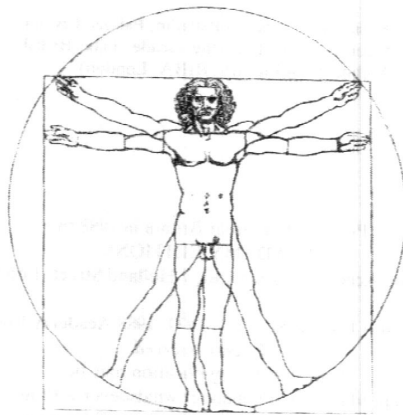


RUDOLF WITTKOWER
ARCHITECTURAL PRINCIPLES
IN THE AGE OF HUMANISM



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This edition includes a selection from hitherto unpublished lectures and essays on proportion by Professor Wittkower which have been kindly given to us by his widow. Sections from each manuscript have been combined and edited into one integrated essay entitled *Proportion in Art and Architecture* which is reproduced as Appendix IV.

Front cover: Andrea Palladio, project for the façade of a palace. (The British Architectural Library, RIBA, London)

Frontispiece: Andrea Palladio, Palazzo Civena, Vicenza, project for the façade. (The British Architectural Library, RIBA, London)

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CONTENTS

PART I	THE CENTRALLY PLANNED CHURCH AND THE RENAISSANCE	
	1. Alberti's Programme of the Ideal Church	16
	2. Centralized Churches in Later Architectural Theory	22
	3. Building Practice: S. Maria delle Carceri	29
	4. Bramante and Palladio	31
	5. The Religious Symbolism of Centrally Planned Churches	38
PART II	ALBERTI'S APPROACH TO ANTIQUITY IN ARCHITECTURE	
	1. The Column in Alberti's Theory and Practice	41
	2. S. Francesco at Rimini	43
	3. S. Maria Novella	47
	4. S. Sebastiano and S. Andrea at Mantua	51
	5. The Change in Alberti's Interpretation of Classical Architecture	59
PART III	PRINCIPLES OF PALLADIO'S ARCHITECTURE	
	1. The Architect as 'uomo universale': Palladio, Trissino and Barbaro	60
	2. Palladio's Geometry: The Villas	67
	3. Palladio and Classical Architecture: Palaces and Public Buildings	75
	4. The Genesis of an Idea: Palladio's Church Façades	89
	5. Palladio's Optical and Psychological Concepts: Il Redentore	97
PART IV	THE PROBLEM OF HARMONIC PROPORTION IN ARCHITECTURE	
	1. Francesco Giorgi's Platonic Programme for S. Francesco della Vigna	104
	2. The Mean Proportionals and Architecture	107
	3. Alberti's 'Generation' of Ratios	111
	4. Musical Consonances and the Visual Arts	113
	5. Palladio's 'fugal' System of Proportion	119
	6. Palladio's Ratios and the Development of Sixteenth-Century Musical Theory	123
	7. The Break-away from the Laws of Harmonic Proportion in Architecture	130
APPENDIX I	Francesco Giorgi's Memorandum for S. Francesco della Vigna	138
APPENDIX II	The Problem of the Commensurability of Ratios in the Renaissance	140
APPENDIX III	Bibliographical Notes on the Theory of Proportion	142
APPENDIX IV	Proportion in Art and Architecture: an amalgamation of previously unpublished lectures by Professor Wittkower	
	Part I: The Need for Order	145
	Part II: Origins of Western Proportional Systems	147
	Part III: Geometry and Mediaeval Proportions	150
	Part IV: Renaissance Proportions and Commensurability	152
	Part V: Post-Renaissance Proportioning – Dilemmas and Possibilities	154
INDEX	156

PREFACE

Despite its rather unwieldy character, this book, when it first appeared in 1949, was unexpectedly given a very friendly reception. To my surprise it caused more than a polite stir. Sir Kenneth Clark wrote in the ARCHITECTURAL REVIEW that the first result of this book was 'to dispose, once and for all, of the hedonist, or purely aesthetic, theory of Renaissance architecture', and this defined my intention in a nutshell. The book is concerned with purely historical studies of the period 1450 to 1580, but it was my most satisfying experience to have seen its impact on a young generation of architects.

The influence a book has upon its readers is to a certain extent intangible and impossible to measure precisely. Yet I may claim that within the twelve years since its appearance many of the basic tenets have been accepted, popularized, enlarged upon, transmuted, and also attacked (which is surely a fruitful way of activating and generating fresh thought). It would not serve much purpose to put this assertion fully to the present reader's test. May it suffice to indicate that such diverse publications as Walter Paatz's *Die Kunst der Renaissance in Italien* (Stuttgart, 1953), Ezra D. Ehrenkrantz's *The Modular Number Pattern: Flexibility through Standardisation* (London, 1956), and P.H. Scholfield's *The Theory of Proportion in Architecture* (Cambridge, 1958) have all taken their cue from *Architectural Principles*; that in a challenging article in the ARCHITECTURAL REVIEW of December 1955 Reyner Banham tried to assess the book's influence ('for evil as well as good') on post-war British architecture; and that Roberto Pane used the forum of the Eighteenth International Congress of the History of Art at Venice (*Venezia e l'Europa*, Venice, 1956) for a broadside against the ideas propounded by me.

It is not easy to predict when a book has run its course. My publishers believed that the time had come for a low-priced edition. The least I felt I should do to justify their optimism was to revise the book thoroughly. Many pages have been entirely rewritten, thoughts have been clarified, errors amended, and the results of new research have been incorporated. Hardly a page has survived untouched.

In a number of essays written during the last decade, I have myself continued to expand, and to comment on, the ideas in this book. The following papers are partly or wholly devoted to closely related themes: 'Systems of Proportion' in ARCHITECT'S YEARBOOK, v, 1953; 'Brunelleschi's "Proportion in Perspective"', in JOURNAL OF THE WARBURG AND COURTAULD INSTITUTES, xvi, 1953; 'Inigo Jones, Architect and Man of Letters', in JOURNAL OF THE ROYAL INSTITUTE OF

BRITISH ARCHITECTS, LX, 1953; 'The Arts in Western Europe', in THE NEW CAMBRIDGE MODERN HISTORY, Cambridge, 1957, Vol. I; 'S. Maria della Salute: Scenographic Architecture and the Venetian Baroque', in JOURNAL OF THE SOCIETY OF ARCHITECTURAL HISTORIANS, XVI, 1957; 'L'architettura del Rinascimento e la tradizione classica' in CASABELLA, No. 234, 1959; 'The Changing Concept of Proportion' in DAEDALUS, Winter 1960. In order to preserve the original character of *Architectural Principles* I had to resist the temptation of incorporating much of the material presented in these studies.

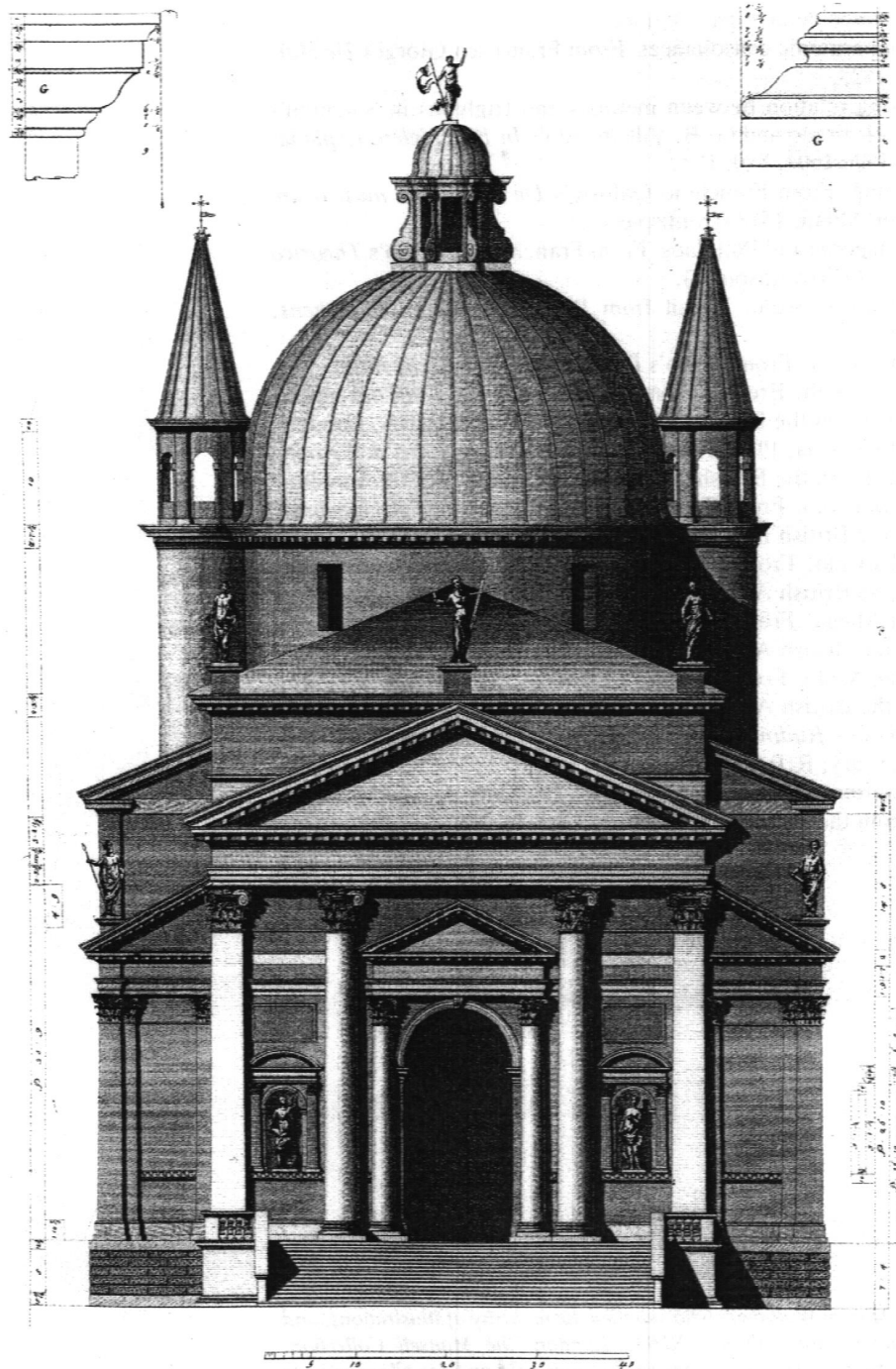
More than once have I been criticized for not having paid sufficient attention to the manner in which the Middle Ages approached the problem of proportion. But I set out to write a book on the Renaissance and this is clearly expressed in the title. I therefore think I was justified in referring to the mediaeval position only where my argument demanded it (and this happened on many occasions). For clarity's sake I have now added as 'Appendix II' some general remarks on proportion in the Middle Ages and the Renaissance.

It is always bad policy to state what a book does not contain. But I want to avoid any misunderstanding and, therefore, wish to emphasize that I am neither concerned with a history of Renaissance architecture nor with monographic treatments of Alberti and Palladio. I am discussing the works of these architects only in so far as they are relevant to my main topic, the illumination of architectural principles at the time of the Renaissance. The structure of the book is simple. Two chapters on (what constitute in my view) the central problems of Renaissance architecture – the meaning of church architecture and the proportional organization of buildings – frame the two chapters on Alberti and Palladio who were equally great as theorists and practitioners and mark the beginning and the end of the period under review.

Some readers may take exception to the many footnotes with long quotations in languages other than English. I have decided to preserve this material also in the present edition since it provides the historical documentation to my arguments. A translation of all these texts would have swelled the size of the book unduly. But the footnotes may be left unread without disadvantage to the main argument. Foreign language quotations in the text are followed by translations. This rule has been abandoned in a few cases where the meaning is obvious.

New York, December, 1960.

R. W.



Andrea Palladio, Il Redentore, Venice, 1576-92. From Bertotti Scamozzi



PART I

THE CENTRALLY PLANNED CHURCH AND THE RENAISSANCE

Renaissance architecture is nowadays usually interpreted in terms which stress its worldliness. At best it is argued that the classical apparatus of forms was used on an equal level for sacred, profane and domestic buildings; that the classical forms were adapted for different purposes without any gradation of meaning; and that consequently, Renaissance architecture is an architecture of pure form.¹ Often in discussions of Renaissance architecture this underlying assumption is silently taken for granted. If this customary interpretation of Renaissance architecture as a profane style is correct, then what would be the essential difference between the eclecticism of the fifteenth and sixteenth centuries and that of the nineteenth century? If both are derivative styles – in the sense that they derive from classical antiquity – is the difference between them only that nineteenth-century architecture, as far as it is classical and not Gothic, is twice removed from the ancient models? The true answer appears to lie elsewhere. In contrast to nineteenth-century classical architecture, Renaissance architecture, like every great style of the past, was based on a hierarchy of values culminating in the absolute values of sacred architecture. We maintain, in other words, that the forms of the Renaissance church have symbolical value or, at least, that they are charged with a particular meaning which the pure forms as such do not contain. Both the theory and the practice of Renaissance architects are unambiguous in this respect.

