the Protestant belief in "correspondences". In other words, perhaps the Platonic or Boethian belief that God is the Divine Architect is here rhetorically argued for by Wren. On the basis of this assumption, and I admit it is a large one, we can view this Protestant-inspired digression as serving to introduce Wren's belief that since there are certain "mechanik" inconsistencies in the Biblical account of the Ark, then it is also acceptable to infer that the detailing of harmonic proportions has likewise been in-

adequately recounted.

When the Surveyor General proceeds to a description of Solomon's Temple, he reiterates the same reservation concerning the Temple as with "Noah's Arke":

> What the Architecture was that Solomon used we know little of, though Holy Write hath given us the general dimensions of the Temple, by which we may in some manner collect the Plan, but not of all the Courts.48

Besides an attack on an obscure Jesuit, Villalpandus, and besides his theory concerning "what need Solomon had of such great multitudes of Labourers", Wren's remarks nonetheless inform us of how insatiable our writer's appetite was for inventories concerning perfectly proportioned architecture.[49]

The "little" that "Holy Write hath given us" is actually quite adequate to support Wren's thesis. In Kings 6-7, the reader can find some very Pythagorean ratios. The temple's length to width is 3:1; its length to height is 2:1; its height to width is 3:2; the length of the vestibule to the width is also 3:2; the inner shrine is a perfect cube equal in size to the holy of holies, or innermost chamber; the sanctuary has a 2:1 ratio between its length to width; this chamber occupies ½ of the body

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[48] Ibid., p. 142.

[49] Ibid.

of the temple; the size of the sanctuary, to the size of the shrine, is therefore 2:1, as is the size of the sanctuary to the size of the porch. With this knowledge of the temple's Pythagorean ratios, why would Wren have needed to ask for more? Surely one would assume that the underlying principle of Pythagorean ratio would be repeated even in the construction of "the Courts".

Unfortunately, there seems to be no definite solution to this problem. We can but surmise. Perhaps Wren really wanted to attack the Jesuits with their fanciful "Romantick Piece" of reconstruction.[50] Perhaps it was, once again, an attempt to protect Pythagoras' "originality". Perhaps Wren was holding back from divulging the crucial significance of the temple's dimensions which the Freemasons held to be esoterica. We have to remember, with regard to this last point, that Wren's membership in the Freemasons is still largely a question for debate.[51]

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[50] Wren Society, op. cit., XIX, 142.

[51] See R. F. Gould, The History of Freemasonry, 2 vols. (London: John M. Watkins Press, 1957), II, 3-55. See also F. de P. Castell, Was Sir Christopher Wren a Mason? (London, 1917).

One thing, however, is clear: Wren venerated the temple despite his wish that "some skilful Artist would give us the exact dimensions to inches".[52] For example, our writer indicates that "Great Monarchs are ambitious to leave great Monuments behind them".[53]

The obscurity of Wren's reticence about Solomon's Temple is strongly contrasted by the treatment given Lars Porsenna's Tomb, the subject of which evidently fascinated Wren for he thought it a "stupendous Fabrick".[54] Not only did he relate its dimensions in detail, attempt to draw it, and discuss it with Robert Hooke, but Wren seems to have used the tomb to complete, in a very sophisticated fashion, his otherwise unpolished architectural writings.

In Robert Hooke's Diary we read the following entries:

> Thursday, Oct. 4th. -- Discoursed of Porsennas Tomb of which Sir. Ch. Wren gave a description, but comparing it with the words it agreed not. I found the form of it quite otherwise and described it.
> Wednesday, Oct. 17th. -- To Sir Chr. Wrens. Discoursed with him long of Porcena's Tomb which he had thus drawn. A. signifying the Labyrinth and ground plat. B. the upright etc. of which see the figure.
> Thursday, Oct. 18th. -- Drew a rationall Porcena.
> Saturday, Oct. 20th. -- With Lord Randlaugh, afterwards to Angiers House. Then Discoursed with Sir

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[52] Ibid.

[53] Ibid.

[54] Ibid., p. 143.

> Chr. Wren at Mans about inscription . . . also about Porcenas Tomb. . . .55

Seemingly, Wren has fired Hooke with a similar interest in the tomb. Hooke "Discoursed long" with Wren and "Drew a rationall Porcena" of his own volition. Either Hooke was being used as a sounding board for Wren's ideas to which he might contribute something "rationall", or the two were arguing. There is very little immediate evidence for this latter view, whereas Hooke appears to be working with Wren. Thankfully, Wren presents us with the fruits of their mutual enterprise in his Discourse.

The architect of St. Pauls surmised that "a Basis of squar'd stone fifty foot high rais'd the pile above any vulgar contiguous Buildings".[56] "The basis of the whole was 300 ft. square, and 50 ft. high upon which stood Five Pyramids, each of 75 ft. square, abt. 150 ft. high . . .".[57]

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[55] H. Robinson and W. Adams, eds., The Diary of Robert Hooke (London, 1935), pp. 317, 320-321, and 322.

[56] Wren Society, op. cit., XIX, 144. This observation may have been occasioned by a reading of Alberti who also thought that a temple ought to be placed well "above any vulgar contiguous Buildings". See Alberti's Ten Books on Architecture, esp. Bk. VIII, Chaps. 3 and 5.

[57] Ibid.

The ratios are given as 6:1 as length to height of the base, and we can observe a 2:1 ratio between the pyramids height to its base. Wren continues:

> The Height of the Pyramids to the Brass Petasus is 2 to 1, but taking in their whole heighth it would have 4 to 1, but allowing the Point of the Pyramid to be taken off (as it ought) and allowing for the Brasen Brim and Bells it will be 250 foot, above which was the Floor that bore the Five upper Pyramids of 4 to 1. . . .[58]

The point which Wren, and Hooke to an extent, worked to put across was that the Tomb represented an edifice having repeating or solidly integrated Pythagorean Proportions; the entire Tomb, despite its levels and varying number of pyramids, forms the lines of an entirely new single "Geometrical Figure":

> The Four Pyramids of the Second Order of 100 ft. high standing upon the Circle or Brim of the Petasus as upon an Entablature, were evidently the Four First Angular Pyramids continu'd to an Apex, or near to a Point, so each will be in all from the Basis 250 ft. high, and rise as high as the Petasus: above which was again a platform, containing the Third Order of Five more Pyramids, of which the four angular Pyramids rested firmly upon the Keys of the Diagonal Sections of the half Hemispherical Vaultings. . . . This platform I take to have been round . . . and the Bases of the Five Upper Pyramids would be contiguous, and thus would be of the same shape and as high as the same below. . . .59

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[58] Ibid.

[59] Ibid.

This structure has "Proportions persuading, which indeed are very fine".[60] Its component parts are, to use Wren's word, the "Beautiful" square, half-circle, and full-circle. These components, in turn, unite to form an entirely new "Geometrical Figure". In many respects, then, the tomb is a veritable treasure house for one interested in geometry and proportion.

However, it has to be admitted that this structure seems somewhat outrageous in terms of its total height, especially considering the question of how the pyramids were placed upon separate levels. Although Wren recognizes this "lofty"[61] quality, his attempt to draw a "rationall" Porsenna is all the more remarkable since, as we have seen, Wren quickly discounted the credibility of Herodotus' "measures" of the Tower of Babel; questioned the authenticity of the Biblical account of Noah's Ark; severely criticized the Temple of Mars Ultor; and deliberately under-estimated the genius of Egyptian pyramids and Gothic architecture.

Why, then, would Wren attempt to "rationalize" Porsenna's Tomb given his obvious reservations and prejudices about many of the remains of "Antiquity"? Moreover, why are Porsenna's pyramids all the more "stupendous" than those of

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[60] Ibid.

[61] Ibid.

Egypt? We have already noticed the "Natural Beauty" of the tomb, but is there any other reason for Wren's unprecedented interest? Fortunately, we have neither to turn to contemporary accounts or to secondary sources for the answer since Wren gives it to us directly after his account of the tomb:

> I have been the longer in this Description, because the Fabrick was in the Age of Pythagoras and his School, when the World began to be fond of Geometry. . . .62

It seems that Porsenna's Tomb has solicited Wren's attention because it exemplifies a "fondness" for the Pythagorean stress on geometry, especially harmonious geometry, such as its component ratios of 1:1, 2:1, and 4:1. Perhaps these Pythagorean elements are also the reason why Wren gave the tomb more consideration and respect than all the edifices of Biblical, Egyptian, Roman, Gothic, and Baroque architecture combined. Since Wren is very approving of the tomb, and because he recognizes its Pythagoreanism, we can argue that he is being similarly approving of the tomb's Pythagorean elements; namely, harmonious geometry. If this is not a probable account, why did Wren make a connection between the historical period usually associated with the beginnings of Pythagorean philosophy and the effect of Pythagoras' "School" on the construction of an edifice

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[62] Ibid., p. 145.

contemporaneous with Pythagoras? Presumably, these observations are not inter-dependent.

The last few words of the Discourse may also contain the fulfillment of Wren's purpose: "to reform the Generality to a truer taste in Architecture . . . beginning with the reasons and progress of it from the most remote Antiquity". Perhaps the "truer taste in Architecture", in Wren's mind, was first represented by Porsenna's Tomb, and the reason of the progress of this type of architecture was "the Age of Pythagoras [in which] the World began to be fond of Geometry". Significantly, both the tomb and Pythagoras' teaching are from "the most remote Antiquity".

Wren's thesis, then, appears to be a tribute to Pythagoras since it is he who expressed the meaning and purpose of geometry in such a way that "the World began to be fond of Geometry". Despite proportion or harmonious geometry in architecture before 500 B.C., Wren seems to be suggesting that Pythagoras transformed the private word of God to Noah, or Solomon, to a message to all men, a message which could be "cherished"[63] by the entire "World".

The purpose of geometry to Pythagoreans, as we have seen from Boethius' definition of the quadrivium, lay in its

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[63] Shorter Oxford English Dictionary (3rd ed.; Oxford: Clarendon Press, 1944).

ability to demonstrate how there exists a union between the heavens and earth because geometric relationships were believed to be universal. Pythagoras would be "cherished" by persons who also held this view of geometry because, reportedly, he was the first person to attempt to define and demonstrate its possibility. Wren seems to have "cherished" this Pythagorean view of geometry if this avid interest in Porsenna's Tomb can be accepted as being an appreciation of the tomb's Pythagorean geometry as symbolic of an anti-dualistic view of the universe. Fortunately, we possess at least one piece of direct verbal evidence from Wren to indicate such an appreciation, namely, the Letter from Paris.

In considering Wren's Letter from Paris it must be remembered that our architect visited Paris in order to study French architecture. What is stated in the letter is, therefore, in Wren's mind, closely bound up with architecture. It is one of the closing sections of this letter which requires our attention:

> Painting and Sculpture, (said the Judicious Sieur de Cambray) are the politest and noblest of antient Arts, true ingenuous, and claiming the Resemblance of Life, the Emulation of all Beauties, the fairest Records of all Appearances whether celestial or sublunary, whether angelical divine or human. And what Art can be more helpful, or more pleasing to a philosophical Traveller, an Architect, and every ingenious Mechanician? All which must be lame without it.64

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[64] Wren Society, op. cit., XIII, 42.

Wren is the "philosophical Traveller" and the "Architect"; but he is also the "Ingenious Mechanician", that is, one who is extremely skilful in the act of constructing.[65] Our correspondent is agreeing with Cambray's opinion that "Painting and Sculpture . . . claims the Resemblance of Life, the Emulation of all Beauties . . . whether celestial or sublinary, whether angelical, divine or human". However, Wren adds that this "claim" can also be made for architecture since he states that there is no other definition of "Art" which "can be more helpful, or more pleasing to . . . an Architect . . . ," that is, Wren himself. Thus, architecture, like all art, cannot represent both the "celestial" and "sublunary" without its possessing the means of showing "correspondences" between the heavens and earth; the means being, for Pythagoreans, harmonious geometry. To express Wren's point simply: Art can represent either the celestial or sublunary because harmonious geometry exemplifies universal law and exemplifies how "correspondences" exist between the heavens and earth. Significantly, Porsenna's Tomb, because Wren thought it a "stupendous Fabrick", must have fulfilled the criteria of a work of art as expressed in the Letter from Paris.

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[65] Shorter Oxford English Dictionary.

Porsenna's Tomb may have struck Wren as a fulfillment of his definition of art by virtue of its harmonic proportions and geometric figures since it was these elements which he studied at length; elements which provide, for Pythagoreans, the demonstration that heaven is here on earth because the same geometric ratios which produce the music of the spheres also produces harmony here on earth, be this harmony musical or physical, be it of sound, or sight, to paraphrase Henry Wotton.

From this close textual analysis of Wren's writings we must observe two things: one, a veneration for Porsenna's Tomb because of its Pythagorean elements; two, a definition of art which is also Pythagorean in that it demands a representation of the celestial, assuming, as it must, that the celestial can be known and portrayed. The means of the portrayal dates from Porsenna's Tomb and involves harmonious proportion for already stated reasons.

But it is one thing for Wren to respect, study, and define art, in accordance with the Pythagorean tradition, and another for him to practice Pythagorean architectural principles. This question concerning Wren's personal commitment to Pythagorean ideas in architecture can only be answered by an analysis of some designs. Thus, it is to inductive analyses of Wren's drawings that we much now turn our attention towards.

II

An important aspect to our study of Wren's drawings is the opinion which Wren held concerning them. We can observe this opinion in a letter written by Wren to the Bishop of Oxford, in 1681:

> It is not a picture I send You or an imperfect Essay but a designe well studied . . . compare it with the orthography and the Compasses will distinquish Wch is which, plainer than words can expresse it.66

We also have a letter written to Sancroft in May, 1666:

> I am glad Mr. May hath given in his Judgment, I am preparing for you, too, but it is lines not discourses; then you will have more to discuss off when you have the other side of the controversey.67

In view of Wren's confidence as to the "pregnancy" of his drawings, in view of our analysis of the Pythagorean themes in the Tracts, letters, and Discourse, we should expect to find stronger evidence in these drawings regarding Wren's expression of Pythagoreanism. Indeed, what some of Wren's designs indicate is that their proportions correspond to musical harmony. The particular "lines" which

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[66] Wren Society, op. cit., V, 17.

[67] Ibid., XIII, 44.

will be examined is the plan for rebuilding London, the Great Model (Greek Cross design), Trinity College Library, Cambridge (Rotunda design), and the interior façade of St. Stephen's, Walbrook. In association with this last item we will also be performing certain functions on Clayton's and Parentalia's listing of the varying dimensions of the Parochial Churches. The aim in examining these designs has been to reconstruct the scheme that Wren had in his mind about, for example, the Great Model. If the scheme is correct, then we should be able to supply all the main parts of the design in both its groundplan and elevation.

Before continuing in this study, however, it may be useful to consider the question regarding the immediate influences which created the impulse for Wren's interest in harmonic proportion. This question bears directly on the early circumstances of his life.

In H. M. Colvin's Dictionary of English Architects, 1660-1840, we can read the following account:

> the outbreak of civil war had brought trouble to Wren's family. His father's deanery was pillaged on two occasions, and his uncle, the Bishop of Ely, who had incurred the hostility of the extreme Puritan part, was imprisoned in the Tower. [Wren's] father took refuge at Bletching-don, nr. [sic] Oxford, where his son-in-law, William Holder, held the rectory. Holder, formerly a Fellow of Pembroke College, Cambridge, was a young man of considerable intellectual

> attainments, and according to Aubrey he was "very helpful in the education of his brother-in-law . . . of whom he as tender as if he had been his own child, whom he instructed. . . ."[68]

The author of Parentalia agrees with Colvin's account, but he offers a portrayal of Holder's relationship to Wren which is more detailed:

> In the Principles of Mathematics, upon the early Appearance of an uncommon Genius. [Sir Christopher Wren] was initiated by Dr. William Holder, before mention'd, some Time Sub Dean of the Royal Chapel: Canon-Residentiary of St. Paul's and Ely, etc. This Gentleman was a great Virtuoso and a Person of many Accomplishments, fam'd for his wonderful Art, in making a young Gentleman . . . who was born deaf and dumb to speak: He wrote an ingenious Discourse of the Elements of Speech 1669; had good Skill in the Theoretick and Practical Parts of Musick; and published a Treatise of the Natural Grounds and Principles of Harmony 1694; and of the ancient Greek Music.[69]

Since Holder was Wren's tutor for approximately two years, sometime between 1646-49, we should carefully examine the tutor's treatise. Hopefully, it will provide

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[68] H. M. Colvin, Dictionary of English Architects, 1660-1840 (Oxford: University Press, 1954), p. 699.