Builders of fifteenth-century churches in Italy gradually turn away from the traditional Latin-Cross plan consisting of the long nave, transept and choir. Instead, they advocate centrally planned churches, and these churches have always been regarded as the climax of Renaissance architecture. But in spite of the contrary evidence of the architects themselves, in the eyes of architectural historians such plans have become something like a touchstone of Renaissance paganism and worldliness.² Since centrally planned churches appear to be unsatisfactory from a liturgical point of view – how can one separate in such a church clergy and laity? where is one to place the altar, etc.? – it is usually held that the craving for beauty was here given preference over the necessities of the service.³ Thus the line art-historians have generally taken falls in with the attitude of those historians who emphasize the irreligious aspect of the Renaissance. Their interpretation derives from the simple – not to say naïve – formula that mediaeval transcendental religion was replaced by the autonomy of man in the Renaissance. A new discussion of the ideas underlying ecclesiastical

¹ The extreme statement of misrepresentation will be found in Ruskin's *Stones of Venice*, Vol. III, chap. iv, par. 35: 'Pagan in its origin, proud and unholy in its revival, paralysed in its old age . . . an architecture invented, as it seems, to make plagiarists of its architects, slaves of its workmen, and sybarites of its inhabitants; an architecture in which intellect is idle, invention impossible, but in which all luxury is gratified and all insolence fortified.' Geoffrey Scott in *The Architecture of Humanism*, London, 1924, attacks this view, but his results are equally disputable: 'The Renaissance style . . . is an architecture of taste, seeking no logic, consistency, or justification beyond that of giving pleasure' (p. 192).

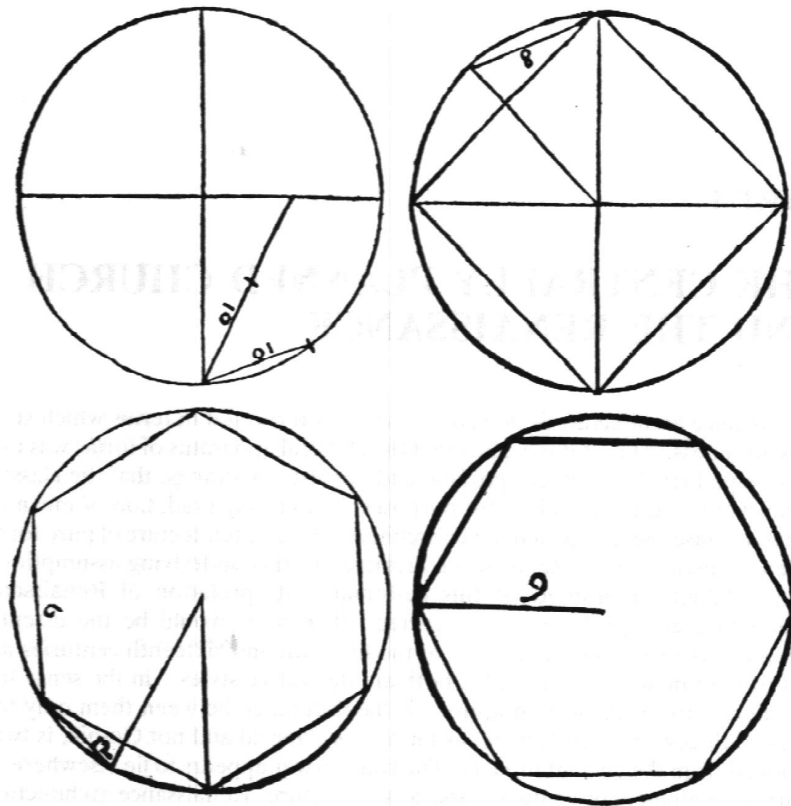
² P. Frankl, *Die Entwicklungsphasen der neueren Baukunst*, 1914, p. 148 ff., in his inspiring discussion of the relations between the liturgy and the Renaissance church, is still dependent on Burckhardt's conception of the Renaissance when he maintains that 'weit stärker als der christliche Zweck . . . ein heidnischer Geist die Form bestimmt . . .' (p. 151).

Burckhardt himself changed his ideas about the meaning of centrally built churches. In the *Cicerone* (9th ed., 1904, II, p. 131) he says that the old ritual nave type was abandoned 'als die Renaissance sich ihrem freien Schönheitssinn überliess.' And (p. 259): 'Wenn nur etwas Schönes und Bedeutendes zustande kam, das der Bestimmung im Ganzen entsprach, so fragte der Bauherr nach keiner Tradition.' Later, in the *Geschichte der Renaissance in Italien*, he modified this opinion in the chapters which contain what is still the most important summary of centralized church architecture in Italy. 'Im Süden ist das Grosse und Schöne von selber heilig', and further: 'die Renaissance hat den Zentralbau einer künftigen Religiosität zum Vermächtnis hinterlassen' (6th ed., 1920, p. 114).

³ D. Frey, *Bramantes St. Peter-Entwurf und seine Apokryphen*, Vienna, 1915, contains many shrewd observations on the general character of Renaissance architecture. But he seems to us to go wrong in his final conclusion: 'Diese Baukunst war ebenso wenig profan als religiös; wenn sie sich heidnisch-antik gebärdete, so war das kein Bekenntnis der

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM

1. Construction of square and polygons. From Bartoli's edition of Alberti's *De re aedificatoria*, 1550



Gesinnung, kein Programm; es war im Herzen recht gut christlich gedacht und empfunden. Was sie unreligiös erscheinen lässt, ist das Fehlen eines Zweckinhalts; sie sah ebenso wenig ihre Aufgabe in der künstlerischen Gestaltung der Kultbedürfnisse als der gesellschaftlich-sozialen Lebensforderungen, sie folgte abstrakten Schönheitsnormen und versuchte in souveräner Umkehrung nach diesen das Leben zu gestalten' (p. 89).

The present position is summarized in N. Pevsner's *Outline of European Architecture*, London, 1948; he maintains that in the centralized church 'the religious meaning of the church is replaced by a human one . . .' (p. 83), that architects created the central plan for churches 'to eternalize the present' (p. 84), and that 'Man is in the church no longer pressing forward to reach a transcendental goal but enjoying the beauty that surrounds him and the glorious sensation of being the centre of this beauty' (p. 83).

Catholic authors like F.X. Kraus and J. Sauer, *Geschichte der christlichen Kunst*, Freiburg, 1908, II, 2, particularly p. 664 ff., rejected the 'pagan' interpretation of centralized church architecture (see also L. V. Pastor, *History of the Popes*, Vol. III), without, however, attempting or being able to explain its specifically 'Christian' character.

4 Cecil Grayson has recently shown convincingly (*KUNSTCHRONIK*, XIII, 1960, p. 359 ff. and *MÜNCHNER JAHRB. DER BILD. KUNST*, XI, 1960) that the bulk of the work was written between 1443 and 1452.

5 First ed. of 1485, fol. p. iii verso; Ital. ed. of 1550, Bk. VII, chap. 4, p. 206.

6 At the end of this chapter Alberti introduces yet another 'temple' form which he calls the 'Etruscan Temple', following partly Vitruvius IV, 7. Cf. the illuminating remarks by Max Theuer, *Leon Battista Alberti, Zehn Bücher über die Baukunst*, 1912, p. 619 f.

architecture during the Renaissance will, it is hoped, clear the ground for a more correct understanding of the architects' intentions and, at the same time, help to elucidate the element of tradition in some important currents of Renaissance thought.

1. Alberti's Programme of the Ideal Church

The views of fifteenth- and sixteenth-century architects are available in sufficient detail to give a fairly correct picture of their ideas. In fact, the first architectural treatise of the Renaissance, Alberti's *De re aedificatoria* (written about 1450),⁴ contains the first full programme of the ideal church of the Renaissance. The seventh book of this work deals with the building and decoration of sacred architecture. Alberti's survey of desirable shapes for temples – his synonym for churches – begins with a eulogy of the circle. Nature herself, he declares, enjoys the round form above all others as is proved by her own creations such as the globe, the stars, the trees, animals and their nests, and many other things.⁵ Alberti recommends nine basic geometrical figures in all for churches: apart from the circle, he lists the square, the hexagon, the octagon, the decagon and the dodecagon. All these figures are determined by the circle and Alberti explains how to derive the lengths of their sides from the radius of the circle into which they are inscribed (Fig. 1). In addition to these six figures he mentions

three developments from the square, namely the square plus one-half, the square plus one-third and the square doubled.⁶

These nine basic forms can be enriched by chapels. For plans derived from the square Alberti suggests one chapel at the far end, or, in addition, a central chapel at each side, or an odd number of chapels at each side. Circular plans may be given six or eight chapels; polygonal ones may either have a chapel to each wall or to alternate walls. The shape of the chapels should be rectangular or semi-circular; both types may alternate. It is evident that by adding small geometrical units to the basic figures of circle and polygon a great variety of composite geometrical configurations can be produced which all have the one element in common; that corresponding points on the circumference have exactly the same relation to the focal point in the centre.

Alberti does not directly express preference for any of the shapes recommended by him. But a bias in favour of the round form seems to be implied, judging from his remarks about nature's love for the round. For nature aspires to absolute perfection,⁷ she is the best and divine teacher of all things⁸ – 'la natura, cioè Idio . . .'⁹

It is well known that for his ideas on centralized planning Alberti, like other architects after him, was inspired by classical structures, though hardly by classical temples.¹⁰ Yet, it is true, that Renaissance architects believed many of the vast number of circular and polygonal ancient ruins to have been temples in antiquity¹¹ and, in addition, they regarded such Early Christian buildings as St. Stefano Rotondo, Sta. Costanza, the octagonal Baptistery near the Lateran and even the twelfth-century octagon of the Florentine Baptistery as Roman temples turned into Christian churches. It can therefore be inferred that Alberti saw here – in spite of Vitruvius' relative silence about centralized plans of temples¹² – a continuity from ancient sacred architecture to the Early Christian church, and took this as historical justification for advocating a return to the venerable forms of temples of the ancients. Alberti was consciously linking his own ideas with those of the early Christians. Emperor Constantine's Rome had a particular attraction for him and other men of his time, because it was then, and only then, that pagan antiquity was blended with the spirit of faith and purity of the early Church. Thus Alberti makes a strong plea for going back to the liturgical usage of the period when churches had only one altar 'to celebrate only one Sacrifice in a Day'.¹³ But whatever his reasoning, the stress he laid on circular and polygonal churches reveals his passion for the centralized geometrical plan.

A controversy during the erection of the choir of the SS. Annunziata in Florence shows that opinions on classical centralized structures were by no means unanimous. Work on this building had been interrupted for fifteen years and when, in 1470, Alberti carried on Michelozzo's unfinished choir, fashioned after the 'temple' of Minerva Medica, a 'reactionary' critic turned against continuing this copy after the antique. His argument was exactly the reverse of that which recommended Michelozzo's design to Alberti, for he alleged that such classical buildings had not been temples in antiquity but tombs of emperors, and were therefore unsuitable as models for churches.¹⁴ It was this liturgical unsuitability of Michelozzo's plan which had been severely censured about twenty-five years before by the aged Brunelleschi.¹⁵ And precisely this question of suitability was approached from a new angle during the second half of the fifteenth century. Alberti's silence on this point suggests that he did not

7 *De re aed.*, Bk. IX, chap. 5. Cf. below Part IV, p. 109.

8 Alberti, *I primi tre libri della famiglia*, ed. F.C. Pellegrini, Florence, 1911, p. 188: '... natura optima e divina maestra di tutte le cose.'

9 *Della famiglia*, ed. cit., p. 236: 'Fece la natura, cioè Idio, l'uomo composto parte celeste e divino, parte sopra ogni mortale cosa formosissimo et nobilissimo.' We may translate somewhat freely: 'Nature, that is, God, united in Man celestial and divine elements with those that make him the best shaped and noble among things mortal.' This remark should not be interpreted as a pantheistic confession; cf. Paul-Henri Michel, *La pensée de L.B. Alberti*, Paris, 1930, p. 536 ff., who devotes a penetrating analysis to this passage.

10 With the exception of the Pantheon, which was and remained of course the most influential classical building, and the two small peripteral temples at Rome and Tivoli, no round or polygonal classical temple survives.

11 Above all, the nymphaeum of the Orti Liciniani, then and still known as the temple of Minerva Medica. Alberti's inclusion of the decagon among his shapes for churches is, no doubt, due to this prototype. See also p. 32, note 102.

12 There is no mention of round temples in Vitruvius' Third Book amongst his seven classes of temples. Round temples appear together with Tuscan temples as a kind of appendix to Book IV.

13 Bk. VII, chap. 13. In spite of his assertion that he leaves it to the judgment of others whether there should be one or more altars in a church, he has some sharp words about contemporary abuses in placing in a church as many altars as possible.

14 Cf. Gaye, *Carteggio inedito d'artisti* . . . Florence, 1839, I, p. 232, also p. 226 ff.; L.H. Heydenreich, 'Die Tribuna der SS. Annunziata in Florenz,' in MITTEILUNGEN DES KUNSTHIST. INST. IN FLORENZ, III, 1930, p. 277 ff. – In a recent paper S. Lang submitted the hypothesis that the SS. Annunziata was planned as an imitation of the Holy Sepulchre (JOURNAL OF THE WARBURG AND COURTAULD INST. XVII, 1954, p. 288 ff.)

15 Braghirolli, 'Die Baugeschichte der Tribuna der SS. Annunziata in Florenz,' in REPERTORIUM F. KUNSTW., II, 1879, p. 272; Heydenreich, *loc. cit.*

16 Alberti is, however, concerned with the position of the altar. He wants to have the main chapel one-twelfth larger ('dignitatis gratia') than the other chapels (VII, chap. 4). There should be only one altar in the main chapel (VII, chap. 13); cf. p. 17, note 13.

17 Bk. VII, chap. 3.

18 Bk. VII, chap. 1. This important passage has been misinterpreted. The original text, fol. o viii verso, runs: 'Quae pietas una est primaria iustitiae pars: ac iustitiam quidem ipsam per se divinum quoddam esse munus quis non assentiat. Et iustitiae pars etiam est huic superiori finitima et dignitate praecipua superisque multo gratissima ac perinde sacratissima: qua erga homines pacis tranquillitatisque gratia utimur: dum esse pro meritis quibusque retributum velimus: idcirco basilicam ubi vis dandum sit religioni adiudicabimus.'

19 Bk. VII, chap. 14.

20 Summary of the beginning of Bk. VII, chap. 3. Cf. the good characterization of Alberti's prescriptions for religious buildings in Paul-Henri Michel, *op. cit.*, p. 542. ff.

21 Cf. below Part II, p. 41.

22 Bk. VII, chap. 5, ed. 1485, fol. p vi: 'Sed quemadmodum in animante caput, pes: et quaecumque velis membrum ad caetera membra atque ad totum reliquum corpus referendum est: ita et in aedificio maximeque in templo conformandae universae partes corporis sunt: ut inter se omnes respondeant: ut quavis una illarum sumpta eadem ipsa caeterae omnes partes dimetiantur.'

23 Cf. note 22.

24 Bk. VII, chap. 10. Alberti gives here also a ratio of 11:4 which has not been satisfactorily interpreted; an attempt by Theuer, *op. cit.*, p. 628. But recently V. Zoubov (in BIBLIOTHÈQUE D'HUMANISME ET RENAISSANCE, XXII, 1960, 56) has suggested an acceptable explanation.

25 For a detailed discussion cf. below Parts II and IV, pp. 50, 105, 111 f.

26 Bk. VII, chaps. 3 and 5.

27 Bk. VII, chap. 5. Alberti obviously had in mind the two classical types of the Pantheon and the Vesta temple.

28 Bk. VII, chap. 6. Cf. below, p. 42, note 12.

29 Bk. VII, chap. 11, ed. 1485, fol. r ii: 'Templis tectum dignitatis gratia atque etiam perpetuitatis maxime esse testudinatam velim.'

30 Bk. VII, chap. 10, ed. 1485, fol. r i: 'Mihi quidem perfacile persuadebitur coloris aequae atque vitae puritatem et simplicitatem superis optimis gratissimam esse.'

31 *ibid.*, and fol. r i v.

32 *ibid.* 'Sed velim in templis cum pariete tum et pavimento nihil adsit quod meram philosophiam non sapiat.'

33 *ibid.* 'Maximeque pavimentum refertum velim

acknowledge the existence of the problem.¹⁶

It is strange that the normal and traditional type of church, the basilica, was not among those recommended by Alberti. The fact that churches were built in the form of the basilica appears only incidentally when Alberti explains that the habit was introduced by the early Christians who used private Roman basilicas as their places of worship.¹⁷ This is the only mention of basilicas in the chapters about 'temples'. But Alberti made his position clear in the introductory chapter of the same book: the basilica, as the seat of jurisdiction in antiquity, is for him closely related to the temple. Justice is a gift of God: man obtains divine justice through piety and exercises human justice through jurisdiction. Thus temple and basilica as the seats of divine and human justice are intimately related, and in that sense the basilica belongs to the domain of religion.¹⁸ In keeping with this, Alberti explains in a later chapter on basilicas that the basilica partakes of the decoration belonging to temples. However, the beauty of the temple is more sublime, and cannot and should not be rivalled by that of the basilica.¹⁹ Thus in Alberti's system the time-honoured form of the church, the basilica, has been relegated from its divine to a human function, and it is evident that Alberti must exclude the basilica from being used for churches.

Alberti is explicit about the character of the ideal church. It should be the noblest ornament of a city and its beauty should surpass imagination. It is this staggering beauty which awakens sublime sensations and arouses piety in the people. It has a purifying effect and produces the state of innocence which is pleasing to God.²⁰ What is this staggering beauty that has so powerful an effect? According to Alberti's well-known mathematical definition, based on Vitruvius, beauty consists in a rational integration of the proportions of all the parts of a building in such a way that every part has its absolutely fixed size and shape and nothing could be added or taken away without destroying the harmony of the whole.²¹ This conformity of ratios and correspondence of all the parts, this organic geometry should be observed in every building but above all in churches.²² We may now conclude that no geometrical form is more apt to fulfil this demand than the circle or forms deriving from it. In such centralized plans the geometrical pattern will appear absolute, immutable, static and entirely lucid. Without that organic geometrical equilibrium where all the parts are harmonically related like the members of a body,²³ divinity cannot reveal itself.

Consequently we find minute guidance for all the proportions of the ideal church. Alberti discusses, for instance, the size of the chapels in relation to the central core of the building and in relation to the wall space between them, or the height of the structure in relation to the diameter of the ground plan. To give at least one concrete example: the height of the wall up to the vaulting in round churches should be one-half, two-thirds or three-quarters of the diameter of the plan.²⁴ These proportions of one to two, two to three, and three to four conform to the all-pervading law of harmony as Alberti demonstrates in his ninth book.²⁵

It is obvious that such mathematical relations between plan and section cannot be correctly perceived when one walks about in a building. Alberti knew that, of course, quite as well as we do. We must therefore conclude that the harmonic perfection of the geometrical scheme represents an absolute value, independent of our subjective and transitory perception. And it will be seen later that for Alberti – as for other Renaissance artists – this man-created harmony was a visible echo of a celestial and universally valid harmony.

Apart from this concern for proportion, Alberti's advice embraces everything from the general appearance of the church down to the details of the decoration. A church should not only stand on elevated ground, free on all sides, in a beautiful square, but it should also be isolated by a substructure, a high base, from the everyday life that surrounds it.²⁶ The façade should be formed by a portico in the ancient manner, and round churches should also be given such a portico or be surrounded by a colonnade.²⁷ Arches are used in theatres and basilicas, but they do not accord with the dignity of churches; for these, only the austere form of columns with straight entablature is appropriate.²⁸ In contrast to basilicas, and in keeping with their dignity, churches must be vaulted; moreover, vaults guarantee perpetuity to churches.²⁹ The chastity of the church should not be compromised by lax appeals to the senses. There should be splendour, particularly in the use of precious materials. But just as Cicero, following Plato, thought that white was the colour for temples, so Alberti was 'entirely convinced that purity and simplicity of colour – as in life – is most pleasing to God'.³⁰ Pictures are preferable to frescoes, and stauary is preferable to pictures,³¹ but whatever decoration is used on walls and pavement should pertain to 'pure philosophy'.³² Thus there should be inscriptions admonishing us to be just, modest, simple, virtuous and pious, and the pavement, above all, should show 'lines and figures pertaining to music and geometry so that everywhere the education of the mind is stimulated'.³³ This last recommendation sounds particularly strange and it can only be understood if we are aware that for Alberti – who follows here a tradition unbroken from classical times – music and geometry are fundamentally one and the same; that music is geometry translated into sound, and that in music the very same harmonies are audible which inform the geometry of the building.³⁴ Finally, windows should be so high that no contact with the fleeting everyday life outside is possible and that one can see nothing but the sky.³⁵ The most dignified ornaments for vaults and domes are coffers in the manner of the Pantheon, but a cosmic significance for the dome is also suggested by a painted representation of the sky.³⁶ A cosmic interpretation of the dome was common from antiquity onwards and was kept alive, above all, in the Eastern Church.³⁷

Alberti gives here a complete picture of the humanist conception of ecclesiastical architecture; it is apparent that for him humanism and religion were entirely compatible. And let it be said emphatically: it is a serene, philosophical and almost puritanical architecture that his descriptions conjure up before us. This was clearly felt in his own day by people who cherished the old traditions. The critic of the centralized choir of the SS. Annunziata, who has been quoted before, protests also against Alberti's wish to paint the whole choir white and leave it without any ornament whatsoever. The church, in his view, would appear 'poor and desolate'.³⁸ But Alberti set the standards for generations of architects with a classical bias who made his ideas and stipulations their own. For them the new forms of the Renaissance church embodied sincere religious feeling no less than did the Gothic cathedral for the mediaeval builder.

* * * * *

Filarete shows in his picturesque treatise, written shortly after the *De re aedificatoria*, that he had read Alberti to advantage,³⁹ and in some respects he

esse lineis et figuris: quae ad res musicas et geometricas pertineant: ut omni ex parte ad animi cultum excitemur.

34 Cf. Part IV for the Renaissance interpretation of music and geometry.

35 Bk. VII, chap. 12; ed. 1485, fol. r iii: 'Aperitiones fenestrarum in templis esse oportet modicas et sublimes: unde nihil praeter caelum spectes: unde et qui sacrum faciunt qui ve supplicant nequicquam ab re divina mentibus distrabantur.'

36 Bk. VII, chap. 11 (fol. r ii v and r iii). For the parallelism of dome and sky cf. also Bk. III, chap. 14 (fol. g iii).

37 The dome as symbol of the sky has a long pedigree. The material for the celestial character of domes in antiquity has been collected in an exemplary manner by Karl Lehmann, 'The Dome of Heaven', ART BULLETIN, XXVII, 1945, p. 1 ff. For Dio Cassius' comparison of the dome of the Pantheon with the sky cf. *ibid.*, p. 22 (see also Robert Eisler, *Weltenmantel und Himmelszelt*, 1910, p. 614, with further examples of cosmic interpretations of vaulting). Lehmann followed the conception up into the Western, Islamic and Byzantine worlds. A Syriac seventh-century hymn about the destroyed church of Santa Sophia at Edessa with a description of the dome as a symbol of the sky, was unknown to him; cf. A. Grabar, 'Le témoignage d'une hymne Syriacque sur l'architecture de la Cathédrale d'Edesse au VIe siècle et sur la symbolique de l'édifice Chrétien', CAHIERS ARCHEOLOGIQUES, II, 1947, p. 41 ff. Grabar has shown the dependence of the symbolism of this hymn on Dionysius the Areopagite whose mystical neo-Platonism, alive throughout the Middle Ages, was revived by Nicholas of Cusa and the Florentine Platonists. A cosmic interpretation of the dome remained common well into the eighteenth century. Cf. also the stimulating book by Louis Hauteccœur, *Mystique et architecture. Symbolisme du cercle et de la coupole*, Paris, 1954.

It is worth pointing out that the Latin term *coelum* for roof or ceiling (cf. Lehmann, p. 27) was adopted by the Italians, cf. e.g. Serlio, *Terzo libro*, etc., ed. 1600, p. 52: 'essa volta o vogliamo dire cielo'.

38 Gaye, *op. cit.*, p. 232: '... se questa tribuna si facesse tutta bianca senza altri ornamenti dalle capelle in su, parrà una cosa povera e spogliata ...'