[69] Stephen Wren, Parentalia, op. cit., pp. 181-182. This last remark may be a reference to an unpublished but circulated manuscript which is now lost. This is doubtful, however, since neither the National Union Catalog or the British Museum General Catalogue mention the book. Thus, it is probable that the remark is an interpretative one concerning the subject of the Principles. Hereafter referred to as the Principles.

us with the key to unlock the immediate course of Wren's theory of musical harmony as a paradigm for architecture. In this way we may respond positively to Geoffrey Webb's conjecture that Wren's interest in Geometric or "exact art" may "be the influence of some dominating personality or some complex mixture of forces".[70] The "complex forces" we argue to be an extreme moral Protestantism, whereas Holder may be the "dominating personality". It is this question regarding Holder's function which we will examine presently.

The actual publication date of the Principles, 1694, and the discrepancy between this date, and that of Holder's pedagogic service to Wren, need not seriously concern us. Holder's views on music, we may assume, did not radically change. Holder may have been interested in applying a scientific method to harmony for some time. Newton, it appears, presented him with the method he had long sought. As Holder admitted, the causes of harmony "lie deep in Nature and requires much research into Natural Philosophy to unfold it".[71] Since the Principles were completed when this statement was written, we may consider it a commentary on Holder's own view of his prolonged efforts.

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[70] Geoffrey Webb, op. cit., p. 573.

[71] William Holder, A Treatise of the Natural

The Principles present a brief history of musical harmony:

> Some of the Ancient Greek Authors of Musick, took notice of Vibrations: and that the Swifter Vibrations caused Acuter, and the Slower, Graver Tones. And that the mixture, or not mixture of Motions creating several intervals of tune, was the reason of their being Concord or Discord. And likewise, they found out the several lengths of Monochord, Proportioned to the several intervals of Harmonick Sounds: But they did not make out the equality of measure of time. . . . Neither could they be prepared to answer such objections, as might be made against the Continuity of the Sameness of tune, during the continuance of the sound of a String, or a Bell after it is struck. Neither did any of them offer any reasons for the proportions assigned, only it is said, that Pythagorus found them out by Chance.72

Holder is saying that although the Greeks discovered musical harmony, they failed to supply enough "reasoning" or systematization. Only Pythagoras is an exception, but even he, Holder states, "found them out by chance". Perhaps, significantly, this remark is predicated by the phrase: "it is said". This may suggest reserved, even feigned, agreement. The author of Parentalia, as we have seen, interpreted Holder's interest in harmony as

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Grounds, and Principles of Harmony (London, 1694), Preface.

[72] Ibid., p. 9.

being concerned with "ancient Greek Music". Holder may have reservations, but an author cannot wholly undermine his subject, and Pythagoras and "ancient Greek Music" are too close for Holder to dismiss Pythagoras. Indeed, at a later and perhaps safer point in his treatise, Holder admits openly to the wisdom or "excellency of the Ancients".[73] On another occasion, he refers to the ancients as "masters".[74] Both of these remarks should suggest to us the possibility of Holder belonging, in some degree at least, to Temple's camp, especially considering the Principles' publication date in the light of our discussion of the "Battle of the Books". In fact, Holder's appreciation of Pythagoras is most clearly expressed in the aim of the Principles:

> Now the Theory on Natural Philosophy, of the Grounds and Reasons of this agreement of Sounds, and consequent delight and pleasure of the ear . . . is the Subject of this Discourse. The design whereof . . . is, to lay down these Principles as short, and Intelligible; as the subject matter will bear.75

The aim of the book is to prove, by natural philosophy, what Pythagoras, "it is said", discovered "by

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[73] Ibid., p. 115.

[74] Ibid., p. 135.

[75] Ibid., Preface.

chance". The connection between Holder's treatise and Pythagoras is self-evident: the author is vindicating Pythagorean harmony in the language of seventeenth-century science. The hammers of the blacksmiths, from whom Pythagoreas allegedly discovered harmony, becomes with Holder, the pendulum of "the Acute Galileo",[76] and the gravitational law of Newton:

> And hence it is, that the Vibrations of a Pendulum are become so Excellent, and Useful a measure of time; especially when a second Observation is added, that, as you shorten the Pendulum . . . , so the Vibrations will be made Proportionably in a shorter measure of time, and the Contrary if you Lengthen it. And this is found to hold in a Duplicate Proportion of Length to Velocity. That is, the length Quadrupled, will Subduple the Velocity of Vibrations; and the Length Sub-quadrupled, will Duple the Vibrations, for the Proportion holds Reciprocally. As you add to the length of the Pendulum, so you diminish the frequency of Vibrations, and increase them by Shortening it.
>
> To bring it Nearer, make you tension of the strong by Gravity, instead of screwing it up with a pegg or pin: Hang weight upon a pulley at one end of the string, and as you increase the Weight, so you do increase the Tension, and as you increase the Tension, so you increase the Velocity of Vibrations. So the vibrations are Proportionably regulated immediately by tension, and immediately by Gravity so that Gravity may claim a share in the measures of these Harmonick Motions.[77]

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[76] Ibid., p. 12.

[77] Ibid., p. 30.

Holder's aim seems not at all contrived to undermine Pythagoras' discovery of proportions and harmony. To utilize natural philosophy in an attempt to vindicate Pythagoras is very significant in that Wren was taught that Pythagoras' musical theory could be "scientifically" demonstrated, or become "exact", to use Geoffrey Webb's word.

The young Wren, we may surmise, was as enchanted with Holder's vindication of Pythagoras as he was with his tutor's Elements of Speech. We know that Wren not only reflects his tutor's interests in language by his illustrations for teaching the deaf and dumb, but Wren also reflects Holder's influence by his work on Protestant Chronology.[78]

With the Pythagorean tradition and its appeal defined, a study of Wren's writings completed, and having suggested the role Holder may have performed in formulating a nascent esteem for Pythagoras in Wren's mind, we may now proceed, armed with the proper "tools", to an "excavation" of Wren's drawings.

The Greek Cross plan of the Great Model design has been studied less because it is but a variant from the final design of 1673, than because it represents Wren's

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[78]Stephen Wren, Parentalia, 194-195. Cf. also pp. 182-195.

architectural ideals when he believed the opportunity and finances existed to support those ideals.[79] Also, the Great Model of 1673, despite the lengthening out of the western limb, still retained the fundamental Pythagoreanism of the original Greek Cross design. Stephen Wren records Wren's opinion about this design:

> much is Specified, upon Recollection, that the Surveyor in private Conversation, always seem'd to set a higher Value on this Design, than any he had made before or since; as what was labour'd with more Study and Success. . . .[80]

Presumably, Wren did not "set a higher value" on only the lengthening of the western limb; rather, it appears that it was the basic body of the design, a component in no way altered, which accounts for his reported interest.

Significantly, the square and circle are the key to the Greek Cross design. In diagram I we can see that of the two shapes the circle is the most important since the square is placed within two circles, C_8 and C_6, forming a ratio of 4:3. This suggests that Wren, like other Pythagoreans, believed the circle to be the progenitor of the square as it is for polygons.[81] The importance of the circle has to do with Pythagoras: he believed that harmonic

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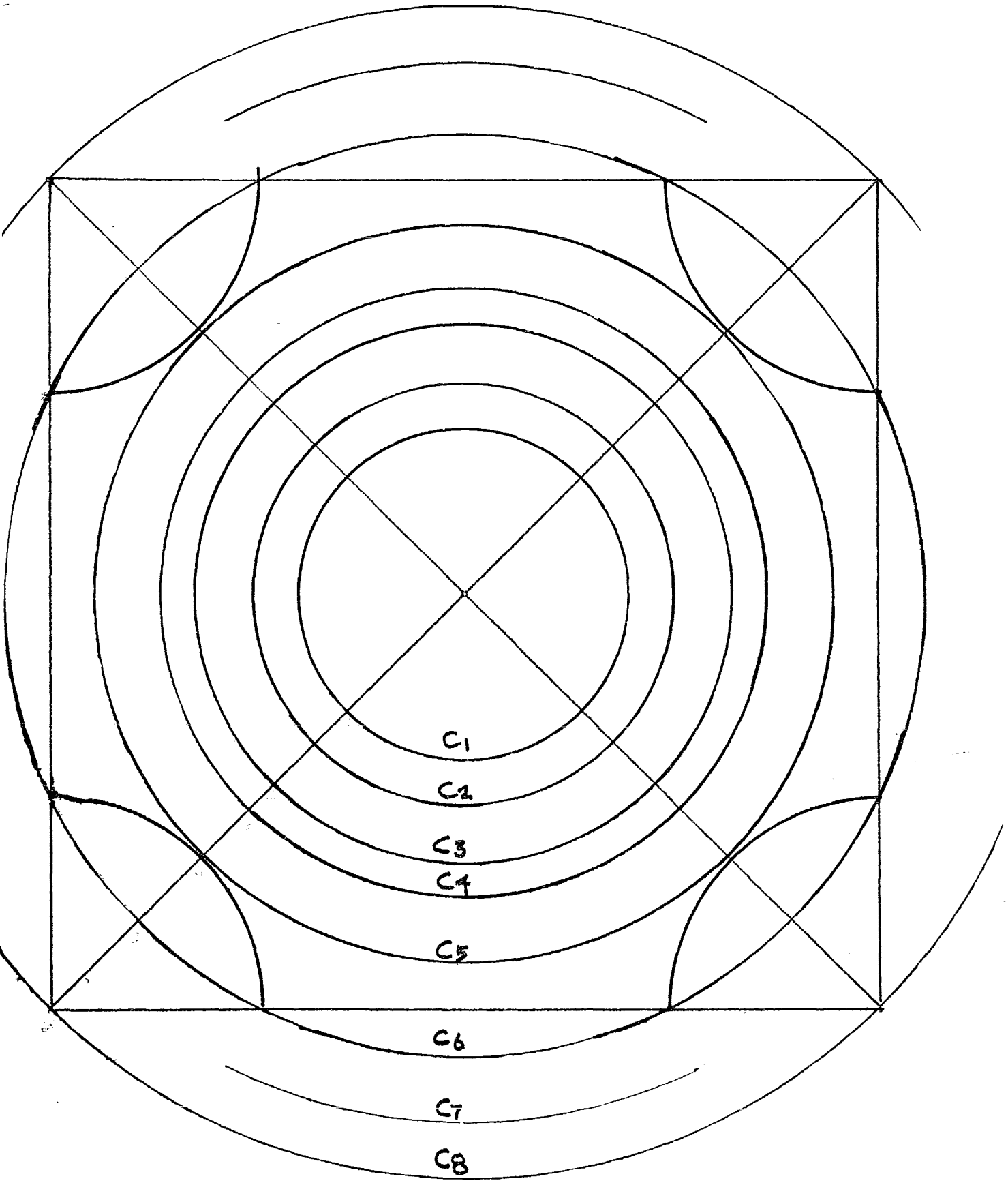
[79] Wren Society, V, 7.

[80] Stephen Wren, Parentalia, p. 282.

[81] Wittkower, p. 3.

DIAGRAM II

GROUNDPLAN OF GREAT MODEL



music was the same music of the spheres as it is here on earth. These spheres, obviously, were circular. Even the sub-lunary sphere moved and gave off music, as we read in Boethius. Thus, the music of the heavens and earth was produced by circular motion. This motion, in turn, had its source in divine universal reason. Andrea Palladio, for instance, venerated the circle because it represented "the unity, the infinite essence, the uniformity and the justice of God".[82] According to Cusanus, the world "is unintelligible without God as its centre and circumference".[83] When Wren uses the circle as an architectural device in design, we can see the influence of the Pythagorean tradition. If this is not an acceptable argument, why did Wren, in his Tracts and Discourse, praise the circle as the most "Natural", "Geometric", and "Beautiful" shape?

By a reference to diagram II we can observe that Wren started with a square inscribed within a circle and proceeded to draw two diagonals of this square. At the centre of the square he constructed a circle, the diameter of which divided the square into four equal ratios of 4:3.

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[82] Ibid., p. 23.

[83] Cardinal Nicolaus Cusanus, Of Learned Ignorance, ed. W. Starr and tr. German Heron (London: Routledge and Kegan Paul, 1954), p. 107.

The square was then extended to accommodate the steps, but this new distance now formed a ratio with the diameter of the circle of 3:1. The diameter of the second circle which Wren drew formed a ratio of 3:2 with the original circle. The point at which C_2 intersected the diagonals of the square formed a ratio of 4:1. The distance from this latest point (P) to the corner of the square (Q) forms a fourfold ratio with the chord of the quarter circles of 1:1. In addition, the radius of this quarter circle to the radius of C_1 is 3:2 and forms yet another fourfold ratio.

The importance of the circle to the Great Model's construction is further clarified by diagram II. The eight circles of the design each play a common role, that is, they determine the proportionate positioning of either the dome, the aisles, the columns, the nave, the vestibule area, and the altar or pulpit area. In addition to determining these positions on an individual basis, the over-all effect was to create a harmonious spatial arrangement between, and despite, different architectural components; for instance,