39 Filarete, *Tractat über die Baukunst*, ed. W. von Oettingen, Vienna, 1890 (Eitelber-Ilgs Quellenschr. N.F. Vol. 3), pp. 39, 47. Filarete's treatise was written c.1457-64 for Francesco I Sforza, but dedicated after the latter's death to Piero de' Medici. John R. Spencer (RIVISTA D'ARTE, XXXI, 1956, p. 93 ff.) argues with good reason that the treatise was composed between May 1461 and the end of 1462.

throws a rather unexpected light on the emotional reaction of Renaissance people to certain forms. He must have had the Renaissance dome in mind when he said: 'We Christians build our churches high, so that those who enter feel themselves elevated and the soul can rise to the contemplation of God'.⁴⁰ We also hear about the soothing effect of the circle; for 'in looking at a circle the glance sweeps round instantaneously without interruption or obstacle'.⁴¹ So Alberti's cosmic philosophical consideration of the round form is here supplemented by a psychological and visual approach. And from now on the geometry of the circle plays an ever more prominent part.

Francesco di Giorgio based his advice to church builders on empirical deduction: he argued that the innumerable types of churches in existence can be reduced to three principal ones:⁴² first, the round form which he declared to be the most perfect; secondly, the rectangular; and thirdly, a composite of both forms. To the first type belong all the polygons, the second type is the nave type of church comprising all the figures deriving from the rectangle, and the third type combines the nave with a centralized arrangement for crossing, choir and transept. The latter type is composite in the proper sense of the word, for each of the two parts follows the rules and norms of the type to which it belongs.

The composite type had a long monumental history in Italy, from the Cathedrals at Pisa, Siena and Florence, to the Chiesa della Casa Santa at Loreto and the Cathedral at Pavia. If completed, Alberti's S. Francesco at Rimini (Fig. 31) would have been a composite church with a dome area of staggering dimensions. Francesco di Giorgio demonstrates by means of the inscribed human figure how to weld together organically the centralized and the longitudinal parts of such a church design (Fig. 2).⁴³ The centralized eastern end is developed from the basic geometrical figures of circle and square. Leonardo shared Francesco di Giorgio's views on the composite church: in one of his theoretical designs the centralized part is constructed *per se* according to the 'proper rules and norms' (Fig. 3).⁴⁴ These drawings illustrate the overwhelming importance which the centralized part of such designs held for Renaissance architects: nothing could be more significant than the meeting of all the radii in the ideal centre of Francesco di Giorgio's design or the closely knit geometrical pattern of Leonardo's plan.

Francesco di Giorgio's keen interest in centralized plans becomes apparent when turning over the pages of his manuscripts; the example here shown (Fig. 5) displays systematic evolutions of the circle with and without portico, the square with inscribed circle and circular chapels, and the octagon with attached circular chapels.⁴⁵ In all these designs the integrity of each geometrical form is carefully preserved. Moreover, Francesco di Giorgio reiterates, with a strong Aristotelian bias, Alberti's ideas; there are full statements on the theory of organic proportion and minute directions are given for 'simmetria' and 'commensurazione' from the general planning down to doors and windows.⁴⁶ There is a philosophical discourse on the hierarchy in building culminating in the house of God which must be worthy of the perfection of God Himself.⁴⁷ Among his complex requirements for churches we find the postulate of the semi-circular dome, and we find, above all, a discussion of the liturgical problem of assigning the proper place for the altar in the centralized church.⁴⁸

It will be remembered that Alberti was silent on this important point. But in the thirty years between Alberti and Francesco di Giorgio, with centralized

40 *ibid.*, Bk. VII, p. 221.

41 *ibid.*, Bk. VIII, p. 273 f: 'Quando vedi uno arco mezzo tondo, l'occhio tuo non è impedito niente quando tu lo risguardi; così quando tu vedi uno cerchio tondo, l'occhio, o vuoi dire la vista, come tu il guardi, subito la vista lo circunda intorno al primo sguardo, et transcorsa la vista, che non à ritegno nè ostaculo nessuno.' The same arguments are repeated for the semi-circular arch. Cf. also D. Frey, *op. cit.*, p. 74 f.

42 C. Promis and Cesare Saluzzo, *Trattato di architettura civile e militare di Giorgio Martini*, Turin, 1841, Bk. IV, chap. 2, p. 102. This treatise was probably written after 1482, but Francesco di Giorgio's literary activity began at a considerably earlier date. On the problem of dating the work, which was not finished until 1492, see Horst De La Croix, in *ART BULLETIN*, XLII, 1960, p. 269, note 22.

43 Illustration from Cod. Magliab. of the *Bibl. Naz.*, Florence (Cod. II. I. 141) after Roberto Papini, *Francesco di Giorgio architetto*, Florence, 1946, II, Fig. 69. For Francesco di Giorgio's procedure, cf. now H. Millon, 'The Architectural Theory of F. di G.', *ART BULLETIN*, XI, 1958, p. 257 ff.

44 Paris, Inst. de France MS. B, fol. 24r; see J.P. Richter, *The Literary Works of Leonardo da Vinci*, 2nd ed., 1939, II, Pl. 96. About the relation of this drawing to the Cathedral of Pavia, cf. L.H. Heydenreich, *Die Sakralbaustudien Leonardo da Vincis* (Diss. Hamburg), 1929, p. 68 ff., with further literature and a valuable discussion of the 'composite' type of church.

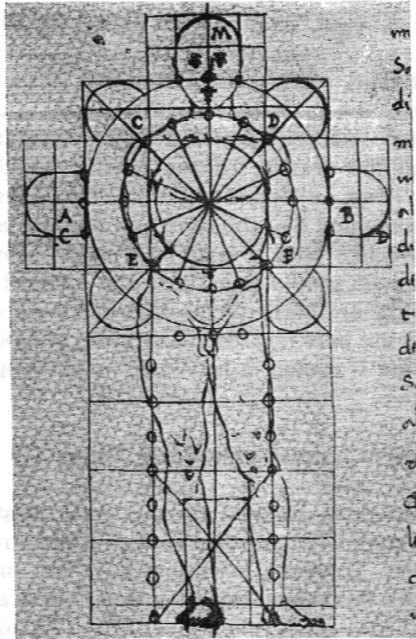
45 Cf. Roberto Papini, *op. cit.*, II, Fig. 288. *Bibl. Laurenziana*, Cod. Ashburnham, 361, fol. 12r. See also p. 25, note 59; p. 26, note 70.

46 Bk. IV, chap. 1 ff.

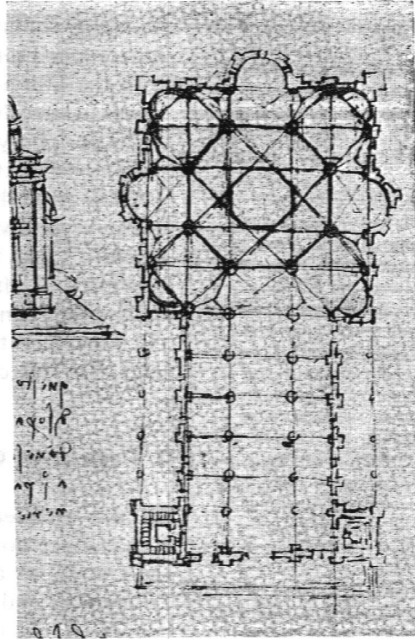
47 Bk. IV, prologo.

48 Bk. IV, chap. 2, p. 103 and chap. 7, p. 115 f.

THE CENTRALLY PLANNED CHURCH



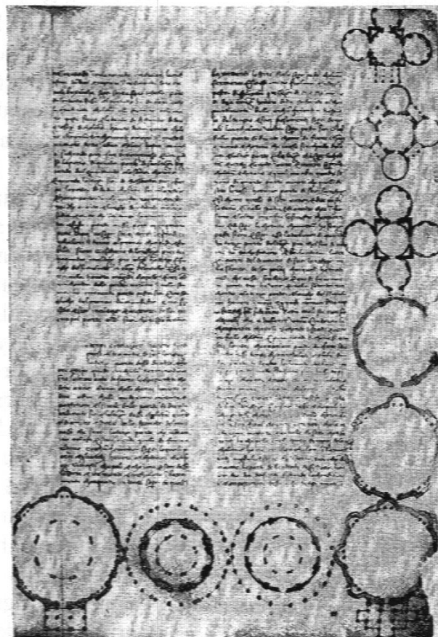
2. Francesco di Giorgio. Drawing from Codex Magliabechiano



3. Leonardo da Vinci. Design of a church (detail)



4. Francesco di Giorgio. Studies in proportion. From the Turin Codex



5. Francesco di Giorgio. Page from Codex Ashburnham 361

49 *ibid.*, p. 115: 'Molti dicono che per dimostrare Dio essere in nobiltà e perfezione lungi da noi per infinita distanza, è conveniente che il simulacro sia più distante dalla porta principale che si può, e questo luogo non è se non appresso alla circonferenza opposta alla porta.' These critics also oppose the central position of the altar for practical liturgical reasons.

50 *ibid.*, p. 116: '... come Dio è presente in ogni luogo e creatura, e di quella cagione conservante a cui tutte le creature hanno rispetto, pare conveniente che così il sacramento o simulacro sia nel centro del tempio, come luogo più indifferente e comune a tutte le parti del tempio, e come al centro tutte le linee della circonferenza concorrono e hanno rispetto. L'altra (scil. ragione) è, come Cristo ne insegna, che dove sono più congregati nel nome Suo. Esso essere in mezzo di quelli: così è conveniente il simulacro o sacramento essere in mezzo degli uomini congregati per laudarlo nel tempio; e perchè nella circonferenza sono più luoghi comuni e di una medesima dignità, ed il luogo del centro è unico e assoluto di tutti gli altri, pare per ciò che sia conveniente, a similitudine di Colui il quale solo veramente è, e tutte le altre cose sono ombra a Lui comparate.'

51 For the tradition of Bramante as writer cf. J. Von Schlosser, *Kunstliteratur*, 1924, p. 129 f. According to A. F. Doni's *La seconda libreria* (Venice, 1555, p. 44) those who study Bramante's *Pratica* 'recognize immediately whether a building is proportioned or not, and can say of all the parts whether they form a harmonious whole'. The contemporary testimonies by Cesariano and Castiglione as to Bramante's 'illiteracy' should be taken *cum grano salis*. The well-informed Vasari evidently did not share this opinion (*Vite*, ed. Milanese, IV, p. 164). Cf. also Geymüller, *Die ursprünglichen Entwürfe für Sanct Peter in Rom*, 1875, p. 21 ff.; Malaguzzi Valeri, *La corte di Lodovico il Moro*, 1915, II, p. 231 f. Even the notoriously learned Palladio was called 'uneducated' by more learned contemporaries; cf. below, p. 129.

52 About Peruzzi's literary plans cf. D. Frey, *op. cit.*, p. 44 f.

53 Cf. Dinsmoor, 'The Literary Remains of Sebastiano Serlio', *ART BULLETIN*, XXIV, 1942, p. 60, note 27. - An earlier translation by or for Francesco di Giorgio is in the codex of the Bibl. Nazionale at Florence (II, I, 141, fol. 103 ff.); cf. Vasari, ed. Milanese, III, p. 72; Von Schlosser, *Kunstliteratur*, 1924, p. 129; Allen Stuart Weller, *Francesco di Giorgio*, Chicago, 1943, p. 272.

54 Vasari, ed. Milanese, V, p. 472, note 1. The preface - the only existing portion - was printed by Aurelio Gotti, *Vita di Michelangelo Buonarroti*, Florence, 1876, II, p. 129 ff., and again by Paolo Fontana in *Miscellanea di storia dell'arte in onore di I. B. Supino*, Florence, 1933, p. 305 ff.