$C_1 : C_3 = 3:2$

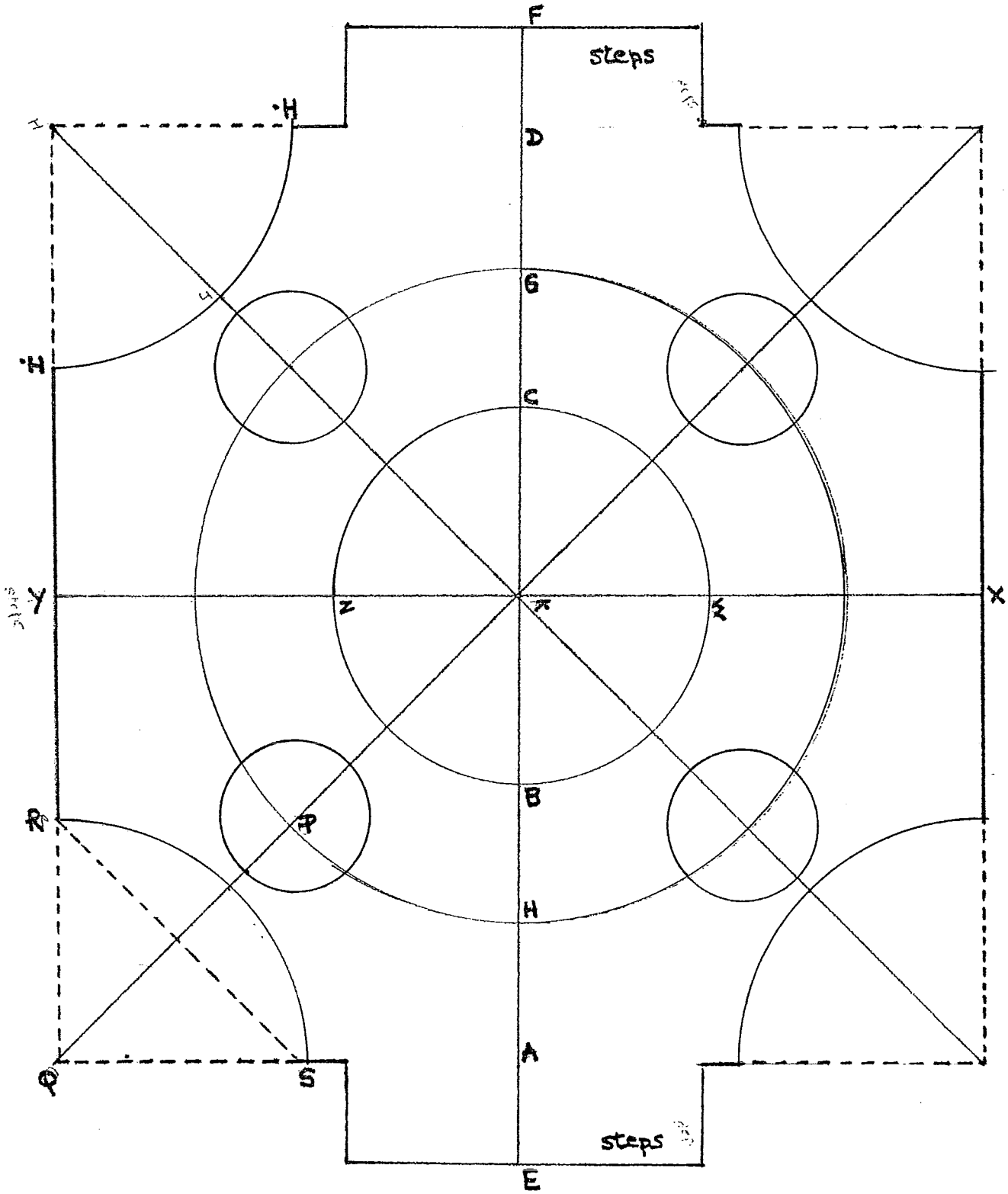
$C_5 : C_3 = 4:3$

$C_5 : C_4 = 5:4$

$C_6 : C_4 = 3:2$

$C_8 : C_6 = 4:3$

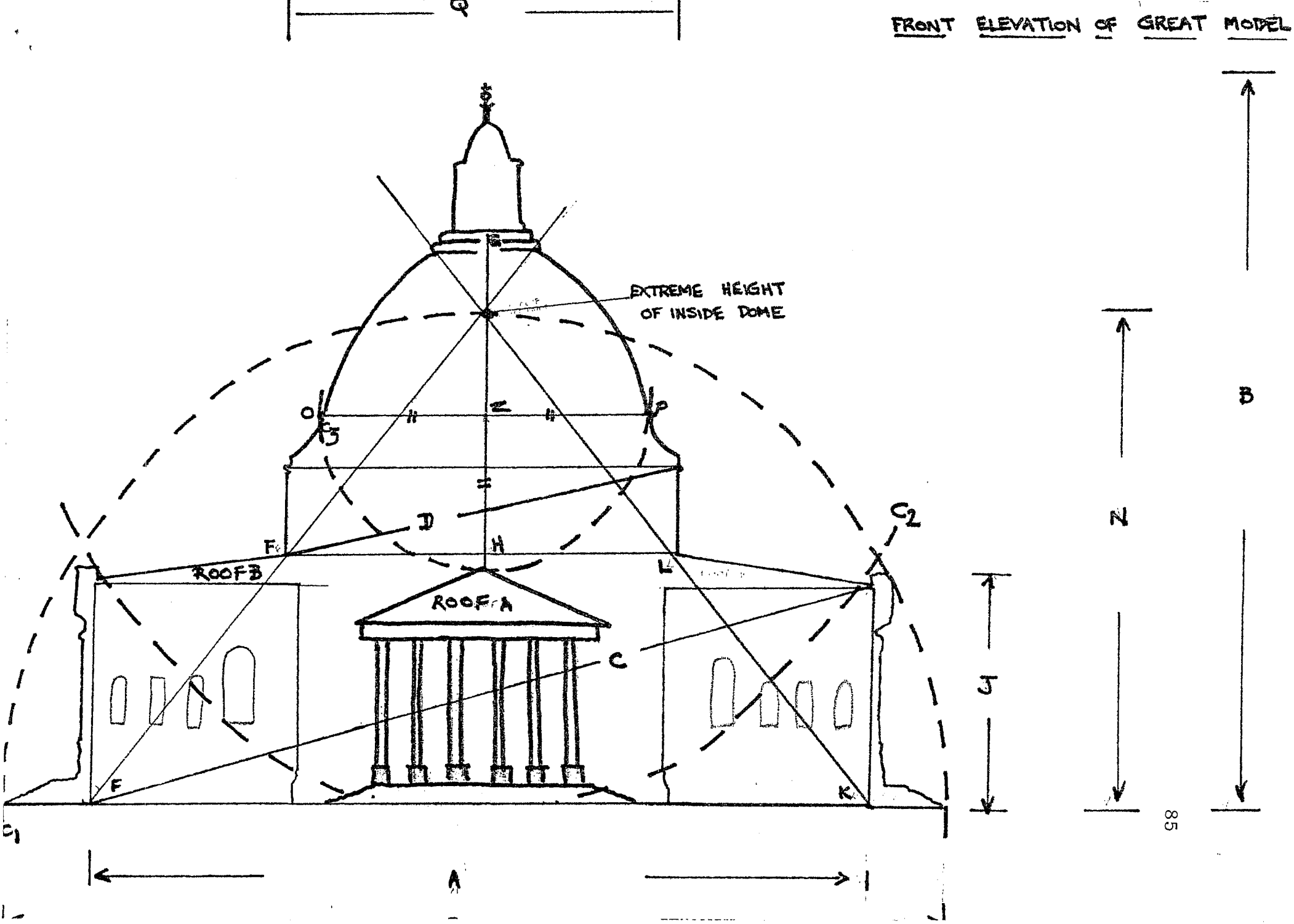
DIAGRAM II
GROUNDPLAN OF
GREAT MODEL



Neither are the Pythagorean ratios and the importance of the circle absent from the elevational design of the Great Model as diagram III illustrates.

The most startling ratio is the length (R) of the church from the north steps to the south steps vis-a-vis its height from the base to the urn (B). The ratio is 1:1. Given perspective, 1/10 is acceptable as a relative error. The height of the portico (J) to B is 3:2. The slope of the portico roof is 4:1. This ratio also repeats for the slope of roof B. The length of the diagonal of the first tier (C) to the length of the diagonal of the dome's base (D) is 2:1. The base and height of the dome (HG) to the distance of the church's base to the height of roof B is 1:1. This ratio repeats for LK. Moreover, the convergence of these lines EF and KL determines the interior height of the dome. The length of the church, excluding the steps (A), to the extreme width of the dome (Q) is 2:1. This ratio repeats for A to the interior height of the dome. The interior height of the dome to Q is 3:2.

Once again, circles are utilized in the elevation of this design. C_3 is the diameter of the dome. It also, when drawn down, determines the height of the porticos. What exists, in effect, is the determining features of an imaginary circle resulting from the half circle dome. The radius of A to the heights of the north and south porticos


Q
EXTREME HEIGHT
OF INSIDE DOME
E
O
P
D
F
H
L
C2
ROOF B
ROOF A
C
F
K
C1
A
J
N
B

(depicted as C_1) is 1:1. Another determining feature to this height is C_2 which is drawn from Z. C_1 and C_2 each determine the width of the portico.

Despite the myriad dimensions of this design there exists both an internal and external harmony based on the Pythagorean ratios of the decad. The over-riding geometrical shapes are the circle and the square. The first determines the formula by which Wren integrated the spatial arrangements, whereas the second evolves into the cube. The essence of this structure is therefore informed by a typically Pythagorean preoccupation with those geometric shapes which determine a rational integration of proportions.

Wren's Parochial Churches are too numerous to be ignored. However, it is quite evident that they are strongly Gothic, especially in the nature of their spires. The following analysis is taken from both Parentalia and the figures published by The Wren Society of J. Clayton. Clayton, who was working with the Royal Academy and the R.I.B.A., made a painstaking study of Wren's Parochial Churches in terms of their dimensions and basic characteristics. What the present analysis does involves defining the ratios of these dimensions.

Church	L:W	L:H	W:H	TH:L	TH:H
All Hallows, Watling St.	2:1	7:3	9:8	1:1	9:4
Relative Error %	3	3	3	5	
All Hallows the Great, Thames St.	3:2	8:3	16:9	1:1	8:3
Relative Error %	3		2		
St. Albans, Wood St.	9:8	2:1	16:9	4:3	11:4
Relative Error %	1			6	
St. Anne & St. Agnes, Gresham St.	1:1	3:2	3:2	3:2	7:3
Relative Error %				6	3
St. Andrews, Wardrobe	5:4	2:1	3:2	9:8	9:4
Relative Error %	2				
St. Andrews, Holborn	5:3	5:2	3:2	1:1	5:2
Relative Error %		2	2	4	2
St. Antholins, Watling St.	5:4	3:2	5:4	7:3	7:3
Relative Error %	2				
St. Benets, Thames St.	1:1	3:2	4:3	9:4	
Relative Error %	8		5	4	
St. Augustine's, Old Change	9:8	7:4	3:2		
Relative Error %		4			
St. Benet's, Gracechurch St.	2:1	2:1	1:1	5:2	
Relative Error %		6	6	1	

Church	L:W	L:H	W:H	TH:L	TH:H
St. Michael's, Crooked Lane	5:3	5:2	3:2	5:4	
Relative Error %	3	3	4	2	
St. Michael's, Cornhill	3:2	5:2	16:9	3:2	
Relative Error %	3	1	3		
St. Mildred, Bread St.	16:9	3:2	3:2	9:4	7:2
Relative Error %	3	2	3		
St. Mildreds, Poultry	4:3	3:2	9:8	4:3	2:1
Relative Error %		3	3		4
St. Nicholas, Coleabbey	3:2	7:4		9:4	
Relative Error %	2			5	
St. Olave's, Jenry			1:1	9:8	5:2
Relative Error %			5		3
St. Peter's, Cornhill		2:1		7:2	7:4
Relative Error %					
St. Sepulchres, Holborn				9:8	4:1
Relative Error %					
St. Stephen's, Coleman		8:5	5:4	3:2	9:8
Relative Error %				2	3
St. Stephen's, Walbrook	4:3	4:3	1:1	1:1	2:1
Relative Error %		4	3	5	3

Church	L:W	L:H	W:H	TH:L	TH:H
St. Bartholomew, Exchange	4:3		3:2	5:4	7:3
Relative Error %			3	2	
St. Benet's Fink, Threadneedle St.	4:3	5:4	1:1	16:9	9:4
Relative Error %	2	3	2		
St. Bride's, Fleet St.	2:1		4:3	2:1	
Relative Error %	3		1		
Christ Church, Newgate St.	7:5	8:1		4:3	4:1
Relative Error %					
St. Christopher's, Threadneedle St.	9:8	3:2	4:3	4:3	2:1
Relative Error %	2		2		
St. Clement Danes, Strand	3:2	2:1	4:3	5:4	
Relative Error %				2	
St. Clement's, Eastcheap	8:5			4:3	5:2
Relative Error %				2	4
St. Dionis, Backchurch	2:1	9:8	7:4	4:3	
Relative Error %	3			3	
St. Dunstan's, in the East	4:3			9:8	9:4
Relative Error %					
St. Edmund the King, Lombard St.	7:4	2:1	9:8	4:3	11:4
Relative Error %		5	5	3	2

Church	L:W	L:H	W:H	TH:L	TH:H
St. George, Botolph Lane	3:2	3:2	1:1	3:2	7:3
Relative Error %				2	
St. James, Garuck Hill	5:3		9:8	9:8	9:4
Relative Error %				3	
St. James, Piccadilly	4:3	2:1	3:2	3:2	7:2
Relative Error %			3		
St. Lawrence, Jewry		2:1		8:5	
Relative Error %		1			
St. Margarets, Lothbury	5:4	16:9			4:1
Relative Error %	3	4			3
St. Margarets Pattens, Rood Lane	5:4	2:1	8:5	3:1	
Relative Error %	1	3			
St. Martins, Ludgate	9:8	1:1	9:8	3:1	3:1
Relative Error %	3	3		2	2
St. Mary, Abchurch	1:1	5:4		9:4	11:4
Relative Error %	5			2	
St. Mary at Hill	8:3	5:2	3:2	1:1	5:2
Relative Error %			4		
St. Mary, Aldermary	3:2		4:2	4:3	3:1
Relative Error %	6		6	2	

Church	L:W	L:H	W:H	TH:L	TH:H
St. Mary Magadalen, Fish St.	5:4	2:1	8:5	no figures given	
Relative Error %					
St. Mary Somerset, Thames St.		11:4		3:2	4:1
Relative Error %				4	
St. Mary le Bow, Cheapside	1:1	7:4	5:3		
Relative Error %	3	2			
St. Mary, Woolwoth	4:3	8:5	5:4	4:3	
Relative Error %	2		2		
St. Mary, Aldermanbury	8:5		9:8	5:4	
Relative Error %			1.1		
St. Matthews, Friday St.	16:9				
Relative Error %		6	2		
St. Michael, Bassisman	7:5	5:3		1:1	7:4
Relative Error %				7	2
St. Michaels Royal, College Hill	7:4			1:1	9:4
Relative Error %				4	
St. Michaels, Queenhythe	16:9	16:9	1:1	2:1	7:2
Relative Error %		3	2	3	
St. Michaels, Wood St.	3:2	2:1	4:3	3:2	3:1
Relative Error %		1.5	1	6	3

Church	L:W	L:H	W:H	TH:L	TH:H
St. Vedasts, Foster Lane	4:3			4:3	5:2
Relative Error %				3	
St. Swithin's, Cannon St.	3:2	1:1	1:1	5:2	15:4
Relative Error %	3	1	5	3	

KEY

L:W = Length: Width

L:H = Length: Height

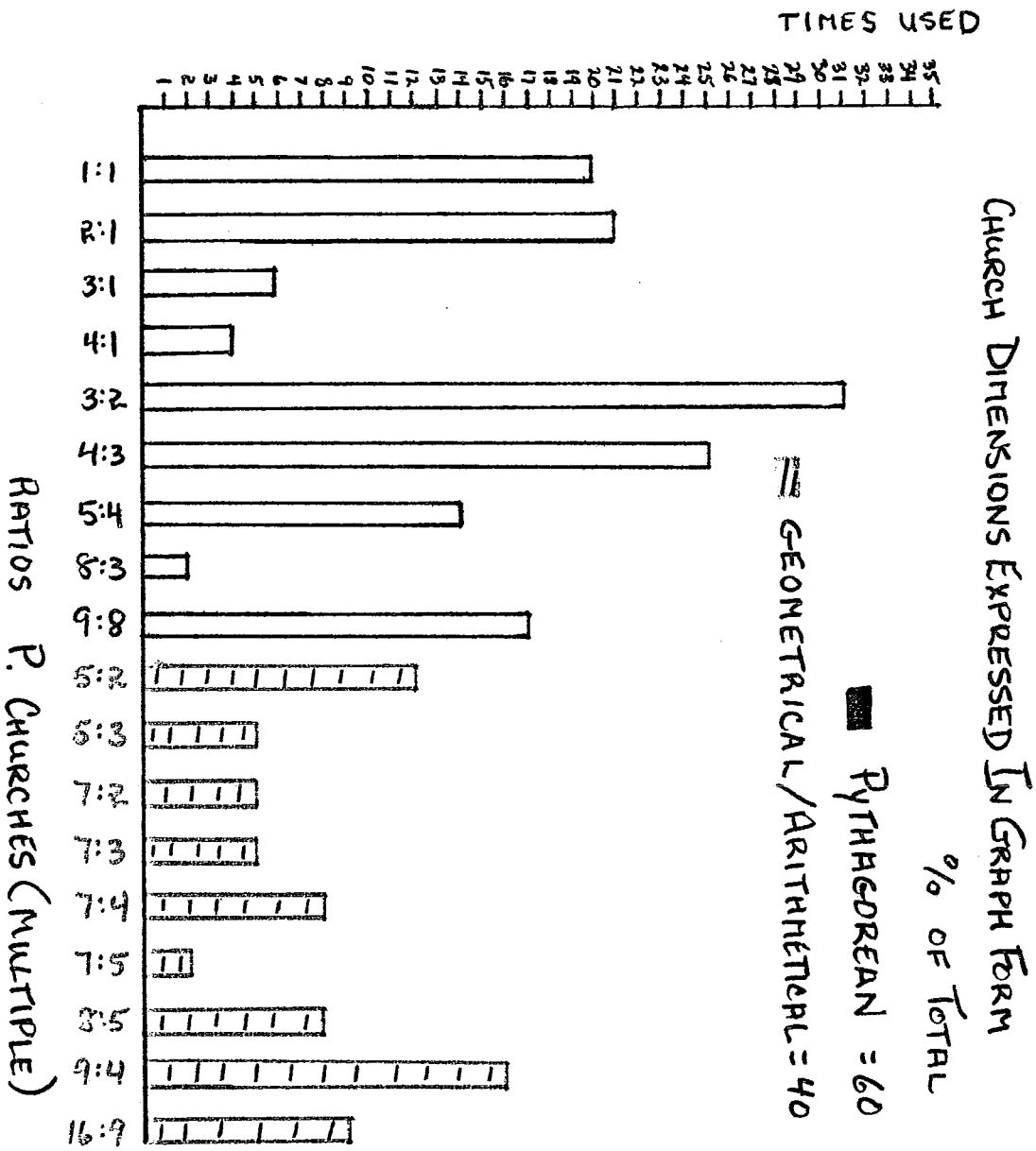
W:H = Width: Height

TH:L = Tower Height: Length

TH:H = Tower Height: Church Height

N.B.: I have not included ratios such as 11:4. However, I have included all ratios before drawing the graphs.

The following graph translates these figures by representing Wren's use of harmonic ratios as opposed to a use of purely geometric ratios:



Quite obviously, the major portion are harmonic, but the findings are not enough to demonstrate a solid performance on Wren's part. However, it must be remembered that Wren's Parochial Churches were built on ancient Gothic foundations for economic reasons.[84] Consequently, Wren was restricted from constructing a church in terms of his ideals for width to length. This would not only account for the large discrepancy between the proportions of the Greek Cross design and the basic proportions of these churches, but it would also account for it in a very reasonable fashion.

But the converse becomes true; namely, Wren may have been restricted in certain ways by Gothic space, but he was certainly free to build as high as he thought necessary. If Wren was a Pythagorean, then he should have harmoniously related the heights of the Parochial Churches to their length. We can understand that he had no control over, say 40% of the various dimensions, but he undoubtedly was free to ascend harmoniously.

Accordingly, the following graph represents the relationship between tower height and church length. If we are correct in our assertion that Wren was, essentially,

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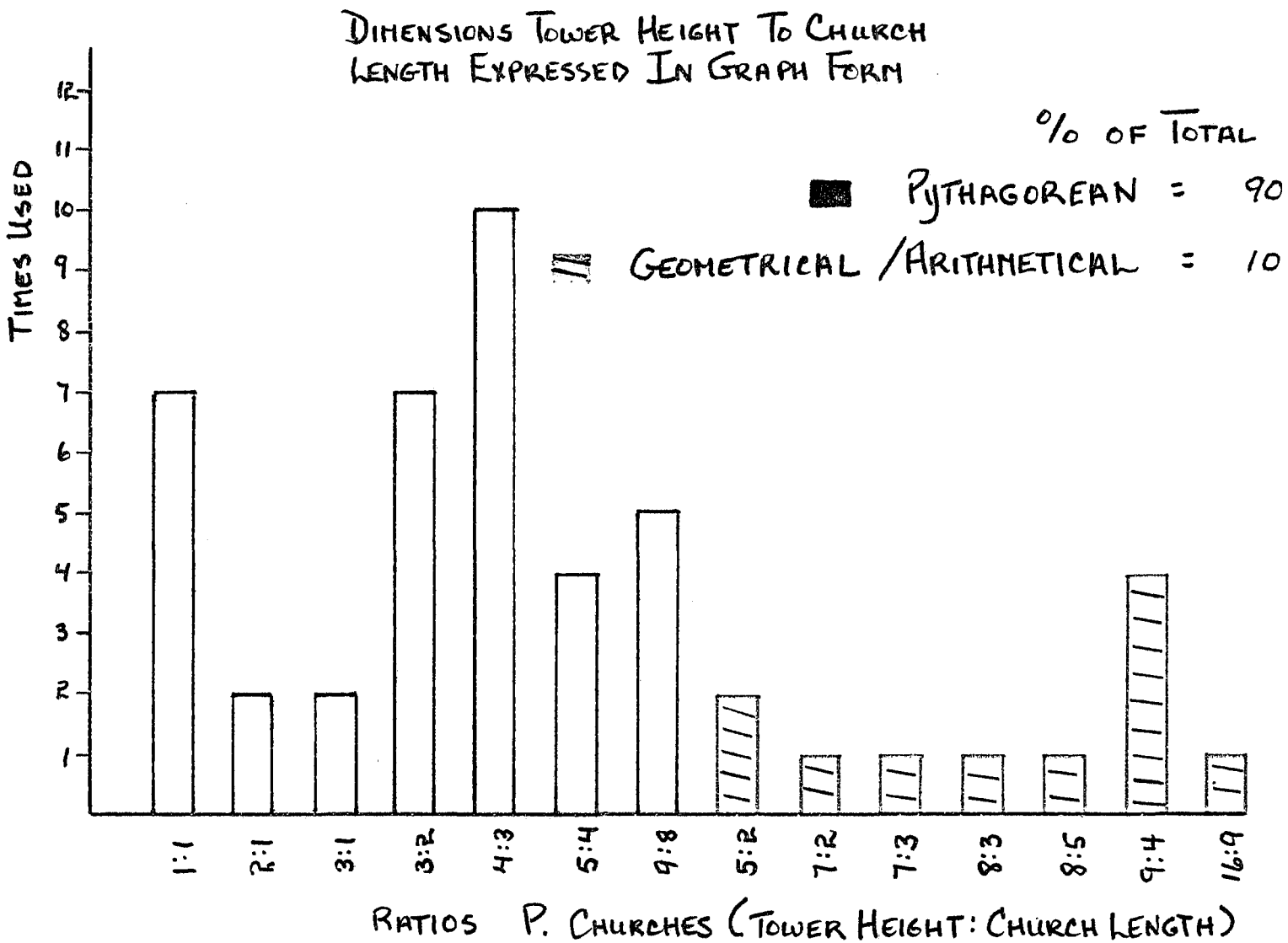
[84]Stephen Wren, Parentalia, op. cit., p. 302. Cf. also Sekler's Wren and His Place in European Architecture (London: Robert Hall, 1956), pp. 72-75.


DIMENSIONS TOWER HEIGHT TO CHURCH LENGTH EXPRESSED IN GRAPH FORM
% OF TOTAL
PYTHAGOREAN = 90
GEOMETRICAL / ARITHMETICAL = 10
TIMES USED
1
2
3
4
5
6
7
8
9
10
11
12
1:1
2:1
3:1
3:2
4:3
5:4
9:8
5:2
7:2
7:3
8:3
8:5
9:4
16:9
RATIOS P. CHURCHES (TOWER HEIGHT: CHURCH LENGTH)

a Pythagorean, then it must be expected that, free from compromise for whatever reason, his natural architectural tastes would manifest. Significantly, this graph vindicates the thesis compellingly since close to 90% of these ratios are harmonic.

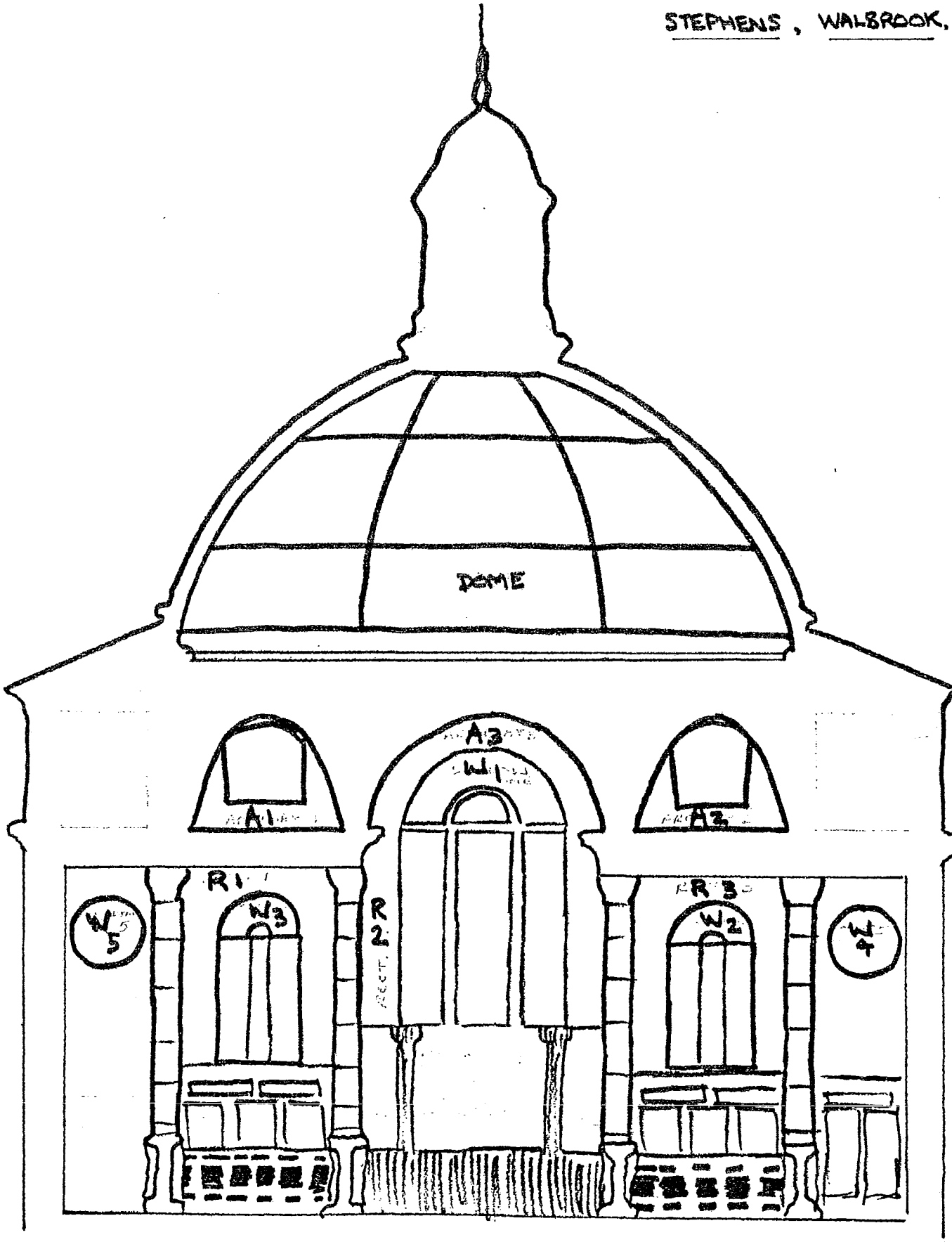
Further evidence that Wren used musical harmony as a paradigm in architecture, despite the restrictive budgets of London parishes, lies in the walls of the newly built churches. The width or length of these walls may have been determined, but the walls themselves were new. Wren could do what he wanted with them. If Wren was a Pythagorean, then we should be able to find harmonic ratios within or upon these walls. Accordingly, we will study the open spaces of the interior facade of St. Stephens, Walbrook, in order to ascertain if Wren realized the potential of these inviting spaces.

In diagram IV exists a rough sketch on the interior of St. Stephens, Walbrook. It includes the altar and vaulting. This last item, which exists in reality, must be imagined. We have elected to study 12 of its components from which 21 harmonic ratios emerge. Through these, in the words of Wotton, "Symmetrie" is reduced to "Symphonie", "Harmony of Sound" reduced to "Harmony in Sight".

For instance, the height of window 2 to the height of window 1 equals 3:2. (Window is hereafter "W".) This

DIAGRAM IV

INTERIOR OF ST. STEPHENS, WALBROOK.



ratio repeats for W_1 to W_3. The height of W_1 to the height of W_4 equals 3:1. This ratio repeats for W_3 to W_5. The radius of W_5 to the radius of W_2 equals 3:2. This ratio repeats for W_4 and W_5. The radius of W_3 to the radius of W_1 equals 3:2. This repeats for W_1 and W_2. The width of W_5 to the width of W_3 equals 3:1. This ratio repeats for W_2 and W_4. The length to the height of archway 3 equals 4:3. (Archway is hereafter "A".) The height of A_1 to A_2 equals 3:2. This ratio repeats for A_1 and A_3. The length to the height of A_1 equals 4:3. This ratio repeats for A_3. The length to the height of rectangle, equals 9:4. (Rectangle is hereafter "R".) This ration repeats for A_3. The length to the height of R_2 equals 2:1. The length to height of R_2 to the length to height of R_3 equals 3:2. This ratio repeats for R_2 and R_1. The height to the width of the dome equals 9:4.

Although the Parochial Churches fail to meet the standards of Pythagorean excellence as established by our analysis of the Great Model, they nevertheless remain as a testimony to Wren's architectural ideals despite the Gothic tastes of the time, the restricting power of the parish budgets, and the limitations of actual space which Wren was forced to work with.

Wren's plan for the rebuilding of London was submitted to the King by early September of 1666. It requires

attention because of a study I made as a result of reading Victor Furst's statement: "[in] essence, Wren's plan is based on a geometrical pattern of rectangles into which the surviving and the immovable features of the city are ingeniously fitted".[85] This "rectangular grid system" may be difficult to discern, but more difficult still is defining the "geometrical pattern". There are few right angles in the plan. Consequently, there are few rectangles. However, a perfect square surrounds St. Pauls which, in turn, forms the exact centre between the Royal Exchange and the West Piazza. When I first examined Wren's plan, I imagined it to be irregular and without any perceptible "geometrical pattern". But the rectangular grid system which Furst believes to exist suggests deliberation and intellection on Wren's part. The pertinent question became: "Is there a geometrical pattern to the drawing which is its real 'essence'?". A reading of John Evelyn's London Revived supplied an answer as Evelyn talked about "the five principal traverse streets on the whole city", particularly

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[85]Viktor Furst, The Architecture of Sir Christopher Wren (London: Lund Humphries, 1956), p. 5.

> the second . . . from the Strand to the utmost Eastern point of the whole City. . . . This street from St. Pauls may be divaricated like a Pythagorean γ, as the most accurately Ingenious Dr. Wren has designed it, and I willingly follow in my second thoughts. . . .86

Evelyn is here alluding to the main thoroughfare in Wren's plan which runs eastward from Temple Bar and divides at St. Pauls; one branch running towards the proposed Royal Exchange and Aldgate, the other towards the Tower. It is this arrangement which may be divaricated like a Pythagorean T. (See diagrams V and VI.) It is interesting to note that Evelyn knew what Wren's arrangement represented; interesting because there seems to be a shared knowledge to the possible significance of this so-called "Pythagorean" letter. What, then, is its significance?

Frances Yates, in The Rosicrucian Enlightenment, remarks that "the Y stands for the . . . emblematic choice between two ways, one, the vicious way, leading to ruin, the other representing virtuous choice".[87] The editor of Evelyn's short treatise accords with this interpretation.[88]

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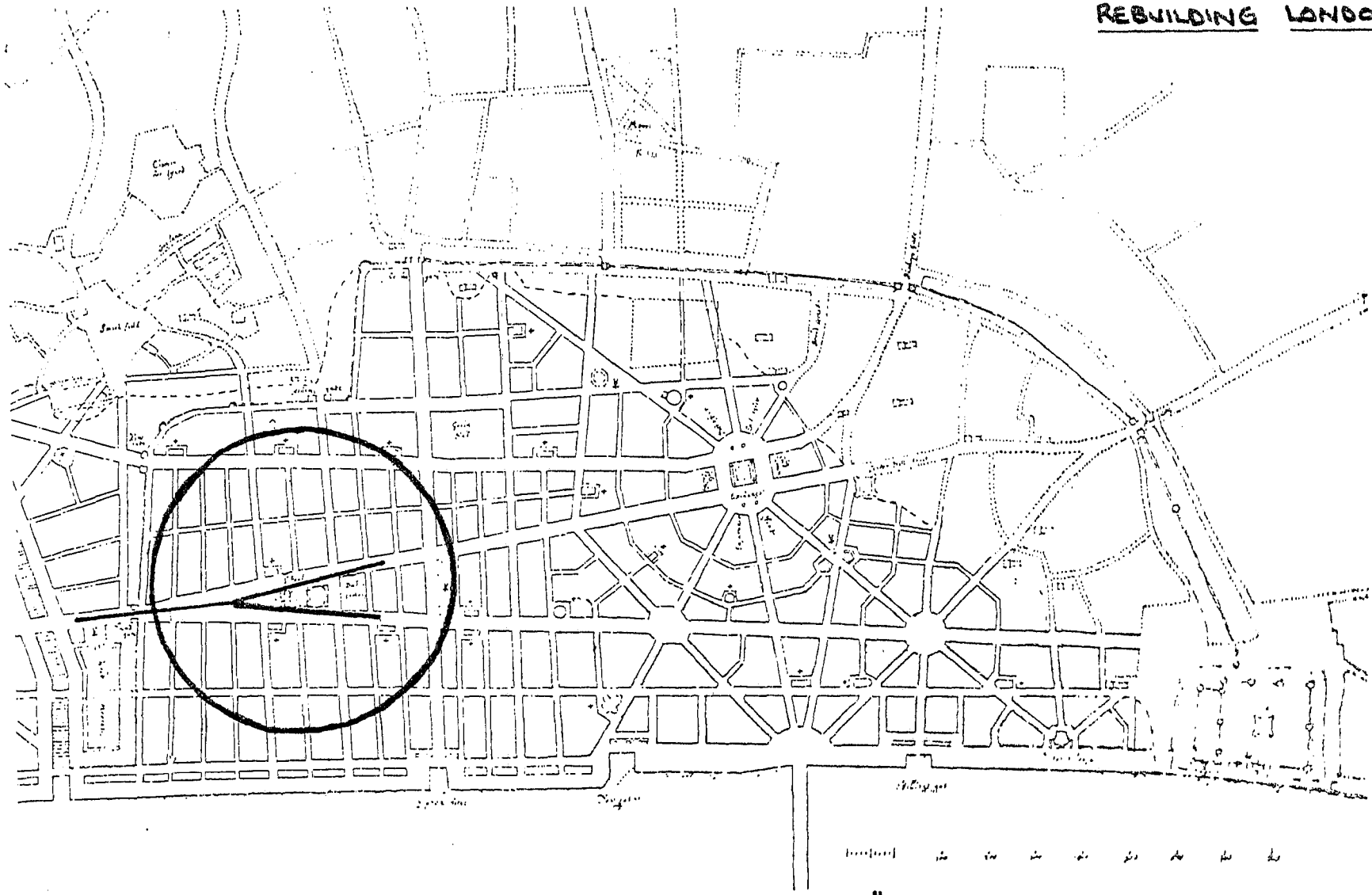
[86]John Guelyn, London Restored, ed. E. S. de Beer, (Oxford: University Press, 1938), p. 38.

[87]Frances A. Yates, The Rosicrucian Enlightenment (London: Routledge and Kegan Paul, 1972), p. 56.

[88]Evelyn, op. cit., p. 62.