55 Cf. Claudio Tolomei's letter, in Bottari, *Lett. pitt.*, 1822, II, p. 1 ff.; Von Schlosser, *op. cit.*, p. 223.

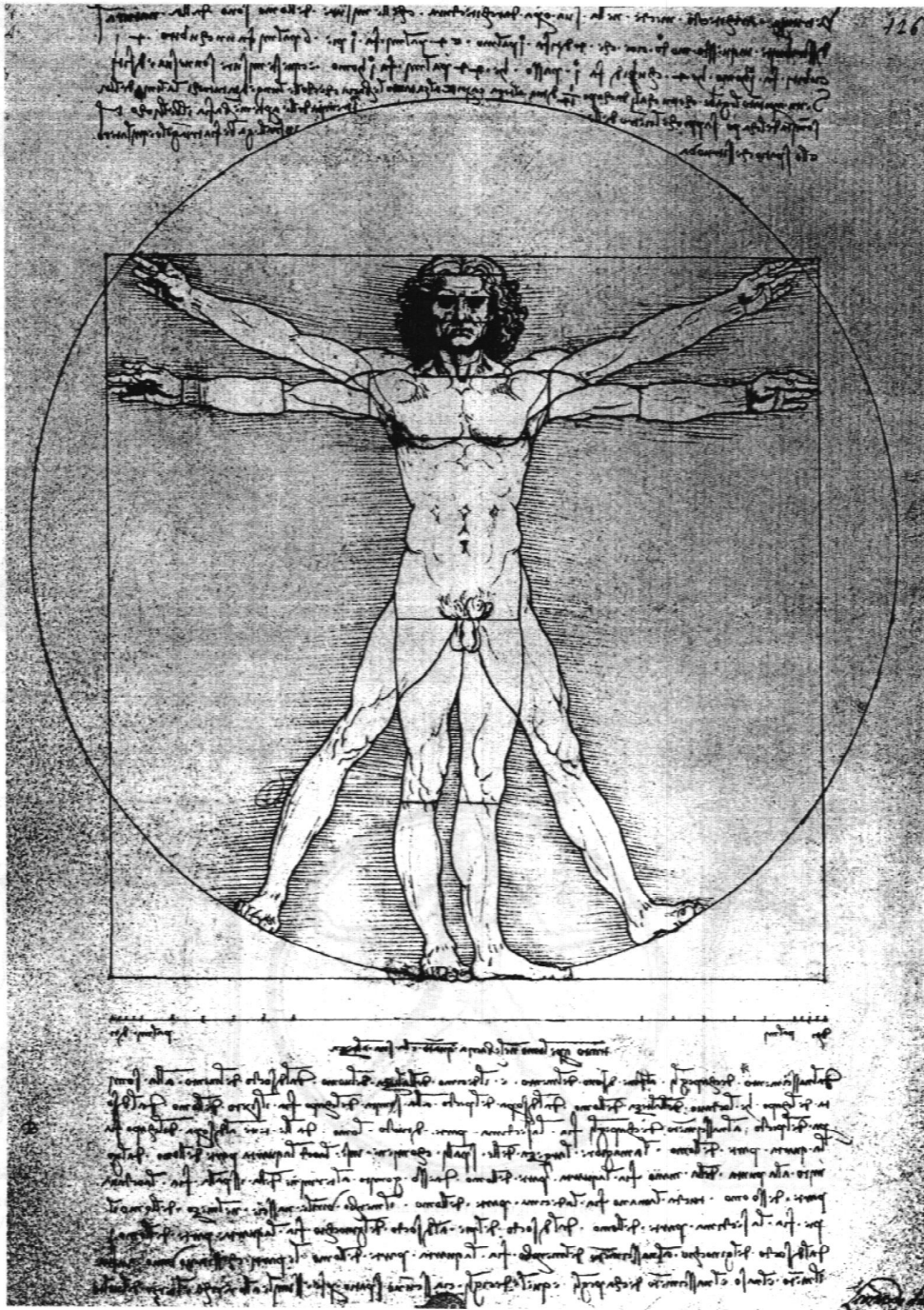
56 Cesariano, *Di Lucio Vitruvio Pollione de Architectura*, etc., Como 1521, Bk. III, I, fol. xlviir v: 'mi pare piu facilissima cosa circondare e costruire li principali membri meniani de uno oppido:

planning coming into its own, controversies flared up which are faithfully mirrored in Francesco's text. These controversies were, however, not concerned with the liturgical suitability of centralized churches as such - which nobody seems to have doubted - but with the question whether the altar should be placed at the periphery or in the centre. Advocates of the first view argued that in order to demonstrate God's infinite distance from us the altar should be placed as far as possible from the main door, i.e. opposite it on the circumference.⁴⁹ Advocates of the second view maintained that the centre is 'one and absolute' ('unico e assoluto') and therefore like Him who alone truly is. Moreover, as God is omnipresent, the Sacrament should be in the centre upon which all the lines of the building converge (Fig. 2).⁵⁰ More directly than in Alberti's cosmic analogies, the circle and its centre are here regarded as symbols of God; it will be shown later that this conception is rooted in neo-Platonic philosophy.

2. Centralized Churches in Later Architectural Theory

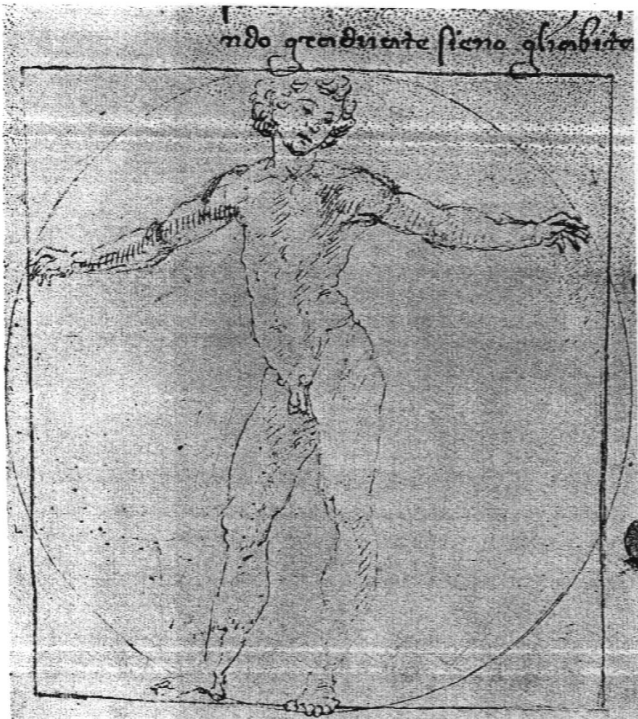
Of the architectural treatises planned by the great masters of the High Renaissance none was completed, nor has enough come down to us to gauge their opinions accurately. Bramante's writings have not survived at all;⁵¹ of Leonardo's and Peruzzi's theoretical works⁵² a wealth of drawings, at least, is preserved. But light is thrown on the intentions of High Renaissance masters by their pre-occupation with, and interpretation of, Vitruvius. The intense study of Vitruvius by these masters is well known: Fra Giocondo was the first to publish the Latin text in 1511 with illustrations showing a remarkable understanding; an (unpublished) Italian translation was completed under Raphael's direction and in Raphael's house by Fabio Calvi;⁵³ towards the end of his career Antonio da Sangallo was engaged on an Italian edition with commentary.⁵⁴ These efforts to understand and interpret Vitruvius culminated in 1542 in the foundation of the Vitruvian Academy whose gigantic, erudite programme, however, never materialized.⁵⁵ It is through the 1521 edition of Vitruvius by Cesariano that we become acquainted with ideas current in the Milan of Bramante and Leonardo. Cesariano was a pupil of Bramante, and the fact that the first Italian edition with an extensive and learned commentary grew out of the latter's circle, is in itself highly significant. The commentary reveals again the ever present sense of an architectural hierarchy; Cesariano declares that every kind of domestic architecture is very easy in comparison with the task of erecting a sacred building 'with its fitting parts proportioned and diligently harmonized'.⁵⁶ Those architects who produce 'accurate results' appear themselves 'like demigods', 'come semidei'.⁵⁷

What should these sacred buildings be like; when are their parts properly proportioned and harmonized? Vitruvius supplied the answer. He had introduced his third book on Temples with the famous remarks on the proportions of the human figure, which should be reflected in the proportions of temples. As a proof of the harmony and perfection of the human body he described how a well-built man fits with extended hands and feet exactly into the most perfect geometrical figures, circle and square.⁵⁸ This simple picture seemed to reveal a deep and fundamental truth about man and the world, and its importance for Renaissance architects can hardly be overestimated. The image haunted their imagination. We find it already in Francesco di Giorgio's codex in the

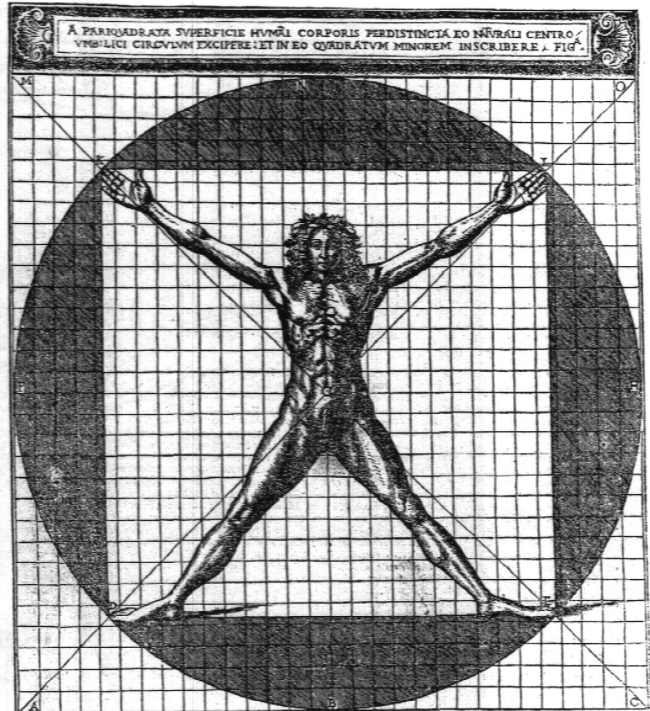


6. Leonardo da Vinci, Vitruvian figure

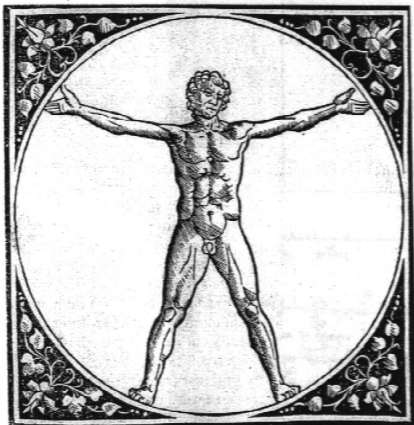
ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM



7. Francesco di Giorgio, Vitruvian figure, Codex Ashburnham 361



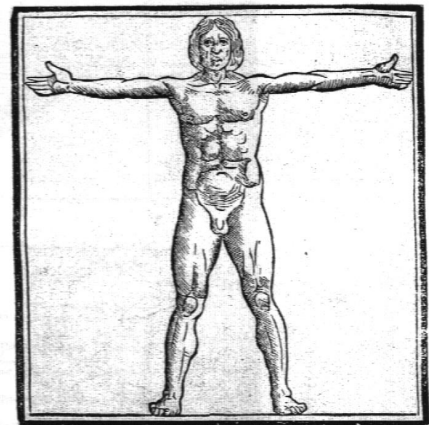
8. Vitruvian figure, from Cesariano's edition of Vitruvius, Como, 1521



9. Vitruvian figure. From Fra Giocondo's edition of Vitruvius, Venice, 1511



10. Vitruvian figure, from Francesco Giorgi, *De Harmonia Mundi*, Venice, 1525



11. Vitruvian figure. From Fra Giocondo's edition of Vitruvius, Venice, 1511

Laurenziana (Fig. 7) which was owned and annotated by Leonardo.⁵⁹ Leonardo himself interpreted Vitruvius' text more accurately in his celebrated drawing at Venice (Fig. 6),⁶⁰ and Fra Giocondo showed the 'homo ad quadratum' and 'ad circulum' on two plates of his Vitruvius edition of 1511 (Figs. 9, 11).⁶¹ Cesariano – certainly not without knowledge of Leonardo's drawing – gave this conception two full-page illustrations (Fig. 8)⁶² and accompanied it with a lengthy commentary culminating in the assertion that with the Vitruvian figure one can define the proportions – he says 'commensurare' which implies the common measure, the harmony – of everything in the world.⁶³

It can hardly be doubted that Cesariano's commentary re-echoes meditations on harmony and proportion which were discussed in Bramante's and Leonardo's circle. There is further evidence of this; it comes, above all, from Leonardo's friend, Luca Pacioli, the mathematician, for whose *De Divina Proportione* Leonardo himself had drawn the illustrations. In Pacioli's work the Vitruvian concept appears again embedded in a metaphysical context. 'First we shall talk of the proportions of man', Pacioli declares in the part on architecture appended to the *De Divina Proportione*,⁶⁴ 'because from the human body derive all measures and their denominations and in it is to be found all and every ratio and proportion by which God reveals the innermost secrets of nature'. And further: 'After having considered the right arrangement of the human body, the ancients proportioned all their work, particularly the temples, in accordance with it. For in the human body they found the two main figures without which it is impossible to achieve anything, namely the perfect circle . . . and the square.'⁶⁵ These observations lead Pacioli on to a long-winded description of the Vitruvian text.

Francesco Zorzi (or Giorgi),⁶⁶ a neo-Platonic friar, who was also closely associated with architecture, takes us a step further to his work on Universal Harmony. Here we find an illustration of the Vitruvian text – significantly only the 'Homo ad circulum' – in a chapter entitled: 'Quod Homo imitatur mundum in figura circulari' ('Why Man in the figure of the Circle is an Image of the World') (Fig. 10). The cosmic meaning of this figure could not be made clearer. But the title contains only half of the author's views. Vitruvius' figure holds for him a dual quality: it discloses through the visible, corporeal world ('homo-mundus') the invisible, intellectual relation between the soul and God; for God is the 'intelligibilis sphaera'. The author interprets the figure derived from Vitruvius in the light of the mystic geometry of neo-Platonism which had reached him through Ficino from Plotinus.⁶⁷

With the Renaissance revival of the Greek mathematical interpretation of God and the world, and invigorated by the Christian belief that Man as the image of God embodied the harmonies of the Universe, the Vitruvian figure inscribed in a square and a circle became a symbol of the mathematical sympathy between microcosm and macrocosm.⁶⁸ How could the relation of Man to God be better expressed, we feel now justified in asking, than by building the house of God in accordance with the fundamental geometry of square and circle?