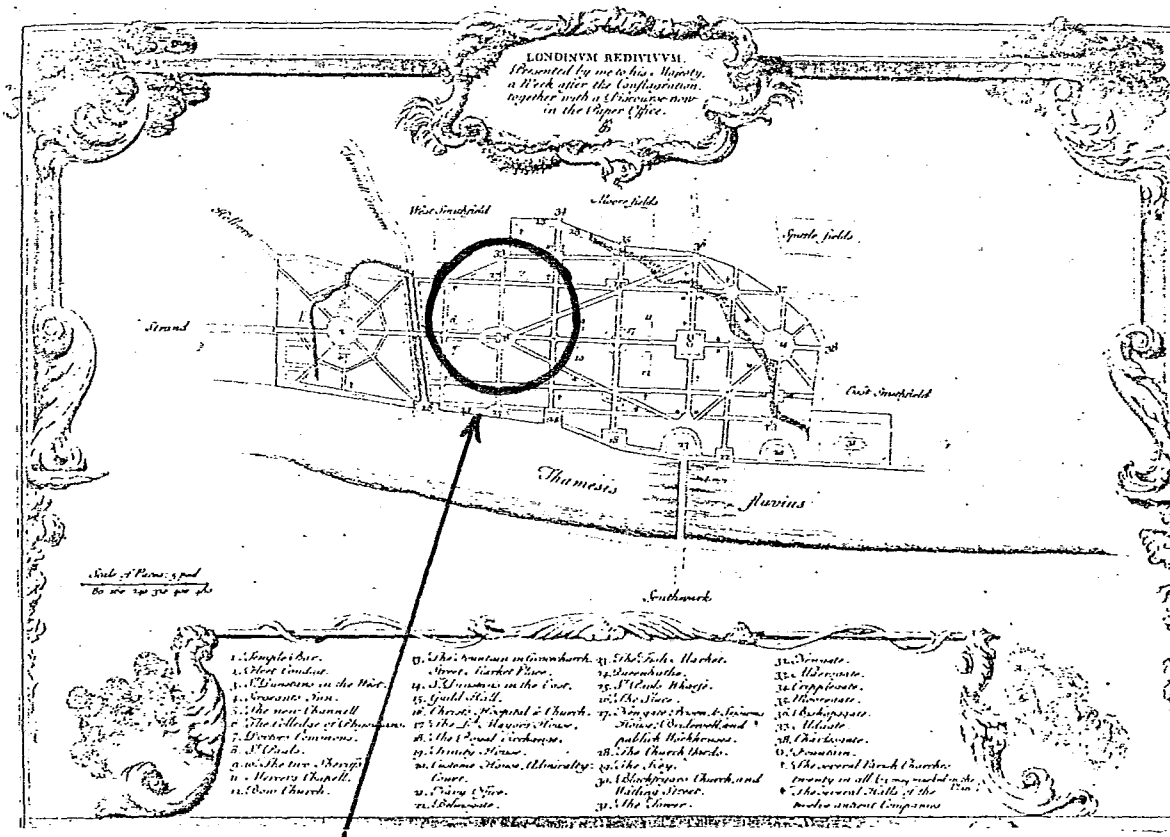
DIAGRAM V

WREN'S PLAN FOR REBUILDING LONDON



NOTE THE "DIVARICATION LIKE A PYTHAGOREAN I"

DIAGRAM VI
EVELYN'S PLAN FOR REBUILDING LONDON



EVELYN HAS "WILLINGLY FOLLOWED WREN."

If this is true, however, why do the branches of the Strand in Wren's plan lead to the Royal Exchange and to the Tower? Moreover, why is St. Pauls, supposedly the representative building of the "virtuous life", placed at the intersection of the T? The same questions can also be made of Evelyn's first plan since one branch leads to the Fishmarket, the other to Moor fields.

I would like to suggest that the Pythagorean letter is significant because it defines the geometrical pattern of Wren's design; namely, the sizes of the re-designed streets. According to Parentalia, each of the streets was to be either 30', 60', or 90'; "The Streets to be of three Magnitudes; the three principle leading straight through the City, and one or two Cross-Streets to be at least 90' Wide; others 60'; and Lanes about 30' . . .".[89] Perhaps this desire on Wren's part for the ratio 3:1 to be laid uniformly throughout London was inspired by Boethius' "Naming of the Notes through Greek and Latin Letters".[90] Boethius here defines the significance of the upsilon or pythagorean T:

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[89]Stephen Wren, Parentalia, op. cit., p. 268.

[90]It is in connection with this point that we should mention that Wren possessed Boethius' complete works. A Catalogue of the Curious and Entire Libraries of that Ingenious Architect, Sir Christopher Wren, in J. Furst's The Architecture of Sir Christopher Wren, op. cit., pp. 231-235.

"The Trite Hyperboleon, or Tertia Excellentium, is a downward leaning toward the right and half of an Alpha leaning toward the left: ⊥ ".[91] Significantly, both the upsilon and the measures of each street in Wren's plan share a common quality: a 3:1 Pythagorean ratio. The "geometrical pattern" of the drawing appears to have a Pythagorean ratio as its essence.

On the authority of Boethius, and on the failings of the usual interpretation on the importance of the Pythagorean T, I suggest that the connection between the episolon, the Tertia Excellentium, and the measures of Wren's streets, are sufficient to identify a Pythagorean element, and thus a "geometrical pattern", in the plan more precise than the vague notion of "grid systems" or "two paths".

The final drawing which we will examine is Trinity College Library, 1676-1684. We also have an interesting statement from Wren to Bathurst concerning this building:

> A building of that consideration you go about deserves good care in the designe and able workmen to perform it; and that he who takes the general management upon him may have a prospect of the whole, and make all parts, inside and outside, corresponde well together.92

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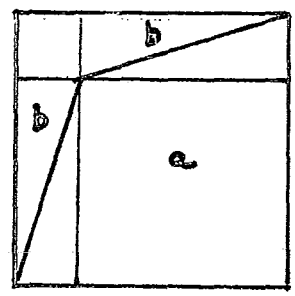
[91] Boethius, op. cit., p. 288.

[92] Wren Society, op. cit., V, 32.

What, we may ask, is the integrated "correspondence this design?

The groundplan of this design (diagrams VII and VIII) bears a remarkable similarity to Thomas Heath's account of Pythagoras' proof of the proposition that "In right angled triangles the square on the side subtending to the right angle is equal to the squares on the sides containing the right angle".

According to Heath, Pythagoras, taking a square divided it into two unequal squares and two equal rectangles (A). The two equal rectangles were then divided into four equal triangles (B).



Pythagoras then rearranged the four triangles one to each corner of the original square such that yet another square was formed in its middle area (C). This new square

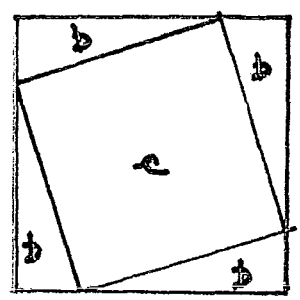
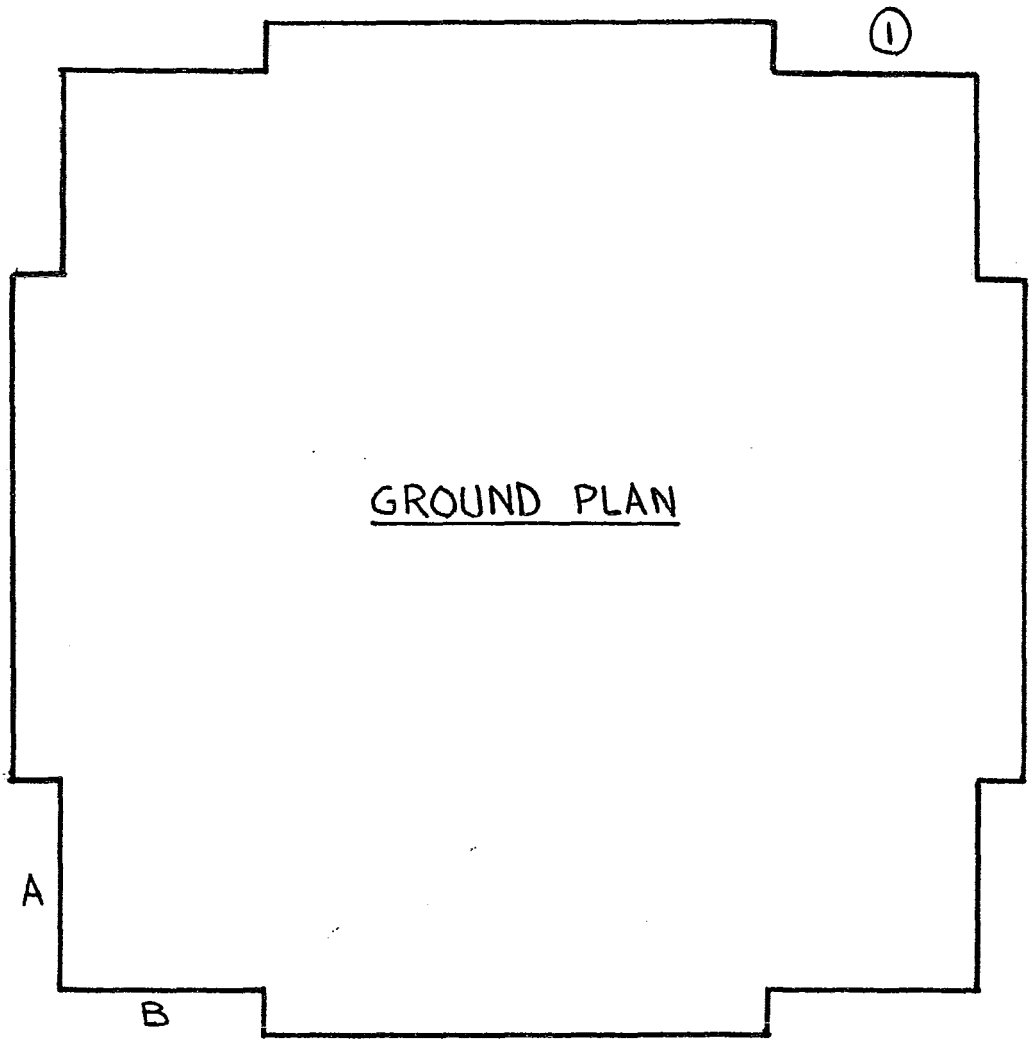
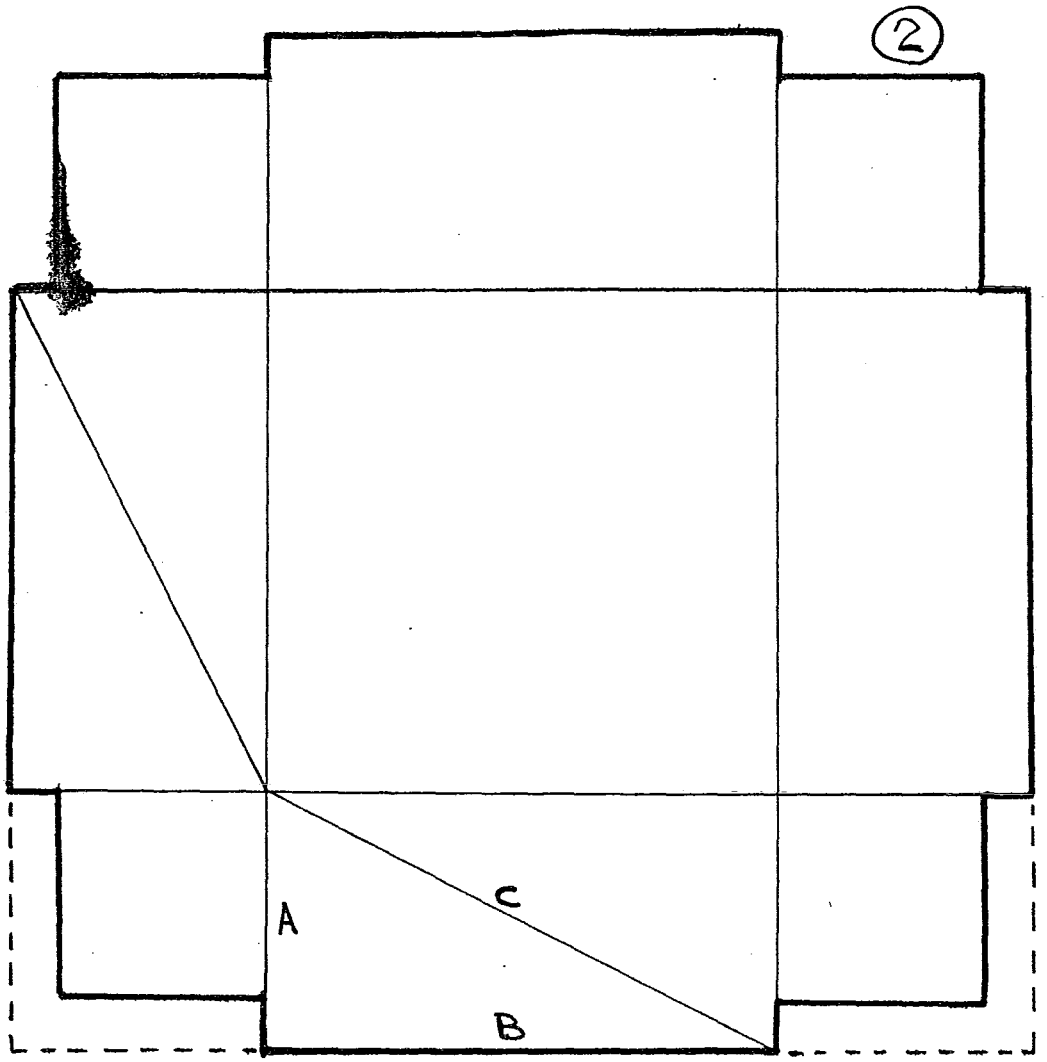


DIAGRAM # VIII
(1-2)