This question leads us on to the topic of Leonardo's preoccupation with the problem of the centralized church. His many drawings of centrally planned churches are more than systematic studies by the greatest artist and thinker of the Renaissance; they are, above all, documents of Renaissance religion. Leonardo himself is almost silent about the ideas which guided him.⁶⁹ But in addition to the evidence supplied by Cesariano and Pacioli we know that he was familiar with

aut Civitate: aut tuto uno magno Castello e altri loci civili cha bene construere una sacra aede con li soi debiti membri: proportionati e diligentemente symmetriati".

57 *ibid.*. Bk. I. fol. ii v: 'quilli Architecti che sano produrre li sollerti effecti pareno come semidei perche cercano che larte si asimiglia & supplisca a la natura'.

58 Bk. III, chap. 1, i: 'Namque non potest aedis ulla sine symmetria atque proportione rationem habere compositionis, nisi uti ad hominis bene figurati membrorum habuerit exactam rationem.' 59 Cf. below, p. 26, note 70, Bibl. Laurenziana, Cod. Ashburnham 361, fol. 5r. Cf. Giuseppe Favaro, *Le proporzioni del corpo umano in un codice anonimo del Quattrocento postilato da Leonardo*, Reale Acc. d'Italia, Memorie classa scienza fisiche, etc., Vol. V, 1934, p. 592 f.

60 J.P. Richter, *op. cit.*, I, p. 255, No. 343.

61 M. Vitruvius per *Jocundum*, Venice, 1511, fols. 22r and v.

62 Fols. xlix and l (Fig. 8). Fol. xlix, not here illustrated, shows the figure in the square under the heading: 'Humani corporis mensura et ab eo omnes symmetrias eurhythmiatas & proportionatas geometrico schemate invenire, ut adest figura.'

Many of the later editions of Vitruvius have illustrations, often derived from Cesariano, of the figure in square and circle (Caporali, Philander). As late as 1590 prominent illustrations appear in Gio. Antonio Rusconi, *Della Architettura . . . secondo i Precetti di Vitruvio*, Venice, 1590, p. 46: System of human proportions, p. 47: 'Homo ad circulum', p. 48: 'Homo ad quadratum'.

63 *Op. cit.*, fol. 50v: 'Et in la supra data figura del corpo humano: per li quali symmetriati membri si po ut diximus sapere commensurare tutte le cose che sono nel mondo'. How literally this was taken can be seen from the direct application of the human body to the proportioning of architectural members. Examples of this method from the fifteenth to the seventeenth century are common, cf. above all, Francesco di Giorgio's drawings (Figs. 2 and 4) and for the later period Bernini's drawings (Brauer-Wittkower, *Die Zeichnungen des G.L. Bernini*, 1931, II, p. 54) and the latter's remarks to Chantelou.

64 Ed. C. Winterberg in Eitelberger-Ilg's 'Quellenschriften', Vienna, 1889, p. 129. About Leonardo's relation to Pacioli, cf. Müller-Walde in *JAHRBUCH D. PREUSS. KUNSTSLG.* XIX, 1898, p. 235 ff., and Solmi, *Le fonti dei manoscritti di Leonardo da Vinci*, 1908, p. 219 ff.

65 *Div. prop.*, ed. cit., p. 131.

66 Francesco Zorzi (or Giorgi), *De Harmonia Mundi totius*, Venice, 1525, p. C, cap. 2. About Giorgi cf. Part IV, p. 104.

67 God as 'sphaera intelligibilis' in Plotinus, *Enn.*, II, 9, 17; VI, 5, 5; VI, 9, 8. Cf. D. Mahnke, *Unendliche Sphäre und Allmittelpunkt*, 1937, p. 68.

68 Rudolf Allers, 'Microcosmus', in *Traditio*, II, 1944, shows that the microcosm conception displayed 'an unexpected vitality and achieved a dominant position in the philosophy of the Italian Renaissance, and, later, with many who were

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM

influenced by these philosophers'. The doctrine of the mathematical correspondence between microcosm and macrocosm was, of course, one of the fundamentals of mediaeval thought. The best recent survey is in Allers' article. For the aesthetic problem cf. Edgar de Bruyne, *Etudes d'esthétique médiévale*, Bruges, 1946, II, pp. 275 ff., 350 ff., 361 ff. Even the Vitruvian image had a formative influence on mediaeval thought; see for instance, the French dialogue 'Placidus et Timeo' written before 1303 where we hear that 'l'homme est un microcosme. Il est rond comme le monde car il doit avoir autant de hauteur que d'envergure en étendant les bras' (Ch.-V. Langlois, *La connaissance de la nature et du monde au moyen âge*, Paris, 1911, p. 290). 69 Hints as to the 'regole del retto edificare' in his draft of a letter to the Opera del Duomo of Pavia: 'il modello da me fatto avere in se quella simetria, quella chorispondentia quella chonformità quale s'appartiene al principiato edifitio'. Cf. L. Beltrami, *Documenti e memorie riguardanti la vita e le opere di L. da V.*, Milan, 1919, p. 24; L.H. Heydenreich, *Die Sakralbaustudien Leonardo da Vincis*, 1929, p. 39 f.

70 It should be recalled that Pacioli was a friend of Alberti's (cf. *Div. prop., ed. cit.*, p. 317 f.). For Leonardo's knowledge and use of Alberti's writings, cf. Heydenreich, *op. cit.*, pp. 41, 82; Solmi, *Fonti, op. cit.*, p. 37 ff.; Sir Kenneth Clark, *Leon Battista Alberti on Painting* (British Academy Lecture), 1944, p. 16 f. Leonardo met Francesco di Giorgio when they were together in Pavia in 1490. He possessed and annotated the unfinished architectural treatise Bibl. Laurenziana, Cod. Ashburnham 361, the attribution of which to Francesco di Giorgio can no longer be doubted; see E. Berti in *Belvedere*, VII, 1924, p. 100 ff.

71 Richter, *Literary Works*, II, p. 27, No. 753.

72 Vasari, ed. Milanesi, IV, p. 21; cf. also Richter, *op. cit.*, II, p. 48.

73 Cf. Geymüller's grouping in Richter, *op. cit.*, II, p. 19 ff. and Heydenreich's dissertation (*op. cit.*). We are here not concerned with the stylistic development of the drawings which was aptly discussed by Heydenreich.

74 Most of the relevant drawings are in MS. B of the Institut de France. Fol. 15r: simplest additions of rectangular and segmental chapels to the square; fol. 21r: the hexagon with chapels; fol. 25v: alternating rectangular and semi-circular chapels; here also an octagon with semi-circular chapels, etc.

75 Bibl. Nat. 2037, fol. 3v.

76 Venturi, *Storia dell'arte Italiana*, XI, i, 1938, p. 25.

77 Geymüller, *Die ursprünglichen Entwürfe für Sanct Peter*, p. 96 ff.; G. Giovanoni, *Saggi sulla architettura del rinascimento*, Milan, 1931, p. 90. G. de Angelis d'Ossat (*BOLLETTINO D'ARTE*, XLI, 1956, p. 207 ff.) has revised many of the dates of the building history and also reaffirmed Bramante's authorship. It should be mentioned that the dome raised above the semi-circle is of later date (1606-17). The interior walls are white and the windows are in the upper tier.

78 Cf. W.B. Dinsmoor, 'The Literary Remains of Sebastiano Serlio', *ART BULLETIN*, XXIV, 1942, p. 62 f.

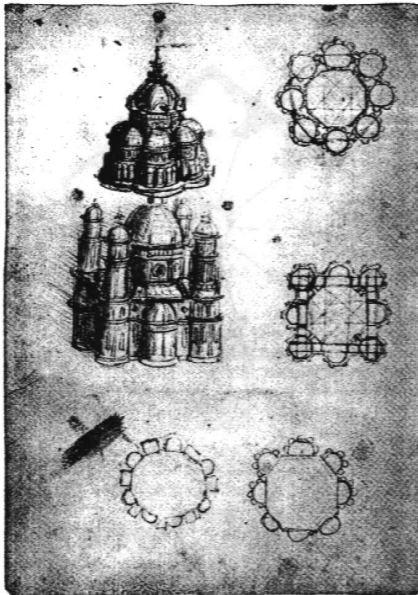
Alberti's and Francesco di Giorgio's works.⁷⁰ There is also that one sentence in which he peremptorily demands that 'a building should always be detached on all sides so that its true form may be seen'.⁷¹ This sentence discloses the same crystalline vision of architecture, the same devotion to pure geometry which we found in Alberti, and it may well reflect a direct influence of the *De re aedificatoria*. If Vasari's report is true that Leonardo meant to lift the Baptistery of Florence and set it on a base⁷² – and the extravagance of the project seems to vouch for it – he must have intended to comply with Alberti's demand that a church should be isolated from, and raised above, the surrounding everyday life, a principle to which Leonardo adhered in all his designs.

If we can infer from all this that Leonardo's ideas agreed with those of Alberti, his drawings are cumulative evidence of that community of spirit: they appear indeed like illustrations to Alberti's theories. These drawings for centralized churches,⁷³ which demonstrate every possible evolution of the square and the circle, from the simplest to the most complex configurations (Fig. 12),⁷⁴ never deviate from the principle of lucid grouping of elementary geometrical forms, and this basic geometry loses nothing of its clarity and effectiveness in the elevations. In an example such as that in Fig. 13⁷⁵ we can see in its unadulterated form the pure cube of the main body with the inscribed circle of the drum, the semi-sphere of the dome and the attached semi-circular chapels. In all his drawings, satellite domes and chapels accompany, and lead up to, the pure and simple form of the dominating central dome under which 'the soul rises to the contemplation of God'.

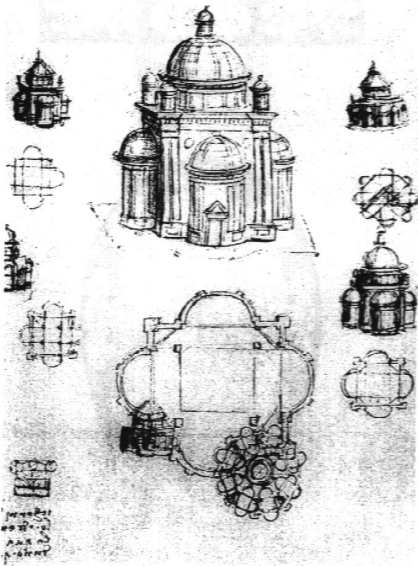
Such plans, organically composed and built up of simple geometrical forms, were more often executed than is generally realized. The creation closest to the ideal plans by Leonardo is perhaps S. Maria della Consolazione at Todi⁷⁶ which looks almost as if it had been based on the design just discussed (Fig. 14), and the crystalline quality of the geometrical pattern is here as evident as it was on paper. The church was begun by Cola da Caprarola in 1504, not from a design by Leonardo, but probably from one by Bramante⁷⁷ – one of the many proofs of the closeness of their views on architecture.

If Cesariano expressed opinions current in Milan in Bramante's and Leonardo's days, Serlio reflects Roman ideas of the beginning of the sixteenth century. It is well known that Serlio's books on architecture, which appeared from 1537 onwards, were based on material left by his great master Peruzzi.⁷⁸ Serlio's work is pedestrian and pragmatic, consisting of a collection of models rather than expressions of principle, and we cannot expect to find here any of Alberti's philosophical concepts. Yet Serlio's survey of suitable plans for churches is significant. He suggests in all twelve basic shapes: 'I begin', he says, 'with the circular form because it is more perfect than all the others.'⁷⁹ Of his twelve plans nine are developments from the circle and square (Fig. 15)⁸⁰ and only three are longitudinal. Apart from two types of circular churches, he recommends the pentagon, hexagon, octagon, the square with inscribed octagon and the square with inscribed circle and circular chapels, the Greek Cross and also the oval. This latter form, though also derived from the circle, suggests an axial direction from entrance to choir and heralds therefore a new approach to ecclesiastical architecture.⁸¹

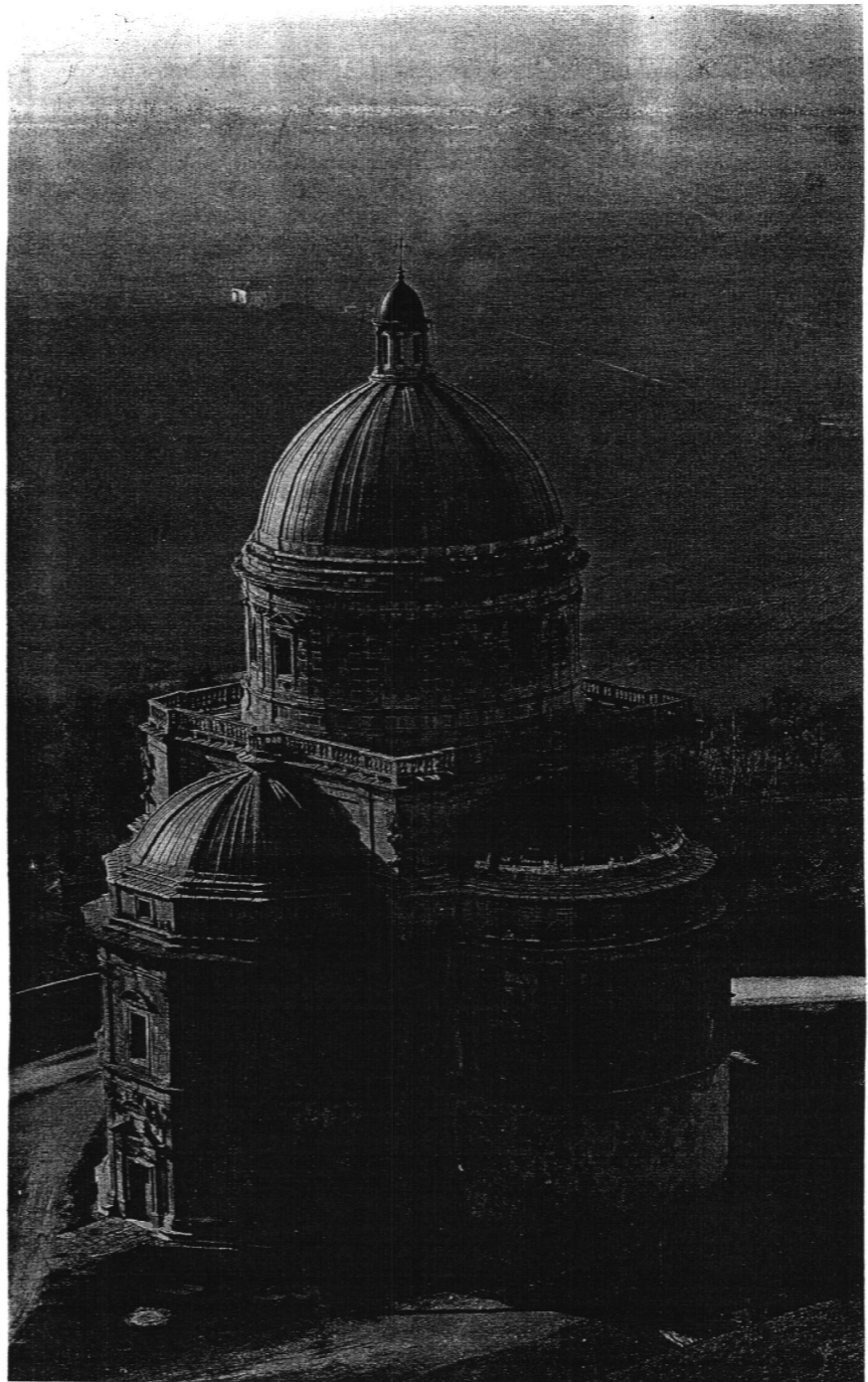
Serlio in fact is still concerned with almost exactly the same problems which we found in Alberti and the Milanese circle, and this is not astonishing if we



12. Leonardo da Vinci. Designs of churches

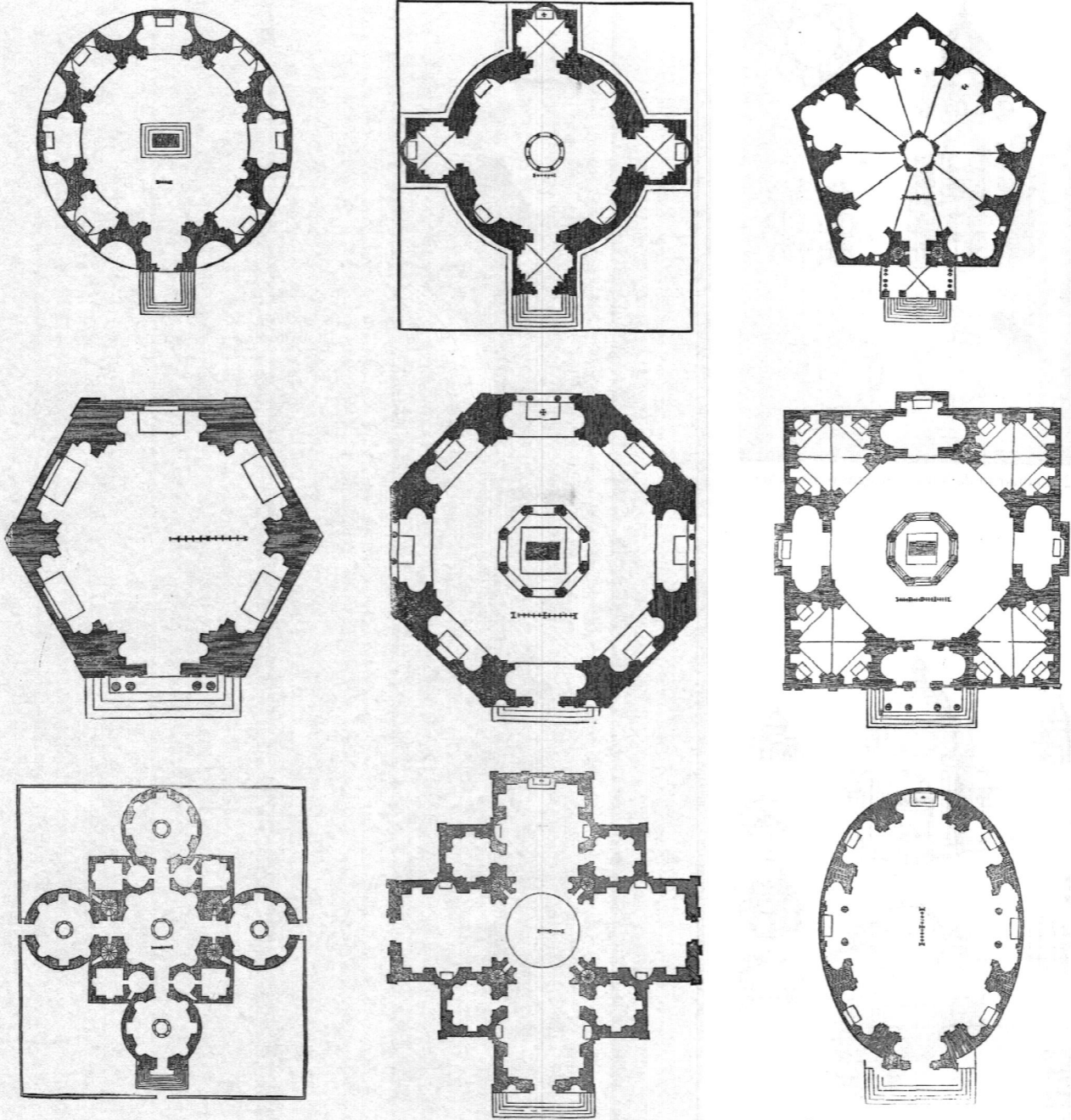


13. Leonardo da Vinci. Designs of churches



14. S. Maria della Consolazione, Todi, 1504

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM



15. Centralized plans. From Serlio's *Fifth Book on Architecture*, 1547

remember that Bramante settled permanently in Rome shortly before 1500. But already towards the end of the fifteenth century the handing on of these ideas was no longer due to personal relations and influences alone; they had become common property, and the rigid geometry of centralized buildings had an emotional appeal not only to architects but also to sculptors and painters.⁸³ And a study of any architectural sketch-book of the period from the Codex Escurialensis⁸³ to Giuliano da Sangallo's⁸⁴ and Bramantino's sketch-books,⁸⁵ and even of the engravings of the rather belated Montano,⁸⁶ leads one forcibly to the conclusion that the geometry of the circle had an almost magical power over these men.

3. Building Practice: S. Maria delle Carceri

Building activity reflects the theoretical position. Centralized churches began to appear sporadically in the first half of the fifteenth century. The great Brunelleschi set the example in 1434 with his plan for S. Maria degli Angeli in Florence. In 1451 followed Michelozzo's choir for the SS. Annunziata. For S. Francesco in Rimini Alberti designed 'the dome of heaven to which the whole argument of the Tempio aspired'.⁸⁷ While this magnificent dome remained forever a wish-dream, he carried out the much more modest church of S. Sebastiano at Mantua over a square plan with attached rectangular chapels (Fig. 41), a plan prefiguring the later development of the Greek Cross.⁸⁸ In the last quarter of the century the examples become more numerous, particularly in northern Italy,⁸⁹ until before and after 1500 we observe a real profusion of centralized structures.⁹⁰

Those churches whose character has not been changed by later alterations show that Alberti's postulates were regarded as binding. As an example one might quote Giuliano da Sangallo's S. Maria delle Carceri at Prato, begun in 1485 (Figs. 16-19). This church is the first Greek-Cross structure of the Renaissance, built on that plan which ideally combines the centralizing aspirations of the time with the symbolical reference to the form of the Cross.⁹¹ Four short and equal arms are joined to the crossing which—as the plan shows—is based on the two elementary figures of square and circle. The ratios are as simple and therefore as evident as possible. The depth of the arms, for instance, is half their length and the four end walls of the cross are as long as they are high, i.e. they form a perfect square.⁹² The entirely flat and plain surface of the walls and arches is framed by pilasters and simple mouldings in the joints of the building, where two surfaces meet. This structural skeleton is built in dark sandstone (pietra serena), while the walls themselves are given a white coat. Thus the dark articulations together with the white walls enhance the lucidity of the geometrical scheme. Above the entablature which runs unbroken round the whole building rise the semi-circles of the arches with the windows set into them. And above the low drum hovers the dome, again of semi-circular shape. It is important to notice that the dark ring of the drum does not touch the mouldings of the arches. The dome, the image of the sky, seems therefore magically suspended in the air as if it had no weight (Fig. 17).

Outside, the whole church is raised on a platform and is faced with white limestones slabs which are divided into geometric units by dark green framing bands.⁹³ Viewed from a certain distance the circle of the dome, the square of the

79 Serlio, *Quinto libro d'architettura*. In the edition of 1600, p. 202.

80 These nine plans on consecutive pages of Serlio's book have been grouped together in our Fig. 15. R. Billing, 'Die Kirchenpläne "al modo antico" von Sebastiano Serlio', *Opuscula Romana* (Acta Instituti Romani Regni Sueciae, series in 4°, XVIII), I, 1954, pp. 21-38, investigated the relation of Serlio's centrally planned churches to ancient prototypes.

81 Cf. now W. Lotz, 'Die ovalen Kirchenräume des Cinquecento', *RÖMISCHES JAHRBUCH FÜR KUNSTGESCHICHTE*, VII, 1955.

82 Cf. M. Ermers, *Die Architekturen in Raffaels Gemälden*, 1909; Fiske Kimball, 'Luciano Laurana and the "High Renaissance"', *ART BULLETIN*, X, 1927, p. 140 f.

83 H. Egger, *Codex Escurialensis*, Vienna, 1906. The group of circular buildings mainly between folios 70 and 75, all after the antique.