TRINITY COLLEGE
LIBRARY




2
A
C
B

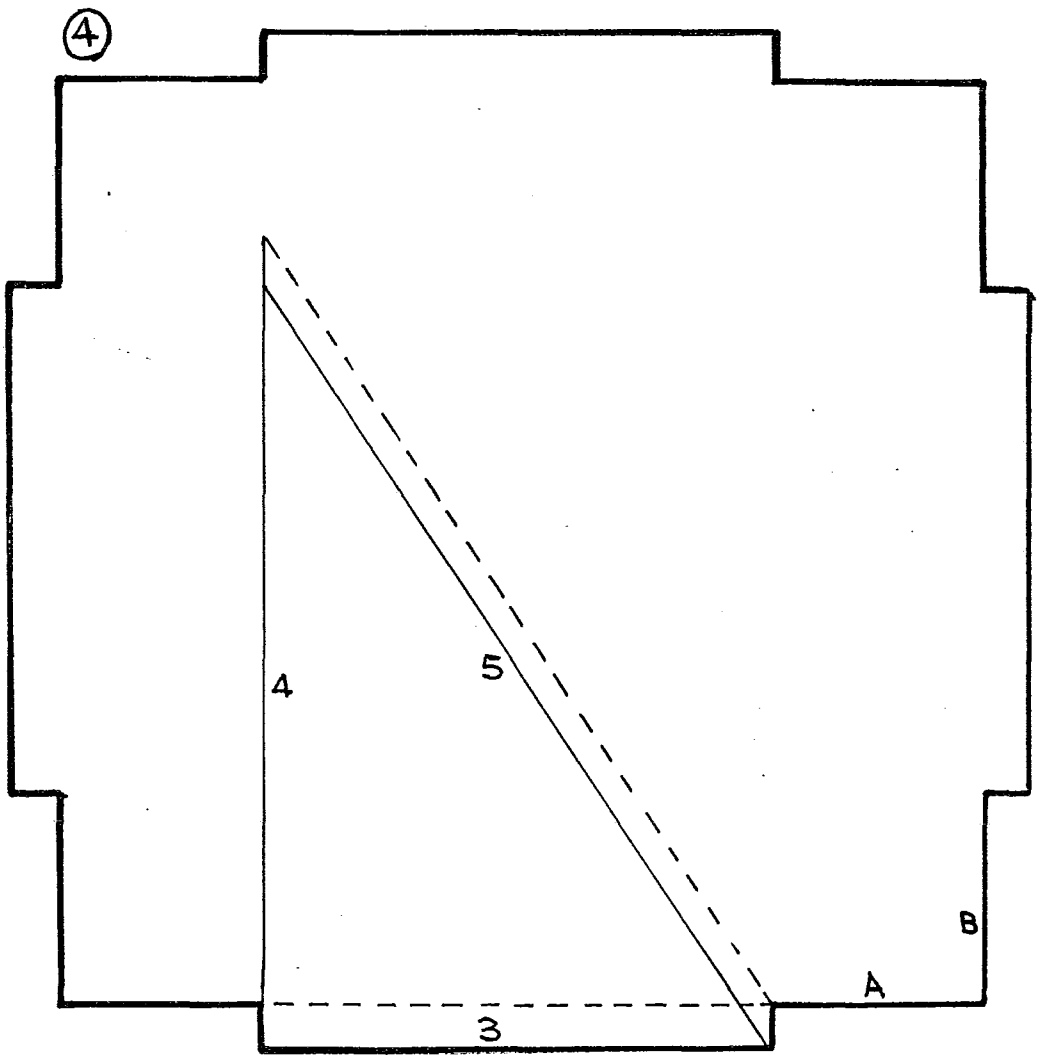
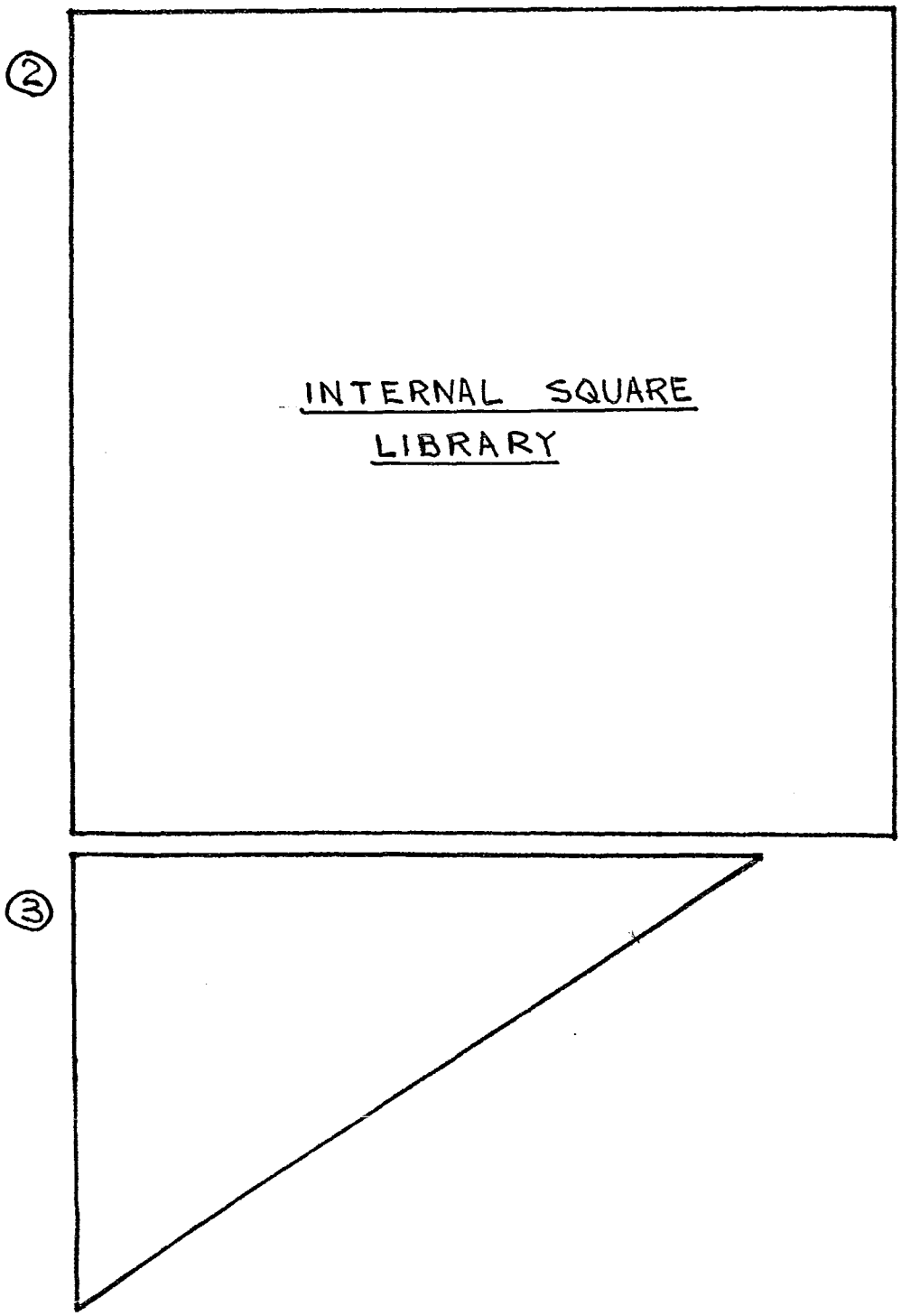

④
4
5
3
A
B

DIAGRAM # VII

(3-4)

TRINITY COLLEGE LIBRARY



was equal to the sum of the previous two squares. Consequently, Pythagoras' proposition was proved.

There exists in Wren's plan two basic squares. The off-setting of each corner is perfectly symmetrical. Taking the outside square we can easily connect the points of its corners. What evolves is a square divided into two unequal squares and two equal rectangles.

The sides of this right angled triangle provide some startling "correspondences". For instance, C equals the width of the steps, the height of the portico, the height of the first tier; and the internal distance from the doorway to the groundplan's central point. The ratio between A and B is 2:1. Similarly, this ratio repeats for the slope of the steps, the slope of the portico roof, the length to the height of the six lower windows, the length to the height of the dome arches, the length to the height of the doorway, and the length to the height of the cupola windows.

The inside square (diagram VII) we shall call AB. The right angled triangle which "corresponds" to this square, that is, the triangle whose sides containing the right angles equals the square of the hypotenuse, provides similar "correspondences" as occurred with the outside square. For instance, side 3 of this triangle equals the lengths of the four bases of the columns. Side 4 equals the height of the

dome and cupola. Side 5, obviously, equals the length of the building, but also the length of the base of the dome.

Wren's making "all parts, inside and outside, correspond well together" appears to have been facilitated by the variations upon Pythagoras' proof of the aforementioned proposition. The principle is applied to both the inside and the outside. This should not be surprising since the design was for a library, a highly intellectual concern. Moreover, Bathurst, the President of Trinity College, was a personal friend of Wren's, a natural philosopher, and perhaps receptive to the philosophical meanings of the Pythagorean design, as were other Royal Fellows, as the Philosophical Transactions and the correspondence of Henry Oldenbury testify.[93]

Conclusion

The inductive analyses, in and of themselves, are important, but having been introduced by Wren's own writings, writings which also reveal Pythagorean interests, the effect

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[93] Philosophical Transactions of the Royal Society of London (London: Johnson Reprint Corporation, 1963), VII, No. 81, 4000-4003; No. 90, 5152; XVIII, No. 208, 67-76; XX, No. 238, 80-84; XXIV, No. 299, 1969. Cf. Rupert Hall and Marie Boas Hall, eds. and trs., Correspondence of Henry Oldenbury, 8 vols. (Madison: University of Wisconsin Press, 1969), II, 179-181, 190-201, 202-203.

of what the analyses indicate is even more forceful; that is, it appears more than just a possibility that Wren was a Pythagorean. In the conclusion we will attempt to account for Wren's interest in Pythagoras and Pythagorean philosophy.

CHAPTER III

SEVENTEENTH CENTURY SCIENCE AND PYTHAGORAS

The "Battle of the Books" has been included in this study less because it is directly related to Wren than because it is corroborative. Indeed, there are several reasons why the ancient-modern controversy should be included: one, Pythagorean philosophy is a "living issue" in the century, an issue which has social and political implications which are in turn, involved in larger moral questions; two, the quarrel involves the greater part of the scientific community and Wren would necessarily, as a member and friend of many individuals belonging to the Royal Society, be included; three, Wren's involvement seems to have been actually partisan, that is, on the side of the ancients; four, the vehemence of the entire controversy substantiates the contention that Wren's career may have been informed by Pythagoreanism because we can see how this philosophy was anything but arcane during Wren's lifetime.

The seventeenth century "Battle of the Books" is a quarrel which involved, primarily, moral and religious issues. It is generally agreed, perhaps not incorrectly, that it was not a literary debate. However, as Temple pointed out, one cannot divorce the art of a period from

the ideas of that same period.[1] Thus, when admitting to the superiority of the ancients in poetry and architecture, the moderns were simultaneously admitting to the superiority of the ideas informing these works. Neither is the conception of progress the main bone of contention since Temple, and even such moderns as Burnet and Wotton, concurred with what one writer has called the "degeneracy theory".[2] Some

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[1]"Some Thoughts Upon Reviewing the Essay of Ancient and Modern Learning", in Samuel Holt Monk, ed., Five Miscellaneous Essays by Sir William Temple (Ann Arbor: The University of Michigan Press, 1963), p. 86.

[2]Bury (The Idea of Progress: An Inquiry Into Its Origins and Growth [London: MacMillan and Co. Ltd., 1921]) posits the idea that the "Battle of the Books" possessed, for its "problem of greater moment", the question: "'Can men of today contend on equal terms with the illustrious ancients, or are they intellectually inferior?'" (p. 79). Bury then asserts that this question implies "the larger issue, Has nature exhausted her powers . . .?". This brings in the author's concept of degeneracy: "the widely prevailing view that man had degenerated in the course of the last fifteen hundred years" (p. 33). Bury's otherwise interesting treatment of the idea of progress is flawed only by a condensing of the material and thus omitting to consider some important nuances. For instance, the question of intellectual inferiority, as will be shown, was really one of moral inferiority. Neither did anyone in the seventeenth century believe that nature's powers were inexhaustible; just as today we know that the sun will eventually exhaust itself. Burnet, a modern, entitled his magnum opus: The Sacred Theory of the Earth: The Wisdom of God Displayed in the Works of the Creation from the Beginning to the Consummation of All Things by Fire: "All things", presumably, included the larger questions of intellectual inferiority, of the question whether "nature has exhausted her powers".

have argued that the battle was over "method", particularly the superiority of the inductive method as opposed to Aristotelian.[3] This is not completely correct because the attacks on natural philosophy were not always concerned with its method, but sometimes its conclusions.[4] Temple did not deny that the moderns could boast of many inventions resulting from experimental science; rather, he questioned the moral value of these inventions.[5] The relative merit of Aristotelian methodology was not really the pivotal point of contention for another reason: ancients and moderns had a common point of agreement in that their shared Protestantism would determine a negative response to Catholic Philosophy, a major part of which consisted of a reliance on Aristotle. This may be why Aristotle became useful only as a critic, not as a philosopher, during the seventeenth

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[3]Richard Forster Jones' stimulating study (Ancients and Moderns: A Study of the Rise of the Scientific Movement in Seventeenth Century England [2nd ed.; Berkeley: University of California Press, 1961]) concludes that the "chief concern" of the moderns lay in their desire "to incite as many men as possible to observe and carry on experiments" (p. 270). Jones' understanding may require minor qualification.

[4]Stubbes and Glanvill argued over methodology but this issue dies out by Temple's time as Jones astutely pointed out in his essay: "The Background of the Battle of the Books", in The Seventeenth Century: Studies in the History of Thought and Literature from Bacon to Pope (Stanford: Stanford University Press, 1951), pp. 10-40.

[5]See below, pp. 122-133.

century.[6]

By the time Newton's Principia was published, however, the apologetic attitude in Thomas Sprat's defence of the Royal Society had become quite the contrary.[7] Burnet, in 1689, strengthened by Newton, and actually corresponding with him, wrote: "As for antiquity and the testimonies of the ancients, we only make general reflections upon them, for illustration rather than proof of what we propose . . .".[8] Having reduced the purpose of ancient thought to the level of exemplifying already established "proofs", Burnet adds a comment as to the purpose of the moderns' knowledge:

> Man is the master of all, and of him a double care is taken; that he should neither want what nature can afford, nor what art can supply. He could not be provided of all conveniences by nature only, especially to secure him against the injuries of the air; but in recompence, nature hath provided materials for all those arts which she saw would be needful in human life, as building, clothing, navigation, agriculture, etc. that so mankind might have both wherewithal to answer their occasions, and also to employ their time, and exercise their ingenuity. This economy of nature, as I may call it . . . is an argument both of goodness and of wisdom, and is every way far above the powers of brute matter. All regular administration we ascribe to conduct and judgment: if an army of

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[6]Jones, Studies, op. cit., p. 36F.

[7]Ibid., p. 15.

[8]Thomas Burnet, The Sacred Theory of the Earth (London: T. Kinnersley, 1816), p. 67.

> men be well provided for, in things necessary both for food, clothes, arms, lodging, security and defense, so as nothing is awanting in so great a multitude, we suppose it the effect of care and forecast in those persons that had the charge of it . . . and can we suppose the great army of creatures upon earth, managed and provided for with less forethought and providence, nay, with none at all, by mere chance.9

Bacon's dictum that "Human Knowledge and human power meet in one",[10] after a cautious defense by Sprat and Glanvill, after an initial resistance by Stubbes' Plus Ultra Reduced to a Non Plus, seems to have soared into the status of unquestionable dogma through Newton's achievement.

Newton himself was reserved concerning Baconian hubris. On Burnet's theory Newton stated: "I have not set down anything I have well considered or will undertake to defend".[11] But Newtonians,[12] such as Burnet, were willing

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[9] Ibid., pp. 338-339.

[10] "The New Organon", in Sidney Warhaft, ed., Francis Bacon: A Selection of His Works, College Classics in English, General Editor, Northrop Frye (Toronto: MacMillan of Canada, 1965), p. 331.

[11] Letter from Newton to Burnet, in Memoirs of Sir Isaac Newton, Sir David Brewster, The Courses of Science, 2 vols. (1855; reprinted London: Johnson Reprint Corporation 1965), II, 446.

[12] Sir Frank Manuel, The Religion of Isaac Newton, The Freemantle Lectures 1973 (Oxford: The Clarendon Press, 1974), pp. 37-41.

to express a view that mankind could be seen as a well organized army dominating nature through a control of universal laws which can be made to provide "building, clothing, navigation, agriculture, etc.". In short, all those things which are material, productive, and man-oriented. God has become the "general" of nature's army, the source of "regular administration". This "regular administration" is defined more precisely by Burnet later in his treatise: "God made all things in number, weight and measure, which are geometrical and mechanical principles".[13] This curious adaptation of Solomon's maxim indicates Burnet's belief that by a knowledge of these principles man can achieve domination. The universals are "number, weight and measure". The method involves the use of natural philosophy as the means to the knowledge of the "geometrical and mechanical" principles underlying the universals of "number, weight and measure". The result is manipulation of these principles for man's benefit. God's wisdom and understanding becomes evident only in an "eternal usefulness of things, an eternal good sense".[14]

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[13]Burnet, op. cit., p. 358.

[14]Ibid., p. 716.

Not everyone after 1687 was so swayed by the "uses" of Newton's philosophy as the Physica Sacra[15] writers obviously are: not everyone was willing to reduce the purposes of knowledge to a means for man's domination. Similarly, nor were these individuals willing to see God as only the creator of "usefulness" or "good sense". One such individual was Sir William Temple.

Politically, Temple was a Whig. For instance, he had been employed to reconcile Charles to the Prince of Orange in regard to the marriage between the latter and Mary.[16] But Temple was a moderate Whig. Evidently he had resolved not to participate actively in the revolution and declined "solicitations"[17] from William to accept a position.

One possible reason for this moderate stand may have been the failure of Temple's attempt to enlarge the privy council.[18] Perhaps it was the death of his daughter and the

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[15]Manuel, op. cit. Cf. Buffon's statements on these writers in Barr's Buffon, 10 vols. (London: H. D. Symonds, 1797), I, 115-154. For instance, Buffon characterizes Whiston, Burnet and Woodward as writers "in the clouds of a physical theology" (p. 153).

[16]Thomas Courtenay, Memoirs of Sir William Temple, 2 vols. (London: Longman, Rees, Orme, Brown, Green, and Longman, 1836), I, 503-504.

[17]Ibid., II, 119.

[18]Robert C. Steensma, Sir William Temple (New York:

suicide of his son which determined Temple's alienation. Perhaps a more simple cause was Temple's age, for he was over sixty by the time of the revolution. Whatever the reason, however, Temple had retired to his private estate, Moor Park, by 1686, and was determined to stay.

Even though Temple was a Protestant, even though he was a Whig, we can see that he was not uncritical of his party's constitutional philosophy. Similarly, we find him resenting the portrayal of the uses of knowledge which Burnet, another Whig, expressed.[19] It was as a reaction to Temple's perusal of Burnet's Sacred Theory of the Earth that the Reflections were written (pub. 1691).

Those who have written about Temple may have each committed the same error. By reading history backwards with regard to the theory of progress, writers have seen in Temple a resistance to what became a vindicated belief. Temple, because he impeded this vindication, has been unfairly and ahistorically treated.

Twayne Publishers, Inc., 1972), p. 20.

[19]Leslie Stephen and Sidney Lee, eds., The Dictionary of National Biography, 22 vols. (Oxford: The University Press, 1921), III, 408-410. The reason for calling Burnet a radical whig is because "he took part in the resistance offered to James II's attempt to make a Roman Catholic, Andrew Popham, Pensioner of the charterhouse of which Burnet became master" (p. 408).

Macaulay characterized Temple's treatise as "ludicrous and contemptible to the last degree".[20] Bury considered "the most useful result of the Essay" as being its ability to provoke Wotton's writing of "the most sensible and unprejudiced contribution to the whole debate".[21] R. F. Jones defined Temple as a reactionary, just as with other ancients "who still sought their knowledge in the lore of the past".[22]

Even writers "sympathetic" to Temple can be found making such statements as: "Temple was an individual, who must be seen not exclusively as 'a man of the world', nor even as a 'man of letters', but rather as an inquiring, impressionable, not very profound mind . . .".[23] Monk writes: "Temple has been stigmatized as intellectually obliquitous, and he was certainly both ignorant of and prejudiced against the modern scientific movement".[24]

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[20]Thomas Macaulay, "Sir William Temple", in Lady Trevelyan, ed., Miscellaneous Works, 2 vols. (New York: Collins' Clear Type Press), II, 549.

[21]Bury, op. cit., pp. 120-121.

[22]Jones, Ancients and Moderns, op. cit., p. 270.

[23]C. Marburg, Sir William Temple: Seventeenth Century Libertine (New Haven: Yale University Press, 1932), p. xviii.

[24]Samuel Hold Monk, ed., Five Miscellaneous Essays of Sir William Temple, op. cit., p. xvi.

But the question is whether Temple is adequately understood by seeing him as a reactionary, shallow, ludicrous, or ignorant. It is this question which we shall presently examine.

Temple's purpose in writing his Essay may have been an attempt to evaluate the informing principles or the results of both ancient and modern learning; "The whole cause, between the pretensions of ancient and modern learning, will be best decided by the comparison of the persons and the things that have been produced under the institutions and discipline of the one, or the other".[25]

Before defining the results, however, Temple describes the informing principles. These are of two kinds: one, the belief that knowledge need only serve man; two, the principle that knowledge must be concerned with morality. To Temple, the former applies to the moderns, whereas the latter defines the ancients' position. The knowledge which serves man is a knowledge which, for Temple, separates knowledge from morality. For instance, "Loadstone and gun-powder" have resulted from knowledge, but they have no claim to morality; "both these have not served for any common or necessary use to mankind: one having been employed for their destruction, not their preservation; and the other,

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[25]Temple, Ancient and Modern Learning, p. 92.

only to feed their avarice, or to increase their luxury . . .".[26] These two "inventions" are representative of a general malaise in which learning has become a means for the gratification of self-interest:

> The humour of avarice and greediness or wealth have been ever, and in all countries where silver and gold have been in price and of current use. . . . May they not have turned more to this pursuit of insatiable gains, since the discoveries and plantations of the West Indies, and those vast treasures that have flowed into these Western parts of Europe almost every year, and with such mighty tides for so long a course of time? Where few are rich, few care for it; where many are so, many desire it; and most in time begin to think it necessary. Where this opinion grows generally in a country, the temples of honour are soon pulled down, and all man's sacrifices are made to those of fortune, the soldier as well as the merchant, the scholar as well as the ploughman, the divine and the statesman, as well as the lawyer and physician.27

Those who "sacrifice" only to fortune eventually pull down the temples of "honour", or morality. The moderns' knowledge which seeks to dominate nature, exploit her, and profit from her, are actually establishing the means for this kind of destruction. To know nature only to exploit her is for Temple a type of learning which, in essence, ridicules "all that is serious and good, all honour and virtue, as well as learning and piety . . . , 'tis the itch of our age and climate, and has overrun both the court

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[26] Ibid., p. 95.

[27] Ibid., p. 68.

and the stage; enters a House of Lords and Commons as boldly as a coffee house, debates of Council as well as private conversation . . .".[28]

Temple believes that the source of the moderns' knowledge is man's pride, the belief that all exists for him alone. This he calls "sufficiency, the worst composition out of the pride and ignorance of mankind".[29] By an excessive reliance on reason, moderns believe they have determined an absolute criteria concerning what is "true learning". But, adds Temple, this leads to the moderns' self-centred belief that "when he has looked about him as far as he can, he concludes there is no more to be seen; when he is at the end of his line, he is at the bottom of the ocean; when he has shot his best, he is sure, none ever did nor ever can shoot better or beyond it".[30] This kind of belief in man's absolute power leads "to presumption, and vain ostentation of the little we have learned, and makes us think we do, or shall know, not only natural, but even what we call supernatural things . . .".[31]

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[28] Ibid., p. 70.

[29] Ibid., p. 38.

[30] Ibid., p. 62.

[31] Ibid., p. 96.

Opposed to the hubris of the moderns is the example of the ancients, the most venerated of whom is Pythagoras. The reason why Temple calls Pythagoras one of "the two founders of Grecian Philosophy",[32] "the father of philosophers";[33] "so great a man",[34] possessor of the "greatest treasures",[35] is simply because, unlike some seventeenth century natural philosophers, Pythagoras never separated natural philosophy from moral philosophy:

> Pythagoras was the father of philosophers, and of the virtues, having in modesty chosen the name of a lover of wisdom, rather than of wise; and having first introduced the names of the four cardinal virtues, and given them the place and rank they have held ever since in the world.[36]

"Pythagoras learned the first principles, both of his natural and moral philosophy"[37] from the Chinese who had, under Confucious, reclaimed "men from the useless and endless speculations of nature, to those of morality".[38]

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[32] Ibid., p. 41.

[33] Ibid.

[34] Ibid., p. 76.

[35] Ibid., p. 42.

[36] Ibid., p. 41.

[37] Ibid., p. 47.

[38] Ibid., p. 46.

Pythagoras then "brought not only astronomy and mathematics, but natural and moral philosophy first among the Grecians . . .".[39]

The ancients, following after Pythagoras, saw knowledge as leading them to a sense and acknowledgment of their own ignorance, the imbecility of human understanding, the incomprehension even of things about us, as well as those above us; so as the most sublime wits among the ancients ended in their 'Ακαταληψία'. In other words, ancient knowledge only went so far as to admit that the world cannot be conquered or dominated because it is simply incomprehensible.[41] Temple attempted to communicate this sentiment to the moderns:

> We cannot comprehend the growth of a kernel or seed, the frame of an ant or bee; we are amazed at the wisdom of the one and industry of the other; and yet we will know the substance, the figure, the courses, the influences of all those glorious celestial bodies, and the end of which they were made: we pretend to give a clear account how thunder and lightning . . . is produced; and we cannot comprehend how the voice of man is framed, that poor little noise we make every time we speak.42

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[39] Ibid., p. 78.

[40] Ibid., p. 96.

[41] H. G. Liddell, R. S. Scott, and H. J. Jones, Greek English Lexicon (9th ed.; Oxford: The Clarendon Press, 1940), p. 48.

[42] Temple, op. cit., p. 61.

When the world is seen as incomprehensible it necessarily produces awe and respect in man. But it also requires sacrifice because men must live in harmony with this incomprehensibility: the world cannot be forced. Indeed, it forces; "forces" in the sense of requiring the four cardinal virtues, requiring the absence of "pulling down the temples of honour". Conversely, when the world is seen as conquerable, it becomes a commodity for man's private use. Temple defines the effect these respective views have on man; namely "sublimity and sacrifice"[43] as opposed to "presumption and ridicule".[44] More importantly, he indicates the political ramifications.

A king, receptive to modern learning and its belief in domination, will lead his country into violence:

> But suppose those idle kings, besides the entertainments of luxury and pleasure, should have spent their time . . . in such speculations as the royal society entertain themselves and the world with; or in conversing with their Magi, or other learned men: I hope it cannot be denied but princes might pass their lives in such entertainments, without bloody and violent actions that make the subject of common history.45

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[43] Ibid., pp. 92-93.

[44] Ibid., pp. 96 and 70.

[45] Ibid., pp. 82-83.

Ancient princes, "formed under the doctrine and discipline of the ancient sciences", manifest "the noble and transcendent virtues and heroic qualities". In short, seventeenth century natural philosophy and its theory of domination leads to war, the morality of ancient philosophy determines "eminent virtues" such as "their justice, their prudence, their temperance, their magnanimity, their clemency, their love to their country, and the sacrifice they made of their lives, or, at least, of their ease and quiet, to the service thereof . . .".[46]

To Temple these moral qualities are the only human traits which have the mark of real truth because, like proverbs, they have received "their chief value from the stamp and esteem of ages through which they have passed".[47] Morality also endures despite "a perpetual course or succession, either of civil or of foreign wars" because their eternal value places them beyond "the reach of all noises and disturbances".[48]

Modern learning, on the other hand, creates these very "disturbances" from the king on down to the merchant.

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[46] Ibid., p. 93.

[47] Ibid., p. 38.

[48] Ibid., p. 67.

Moderns are taken by pride, by reasoning, and by a desire to dominate. Nature is transformed into a man-oriented entity, not a God-oriented one. Moderns see in nature wealth in a material sense, not in a spiritual sense. By self-glorification they, in turn, diminish God's glory. By seeking power over nature they omit to consider that real power only rests in God. In the midst of this consuming hubris, man falls from the morality of the ancients and of the Church Fathers:[49] hedonism[50] replaces sacrifice. Moderns see in nature only a means and man as the end, whereas man and nature are but two equal creations of God; creations which must be balanced, not dominated one against the other, in order that both endure. Temple indicates that the ancients recognized this responsibility to nature:

> Pliny the elder, and the most learned of all the Romans whose writings are left, concludes the uncertainty and weakness of human knowledge, with "constat igitur inter tanta incerta nihil esse cert: praeterquam hominem, nec miserius quicquam nec superbius".

Temple concentrates on Pliny's dictum that man need not be miserable or haughty, need not be vanquished or the conquerer. This is why he adds, as a gloss, that the moderns

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[49] Ibid., p. 76.

[50] For a clarification of the intended meaning of this word please see: Lewis S. Feuer, The Scientific Intellectual: The Psychological and Sociological Origins of Modern Science (New York: Basic Books, Inc., 1963), especially pp. 16-19.

"have forgotten the humility and charity are the virtues which run through the scope of the Gospel". Temple is warning moderns that they must live humbly within nature, and must be charitable towards it, not dominate it through "pride and ignorance". Finally, this is why he tells us that Solomon, through divine inspiration, that is, by God's command directly, wrote:

> The thing that has been, is that which shall be, and there is no new thing under the sun. Is there any thing whereof it may be said, See, this is new? It has been already of old time which was before us: There is no remembrance of former things, neither shall there be any remembrance of things that are to come with those that shall come after.51

Temple sees this statement as capable of "mortifying"[52] the moderns since their theory of domination is clearly contrary to the commands and wisdom of God who wishes man to live with humility and charity amid creation.

To Temple, the moderns' theory of progress is an error since it is predicated not on God, but only upon man: not on morality, only "sufficiency". A knowledge which serves only man can but lead, in Temple's mind, to a return

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[51] Temple, op. cit., pp. 96-97.

[52] Ibid., p. 97.

to the barbarity which existed before the advent of Pythagoras' moral philosophy; a barbarity produced by the governance "by nothing but will and passion, violence and cruelty".[53] Natural philosophy, although reasonable, cannot be accepted as a suitable defense against man's pride simply because modern science, with its emphasis on reason, believes itself capable of penetrating into nature's secrets. Reason, to Temple, must always be tempered by sense,[54] that is, by substance.[55] For Temple, this substance must be morality, not material assets.

To view Temple's thoughts as reactionary is too condemnatory, perhaps even a refusal to admit that Temple realized there existed a very thin line between a man-oriented universe and materialism. Similarly, the charge that Temple is ignorant of the science he criticizes is equally unfair. Descartes or Hobbes have not "eclipsed the lustre of . . . the ancients".[56] The Copernican system

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[53] Ibid., p. 78

[54] Ibid., p. 57.

[55] C. T. Onions, ed., The Shorter Oxford English Dictionary on Historical Principles (3rd ed.; Oxford: The Clarendon Press, 1944), pp. 1939 and 1941.

[56] Temple, op. cit., p. 56. Cf. the treatment of

is "derived from old foundations".[57] We still do not possess a suitable frame of reference to determine what Temple indicates as the problem inherent in Copernicus' system; "The motion of the sun is plain and evident to some astronomers, and of the earth; yet we none of us know which of them moves, and meet with many seeming impossibilities in both, and beyond the fathom of human reason or comprehension".[58] The loadstone and gunpowder, as products of experimental science, did engender adversities for both aborigines and imperialists alike. Indeed, Temple was satirizing modern science, not misrepresenting it because of ignorance:

> What has been produced for the use, benefit, or pleasure of mankind, by all the airy speculations of those who have passed for the great advancers of knowledge and learning these last fifty years. . . . I confess I have indeed heard of wondrous pretensions and visions of men, possessed with notions of the strange advancement of learning and sciences on foot in this age, and the progress they are like to make in the next: as . . . the admirable virtues of that noble and necessary juice called spittle, which will come

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these same subjects in: Thomas S. Kuhn, The Copernican Revolution: Planetary Astronomy in the Development of Western Thought (Cambridge: Harvard University Press, 1957), pp. 41-42, 114-116, 141, 143, 148 and 233-237.

[57] Temple, op. cit., p. 56.

[58] Ibid., p. 61.

> to be sold, and very cheap, in the apothecaries' shops; discoveries of new worlds in the planets, and voyages between this and that in the moon to be made as frequently as between York and London. . . .59

The point Temple was trying to impress upon the moderns is this satire was their separation of knowledge from morality. This is why, in the Review, Temple followed his "short survey" with no survey at all. The technique was rhetorical, in that the moral concerns of all nations throughout history adequately portrayed the hiatus of modern learning from the "idle king" to the modern "critics, who can at best pretend but to value themselves by discovering the defaults of other men, rather than any worth or merit of their own: a sort of levellers that will needs equal the best or richest of the country, not by improving their own estates, but reducing those of their neighbours . . .".[60]

The thoroughness of the moderns' response to Temple is evidence of how thoroughly Temple had attacked. If Temple had been patently wrong, his accusations would have required little reaction; as it was, however, they had struck deep into the moderns' camp, and Temple created a

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[59] Ibid., pp. 95-96.

[60] Ibid., p. 89.

lot of reaction. For instance, Bentley attacked in such a way that the question was not the superiority of the ancients, as cited by Temple; rather the question became "who exactly are the most ancient?". As R. J. White states: "by showing that our texts of the Epistles of Phalaris of Aesops Fables, and many other ancient authors -- including Socrates and Euripides -- were very far from being the most ancient works of European literature, pure and undefiled [Bentley] knocked a very large hole in the bottom of Sir William's Ark of the Covenant of ancient pre-eminence".[61] But, we might ask, did Bentley neutralize Temple?

Temple saw Bentley's attack as "falling Foul upon Pythagoras",[62] but considered his adversary as merely prejudiced concerning the responsibility which learning owes to morality. Bentley will admit that Pythagoras was a lawgiver, but not a philosopher. Temple viewed this refusal as pure bias considering how Pythagoras, "by all learned nations and persons, even Christians as well as Pagans [has] been esteemed the prince of philosophers, and to have excelled in all natural and moral knowledge . . .".[63]

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[61] R. J. White, Dr. Bentley: A Study in Academic Scarlet (Michigan: State University Press, 1968), pp. 99-100.

[62] Temple, op. cit., p. 76.

[63] Ibid.

William Wotton attacked Temple with the support of the entire Royal Society. In fact, Royal Fellows were actually writing chapters for Wotton. For instance, Wotton was not only given a free hand with the Philosophical Transactions for whatever purposes he could turn them to, but John Craige supplied eight pages on geometry, and Edmund Hally the chapter on astronomy and optics.[64]

Wotton's technique was twofold: one, a personal attack on Temple by implying he was a "Libertine"[65] and therefore his thought was anti-Christian: two, an argument that because the moderns have greater sophistication in the various fields of learning, they necessarily are superior. One such example of Wotton's method should suffice:

> For, tho Diophantus has given us the Solution of a great many hard and knotty Arithmetical Problems, yet the last Step of his Desolution serves only for one particular Example of each problem So that for every new example of the same Question, there must be a new Process made of the whole Analysis Whereas by our Modern Algebra, the Analysis of any one Case given a general Cannon for all the infinite Cases of each Problem; whereby we discover many curious Theorems about the Properties of Numbers, not to be attained by Olophantus's Method.66

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[64]Jones, Studies, op. cit., p. 30f.

[65]William Wotton, Reflections Upon Ancient and Modern Learning (London: J. Leake, 1694), Preface.

[66]Ibid., pp. 165-166.

Wotton has obviously ignored the debt which moderns should recognize for the initial first principles which allow for their added sophistication. Wotton also ascribes superiority to the moderns in such things as divinity.[67] But as Temple stated in his Review; "for divinity, wherein they give the moderns such a preference above the ancients, they might as well have made them excel in the knowledge of our common law, or of the English tongue . . .".[68]

As has been stated, Temple had an extensive effect upon the moderns. Perrault, after the publication of Temple's Essay, modified some of his claims for the superiority of the moderns, particularly with regard to poetry, painting and architecture.[69] The moderns considered this a small concession though: even Wotton concurred with it.[70] It was argued that these fields were but subjective; questions of mere fashion. Temple, however, recognized in ancient poetry, art, and architecture, the strivings of the human soul under the moral ideals of ancient philosophy. To Temple, they are the products of

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[67] Ibid., pp. 322-341.

[68] Temple, op. cit., p. 89.

[69] Bury, op. cit., pp. 121-122 also, Jones, Studies, op. cit., pp. 31-32.

[70] Wotton, op. cit., pp. 61-77.

true genius, not reason, divine inspiration, not pride.[71] As for the argument that they are products of fashion, Temple replies: "They [the moderns] might as well say the excellence of picture comes from the beauty of the colours; and of statuary from the fineness of the marble; whereas a common hand, with the finest colours in the world, can paint nothing better than a sign post . . .".[72] According to Temple, he had even driven Burnet to qualify his opinion on the ancients when, in Achagologiae, Burnet showed "both his great knowledge and esteem of the ancient learning, and proved thereby, that whoever knows it must esteem it . . .".[73] But Temple's greatest effect was upon the Boyle lectures.

Temple had accused natural philosophy of being man-oriented and morally deficient. It was a charge that had to be neutralized for the sake of the Royal Society's credibility. Thus, the moderns "assembled" to combat the charge. Temple's Essay was published in 1691, according to Courtenay's scholarship.[74] The moderns, in little more than one year, had devised a defense: The Boyle Lectures.

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[71]Temple. op. cit., pp. 96-97.

[72]Ibid., p. 86.

[73]Ibid., p. 75.

[74]Courtenay, op. cit., II, 152.

Bentley, Temple's adversary, was to deliver these lectures. In an attempt to disprove Temple's criticism, Bentley was to begin corresponding with Newton "at the close of 1692, and during the first two months of 1693".[75] Boyle's will may never have been so professionally executed had it not been for the aggressive defense by which the moderns responded to Temple.

The lectures were to prove the compatibility between natural philosophy and divinity; the findings of science and Christianity.[76] Bentley rejected the idea that the moderns were materialists. He attempted to show how science was an undertaking not divorced from revealed religion, not consumed by a desire for man's dominance over creation:

> In the first six lectures Bentley exposed the folly of atheism even in reference to the present life, and derived powerful arguments for the existence of a Deity from the faculties of the soul, and the structure and functions of the human frame. In order to complete his plan, he proposed to devote his seventh and eighth lectures to the demonstration of a Divine Providence from the physical constitution of the universe as established in the Principia.77

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[75]Brewster, op. cit., II, 124.

[76]Wotton stated in the Preface of his Reflections regarding Bentleys achievement: "Mr. Bentley, has, in his late Discourses Against Atheism, shewn that admirable Use may be made of an accurate Search into Nature, thereby to lead us directly up to its Author . . .".

[77]Brewster, op. cit.

But Bentley was actually failing in his attempt since, in his eighth lecture, he not only copied Burnet's closing chapter in the Sacred Theory (published 1689), but also Burnet's definition of God as "an eternal usefulness of things, an eternal good sense". The moderns had come full circle. Thus, Temple's criticism had not been neutralized, it had only been publicly patronized.

Bentley had also sought to bring Newton into the battle against Temple. As for Newton, however, he realized that Temple's sentiments were far from "ludicrous". When Bentley asked Newton[78] to describe gravity as an immaterial cause, that is, coming from God as opposed to Burnetian "mechanical or geometrical principles", or Descartes' vortexes, Newton was typically cautious. Temple's accusation that natural philosophy was materialistic was a subject Newton was particularly sensitive about: "Gravity must be caused by an agent acting constantly according to certain laws, but whether this agent be material or immaterial I have left to the consideration of my readers".[79] In other words, Newton recognized how natural philosophy could be

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[78]See Newton's four letters to Bentley in H. S. Thayer, ed., Newton's Philosophy of Nature: Selections from His Writings, Hafner Library of Classics (New York: Hafner Press, 1953), pp. 46-58.

[79]Ibid., p. 54.

seen as separate from spiritual or moral concerns. To Newton, the issue could only be resolved in a subjective sense. Temple's criticism, although patronized, was far from neutralized.

The conception of God in the modern's camp ranged from Burnet's "general" and "regular administrator", to Wotton's God of "learning and industry".[80] Swift shared with Temple the belief that science was not to supercede, or be alienated from, divinity. Against Wotton's spurious charge that the author of The Tale of the Tub had written "so crude a banter upon all that is esteemed as sacred",[81] Swift replied as to the actual author's purpose:

> He designed at last to show the Purity of the Christian Church in the primitive Times, and consequently how weakly Mr. Wotton pass'd his Judgment, and how partially in preferring the Modern Divinity before the Ancient. . . .[82]

Swift agreeing with Temple, and writing between 1696-1697[83] identifies true "divinity" with the "purity" of

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[80]"Observations Upon The Tale of a Tub", in A. C. Guthkelch and D. Nichol Smith, eds., A Tale of a Tub (2nd ed.; Oxford: The Clarendon Press, 1958), p. 317.

[81]Ibid., p. 316.

[82]A Complete Key to the Tale of a Tub, op. cit., p. 332.

[83]Ibid., pp. xliii-xlvii.

"primitive times", or ancient times, whereas the moderns' God, Swift adds, is a "new religion", born from "Madness"[84] or pride:

> In that building of yours, there might, for ought I know, have been Labour and Method enough, but by woeful Experience for us both, 'tis too plain, the materials are nought, and I hope, you will henceforth take Warning, and consider Duration and matter, as well as method and Art. You boast, indeed, of being obliged to no other Creature, but of drawing, and spinning out all from your self . . . by a lazy Contemplation of four Inches round; by an over-weening Pride which feeding and engendering on itself, turns all into Exrement and Venon; producing nothing at last, but Flybane and a Cobweb. . . .85

Swift has here recognized the same separation which Temple perceived in the moderns; the separation of man from everything except hubris. This kind of knowledge is rhetorically juxtaposed to the results from the learning based upon the ancients' "Rock"[86] of

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[84] Ibid., p. 169.

[85] Ibid., p. 232.

[86] Ibid., p. 220. Swift has the ancients replying to one of the moderns' threats: "That, as to levelling or digging down, it was either Folly or ignorance to propose it, if they did, or did not know, how that side of the Hill was an entire Rock, which would break their Tools and Hearts, without any Damage to itself". The use of the word "Rock" may strike the reader as a Biblical reference, especially to Matthew 16: "And I say this to you: You are Peter, the Rock; and on this rock I will build my church . . .". If this interpretation of Swift's use of language can be accepted, then we have another instance of Christian truth being identified with ancient morality.

St. Peter;[87] namely, "Honey and Wax".

But Temple's criticism, although not effectively countered, did not have to be countered. Radical Whigs or moderns such as Burnet considered natural philosophy its own justification and reward. Perhaps they felt that the theory of domination would make up in material surplus what it lacked in morality.[88] The moderns may even have conceived their learning as spiritually beneficial in potentia because of the existence of material wealth. The ancients, however, understanding the inevitability of materialism stemming from a man-oriented universe, attempted to establish moral truths as the binding force in society. This is why Temple rhetorically compares ancient and modern politics, thereby showing virtue compared to self-interest: why he compares Socrates' humility with moderns' pretension: why he advocates a philosophy of harmony with nature based on God's moral commands rather than a theory of dominance.[89]

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[87] The New English Bible (Oxford and Cambridge: University Press, 1970), The Gospel According to Matthew, p. 24.

[88] If I am understanding Feuer's, The Scientific Intellectual, correctly, this seems to be the point behind his apologetic study of the seventeenth century scientific revolution.

[89] For a more detailed treatment of this theme see the conclusion pp. 149 - 51.

An individual such as Wren, employing Neo-classical architectural principles; principles which were informed by ancient philosophical ideas, may have been sympathetic to Temple's criticism, receptive to Temple's message that knowledge must be moral. Since Wren was both an architect and a natural philosopher, he may have recognized how the moral purpose of building a church was not entirely distinct from the "mechanical" learning necessary for such building. If Wren was reconciling both he was certainly conforming to the basic principle of Pythagoras' teaching: the joining of moral truth to learning.

The Protestant churches which Wren designed were to exemplify, where possible, universal law because of their Pythagorean ratios. For Pythagoras, as Temple has stated, universal laws were spiritual laws: correspondences between the divine and man. Newton and Wren conceived of universal law in this sense, not as Bacon or Burnet did with their purely "mechanical" universals. Universal law, for the moderns, provided the means to man's direct control over creation; the ancients employed universal law in order to relate man to his creator and creation. When Wren attempted to use Pythagorean number theory in the architecture he may have been trying to achieve this spiritual or moral end. Perhaps this is why Evelyn and Wren vehemently

desired a cupola for St. Pauls as early as 1666.[90] Of the significance of the "cupola" Evelyn writes: "is that dome or hemispherical concave made in resemblance of the heavens".[91] The similarity of the dome to the heavens is made possible only by universal law. Evelyn did not write "suggests"; rather, he spelled out "resemblances", that is, "to have some feature or property in common".[92] The obvious spiritual significance of this "resemblance", for Wren and Evelyn at least, Protestants, defines it morality.

We can see that Wren's support of universal law was not a support derived from his desire to dominate in the Baconian or Burnetian sense. This was not the case for Newton, it does not seem to have been the case for Wren either. We have Newton's own words for his position.[93]

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[90]E. S. de Beer, ed., The Diary of John Evelyn, 6 vols. (Oxford: Clarendon Press, 1955), III, 110.

[91]William Upcott, ed., An Account of Architects and Architecture in the Miscellaneous Writings of John Evelyn (London: Henry Colburn, 1825), p. 416.

[92]Oxford English Dictionary on Historical Principles.

[93]Letters to Bentley, Ed. Thayer, op. cit. Admittedly, Newton's position can be seen from both points of view. For instance, he states: "all these things together, in so great a variety of bodies, argues that cause to be . . . very well skilled in mechanics and geometry" (p. 49). However, in another place Newton says of God: "We must love him, fear him, hallow his name, obey his commandments . . ." (p. 66). Significantly absent from these quotations is the Burnetian

For Wren we have, besides the above quotation from Evelyn, an experiment with bee hives, a curious coincidence between Temple's list of ancient fabricks and a list drawn up by Wren, and finally, an anecdote from Aubrey.

In 1654 Evelyn had the opportunity to observe that Wren was working with "apiaries which he had built like castles and palaces, and so ordered them one upon another, as to take the honey without destroying the bees". This experiment in natural philosophy seems to show how Wren respected, rather than dominated, nature. For instance, not only was the existence of the bees a matter of concern, but Wren went to far as to adorn his hives "with a variety of dials, little statues, vances, etc."[94]. This adornment, this making the hives into "palaces", may have been intended to represent the bee hives as a model community which could be emulated by man. The adornment in a particularly human fashion suggests this connection. Presumably, Temple would have considered this moral study of "God's handiwork"[95]

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request to dominate.

[94]de Beer, The Diary of John Evelyn, op. cit., III, 10.

[95]The idea of "God's handiwork" in the seventeenth century is a question really necessitating an essay in and of itself. However, if Protestants wanted to believe that God existed even in the depths of the earth among the species which might dwell in the deepest realms of the sub-lunary sphere, then ants and other tiny forms of life, previously considered but vegetative, must now be viewed as examples

as indeed "seeing what more there is to see".

Temple lists several "traces" of that admirable science or skill in architecture, by which such stupendous fabrics have been raised of old".[96] There are the walls and palace of Babylon, the pyramids of Aegypt, the tomb of Mausolus, the temples and palaces of Greece and Rome, and the obelisks of Aegypt.[97] Perhaps not insignificantly, Wren, in his Tracts and Discourse[98] written "after his retirement in 1718",[99] mentions each of these same edifices and similarly describes most of them as "stupendous".[100] Perhaps this mutuality is but the accidental production of mere coincidence of interest and use of conventional language.

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of God's omnipresence: "How manifold are Thy Works. In Wisdom hast Thou made them all". The method resulting from this motive is evident in Bentley's lectures on The Structure and Origin of Humans Bodies. See Eight Boyle Lectures on Atheism 1692 (reprinted New York: Garland Publishing, 1976).

[96] Temple. op. cit., p. 58.

[97] Ibid., pp. 58 and 79.

[98] Wren Society, op. cit., XIX, 126-145.

[99] Ibid., p. 123.

[100] Ibid., p. 143. Cf. "magnificent", pp. 134 and 135.

However, the fact that Wren studied, at length, one obelisk: Porsenna's tomb, because he says, "it was built in the Age of Pythagoras",[101] forces one to consider the possibility that Wren may have agreed with Temple in both the superiority of ancient architecture and the superiority of the philosophy which informed such architecture, that is, Pythagoreanism.

Finally, in Aubrey, we read about the fate concerning one of Wren's inventions:

> It ought never to be forgott, what our ingenious Country-Man, Sir Christopher Wrenn proposed to the Silke-Stocking-Weavers of London, viz. a way to weave seven pair or nine paire of stockings at once. . . . He demanded four hundred pounds for his Invention: but the weavers refused it, because they were poor: and besides, they sayd, it wouod spoile their trade . . . Sir Christopher was so noble, seeing they would not adventure so much money, He breakes the Modell of the engine all to pieces, before their faces.102

In a period where the guild systems were deteriorating[103] this "noble" response is antithetical to Bacon's dictum: "Human knowledge and human power meet in one".

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[101] Ibid., p. 145.

[102] Oliver Lawson Dick, ed., Aubrey's Brief Lives (London: Secker and Warburg, 1958), p. 191.

[103] Peter Laslett, The World We Have Lost (2nd ed.; London: Methuen and Company Ltd., 1971), pp. 1-23.

This anecdote indicates Wren's position in the battle of moderns against ancients.

Conclusion

From this discussion of the "Battle of the Books" we can see not only the importance of Pythagoras to the seventeenth century as the thinker who denied a dualistic universe, but also the moral concerns which were attributed to Pythagoreanism. Wren's position in the ancient-modern controversy is with the former. The natural philosopher who turned from experimental philosophy to architecture, perhaps believing that a belief in universal law, in a moral sense, could best be achieved in an artistic vocation, seems to allow placing him with the ancients. Neither could Wren's behaviour concerning the "spinning jenny" be expected from a modern.

CONCLUSION

Wren's Pythagoreanism can be seen as an outgrowth from an existing tradition, conditioned by his Protestant belief in God's universalism, demonstrably embodied in his architecture, and as a constructive reaction to an emerging scientific materialism. However, despite any case made for Wren being a Pythagorean, the modern reader must accept the consequences of the vast gulf which exists between today's standards of judgment and even those standards from as recent a time as the seventeenth century. The attack launched during the eighteenth century on the philosophical foundations of objective beauty[1] has separated us from a ready understanding of what Keats attempted to describe in the last line of his Ode on a Grecian Urn. Wren's similar conception of Truth as Beauty and vice versa is all the more difficult to accept if we think of science or scientists as detached. Wren's interest in science suggests how he viewed it as a type of investigation into nature in no way dissimilar from, say, religion. It was because

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[1]See Rudolf Wittkower, Architectural Principles in the Age of Humanism (4th ed.; London: Academy Editions, 1973), pp. 142-154. P. H. Scholfield, The Theory of Proportion in Architecture (Cambridge: The University Press, 1958), pp. 72-81.

science was moving into materialism that Wren withdrew from it, and not, significantly, because it was this quality that originally drew him towards science. A telescope to Wren was a means of "stretching"[2] out the visionary eyes of Scipio so as to demonstrate how "the heavens turn in harmonic gyrations".[3] Wren turned from science as it became contrary to how he had originally conceived of its purpose; the purpose being to bridge the gap between transcendental beliefs and physical facts, that is, between the "lines" or "circles" of planets and "the Finest, Greatest of the Geometers, God Almighty".

To fully understand Wren's Pythagoreanism, then, we must accept the influence of an objective theory of beauty, that is, how certain mathematical constructions for Wren, as for many others before him, appeared as Truth through an ancient tradition legitimized by a special set of shared symbols and beliefs. Moreover, we must also accept how science generally, and to Wren particularly, was intended to supply an additional means in an attempt

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[2]Wren's Inaugural Lecture to Gresham College in 1665, in Stephen Wren, Parentalia: Memoirs of the Family of the Wrens (reprinted; Farnborough, Hants: Gregg Press, 1965), p. 205.

[3]Ibid., pp. 200-201.

to know and communicate a consummate order. In other words, Pythagorean number philosophy, with its natural knowledge leading only to a means of perceiving divinity, was employed by Wren. Wren knew science had taken a wrong turn when it placed spiritual considerations in a secondary status, elevating, as occurred with Burnet's "mechanical principles", man's domination. A great amount of work yet to be done before we too can respond as constructively as did Wren to the same insight: namely, the need to bridge natural and moral spheres of knowledge.

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