84 C. Hülsen, *Il libro di Giuliano da Sangallo*, Leipzig, 1910.

85 Angelo della Croce, *Le Rovine di Roma*, 1880.

86 G.B. Montano, *Scielta di varii tempietti antichi*, Rome, 1624.

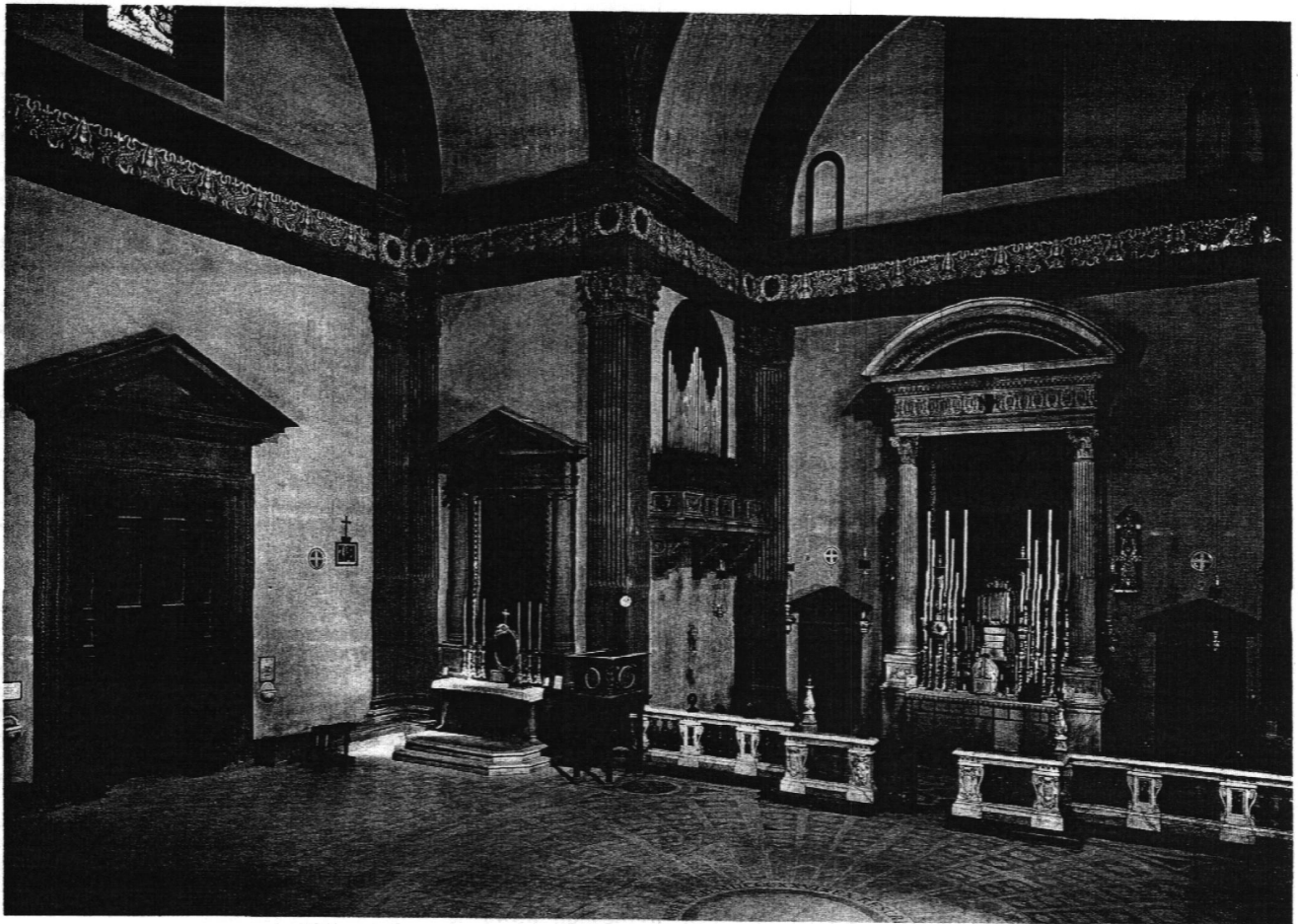
87 Charles Mitchell, 'The Imagery of the Tempio Malatestiano', *STUDI ROMAGNOLI*, II, 1951, p. 90.

88 For the reconstruction of the interior, cf. the drawing referred to below, p. 53, note 60.

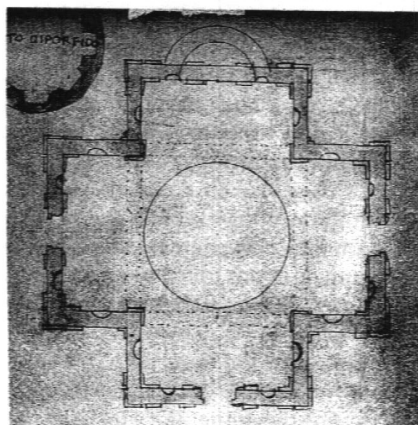
89 As we are concerned with an interpretation and not a history of centralized building we omit a discussion of the genetic derivation of centralized planning. We also omit from the following list centrally built fifteenth-century chapels and sacristies which had an important bearing on the development of centralized church design. Dates in brackets refer to the beginning of the construction: S. Maria delle Carceri, Prato (1485); Incoronata, Lodi (1488); S. Maria de' Miracoli, Brescia (1488); S. Maria della Croce, Crema (1490); S. Maria di Canepanova, Pavia (1492?); S. Maria Maggiore, Orciano near Urbino (1492); S. Maria dell'Umiltà, Pistoia (1495).

90 S. Giovanni Crisostomo, Venice (1497); Santuario, Saronno (1498, with later nave); S. Maria della Passione, Milan (1501, with later nave); Tempietto, S. Pietro in Montorio, Rome (1502); S. Magno, Legnano (1504); S. Maria della Consolazione, Todi (1504); Bramante's St. Peter's (1506); S. Giovanni Battista, Ferrara (1506); S. Maria di Loreto, Rome (1507?); Chiesa degli Innocenti, Siena (1507); S. Eligio degli Orefici, Rome (1509); Madonna di Vico near Spello (1517); Madonna di S. Biagio, Montepulciano (1518); S. Maria di Piazza, Busto Arsizio (1518); Cathedral Montefiascone (1519); S. Spirito, Ferrara (1519); S. Croce, Riva S. Vitale (c. 1520); Madonna della Steccata, Parma (1521); Madonna di Campagna, Piacenza (1522); Chiesa della Madonna, Mongiovino (1524); Chiesa della Manna d'Oro, Spoleto (1527); Cappella Pellegrini, S. Bernardino, Verona (1527-8); Cf. above all H. Strack, *Central- und Kuppelkirchen der Renaissance in Italien*, Berlin, 1882; P. Laspeyres, *Kirchen der Renaissance in Mittelitalien*, Berlin, 1882; Geymüller, *Die*

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM



16, 17. Giuliano da Sangallo. S. Maria delle Carceri, Prato, 1485: (above) interior view, (below) plan (from the 'Taccuino')



crossing and the Greek Cross of the arms appear as spatial evolutions of one geometrical concept.

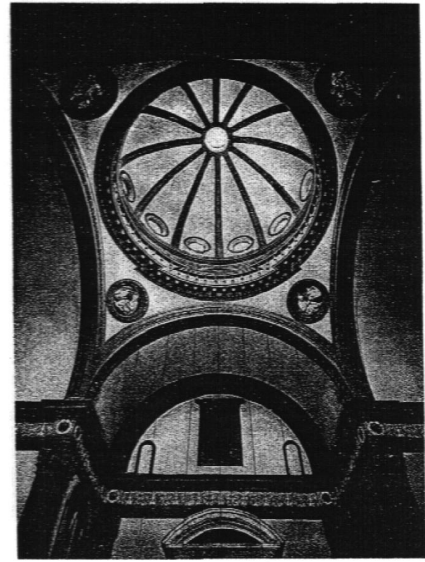
This short description of S. Maria delle Carceri may have recalled to the reader Alberti's theoretical demands and shown that Giuliano da Sangallo complied with them. The church, standing here like a precious jewel, is conceived, as it were, in Alberti's spirit. Its majestic simplicity, the undisturbed impact of its geometry, the purity of its whiteness are designed to evoke in the congregation a consciousness of the presence of God – of a God who has ordered the universe according to immutable mathematical laws, who has created a uniform and beautifully proportioned world, the consonance and harmony of which is mirrored in His temple below.

4. Bramante and Palladio

Of all this we find a final and comprehensive statement in the work of the last of the great humanist architects, Palladio. The importance of his clearly arranged and lucidly written treatise, published in 1560, is comparable only with Alberti's work written more than a hundred years earlier. There is in fact a close relationship between the two treatises; for much of Palladio's thought and sometimes even his phrasing derive from Alberti.⁹¹ Nevertheless in his economical style and with the humanist experience of four generations behind him, Palladio can often express with precision ideas which were only loosely implied by Alberti. He introduces a new clarity.

Like most Renaissance artists, Palladio, following Alberti, subscribed to the mathematical definition of beauty: 'Beauty will result from the beautiful form and from the correspondence of the whole to the parts, of the parts amongst themselves, and of these again to the whole; so that the structures may appear an entire and complete body, wherein each member agrees with the other and all members are necessary for the accomplishment of the building',⁹² a formulation which closely follows Vitruvius' definition of 'symmetria'.⁹³ Moreover, Palladio expressed in his Fourth Book on Temples many views which stem directly from Alberti: buildings in which the supreme Being is invoked and adored should stand in the most noble part of the city, on beautiful piazzas, raised above the rest of the city. To ascend to a temple by steps inspires us with devotion and awe. Such places of worship should be of the highest perfection; they ought to be built so that nothing more beautiful could be imagined and those who enter should be transported into a kind of ecstasy in admiring their grace and beauty. Buildings dedicated to the omnipotent God should be strong and everlasting. And in order to honour divinity as much as possible, the most beautiful orders and the most excellent and precious materials should be used. White is the colour for churches, for as the colour of purity it is most akin to God. Nothing in a temple should distract the mind from the contemplation of the Divine, and the decoration should inflame us to the service of God and good works.⁹⁴ So far there is complete correspondence with Alberti's ideas.

But Palladio goes on to explain more fully what Alberti only adumbrates. For he states authoritatively which form is most worthy for the house of God. 'The most beautiful and most regular forms' – he says – 'and from which the others receive their measure are the round and the quadrangular.' And of these two he singles out the round form 'because it is the only one among all the figures that is



18. S. Maria delle Carceri, Prato. Dome

ursprüngl. Entwürfe, op. cit., p. 10 ff. and passim; Malaguzzi Valeri, *La corte di Lodovico il Moro*, Vol. II.

91 Two studies for the Madonna della Carceri, attributed by Geymüller to Giuliano da Maiano (*Architektur der Renaissance in Toscana*, Vol. XI, Figs. 33, 34) are pure octagons.

92 For more details about the proportion cf. Geymüller, *ibid.*, Vol. V, p. 8.

93 The exterior remained unfinished. The history of the building is fully discussed in Giuseppe Marchini, *Giuliano da Sangallo*, Florence, 1942, p. 87.

94 This can escape nobody who reads the beginning of Palladio's Fourth Book. Cf. below, pp. 64, 108, 109.

95 Bk. I, chap. 1.

96 I, ii, 4.

97 These sentences are an epitome from the preface and chapters i and ii of Palladio's Fourth Book.

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM



19. S. Maria delle Carceri, Prato. Exterior

simple, uniform, equal, strong, and spacious. Therefore let us make our temples round.⁹⁸ The context in which this important passage occurs is on the conformity between the place of worship and the character of the particular god venerated in it, in other words on the old question of agreement between content and form. Vitruvius (I, 2) explains that the form of the temple should be 'analogous to the character of the divinity'; and, following him, Palladio comments that the ancients built the temples dedicated to Sun and Moon round, 'because they continually revolve round the world'; the same applies to temples dedicated to Vesta, Goddess of the Earth, 'which we know is a round body'. Thus for Palladio the particular fitness of the circle for churches consists in the fact that 'it is enclosed by one circumference only, in which is to be found neither beginning nor end, and the one is indistinguishable from the other; its parts correspond to each other and all of them participate in the shape of the whole; and moreover every part being equally distant from the centre such a building demonstrates extremely well the unity, the infinite essence, the uniformity and the justice of God'.⁹⁹ If we add to this remarkable passage Palladio's statement on the macrocosm-microcosm relation between the universe and the temple – 'We cannot doubt, that the little temples we make, ought to resemble this very great one, which, by His immense goodness, was perfectly completed with one word of His'¹⁰⁰ – we have an epitome of what Renaissance church builders endeavoured to achieve: for them the centrally planned church was the man-made echo or image of God's universe and it is *this* shape which discloses 'the unity, the infinite essence, the uniformity and the justice of God'.

These last words provide the key to the whole concept, for they lead us back to Plato's *Timaeus*, where Plato describes in words, which Palladio directly or indirectly borrowed from him,¹⁰¹ the world as a sphere 'equidistant every way from centre to extremity, a figure the most perfect and uniform of all' so that the world which the Demiurge brought into being 'was a blessed God'. The Renaissance conception of the perfect church is rooted in Plato's cosmology. Earlier writers had adumbrated more or less clearly the Platonic substance of their thought and it is this knowledge that enables us fully to appreciate the strength which prompted the aesthetic aspirations of a whole century, since Alberti's day, as well as the persistence with which the centralized form was advocated for churches.

Palladio's Fourth Book from which we have quoted consists of measured drawings and descriptions of ancient temples which – even by modern standards – are not unsound. Although he shows, apart from the Pantheon and the Vesta temples in Rome and Tivoli, a few centralized structures which were then believed to have been temples in antiquity,¹⁰² the impression one carries away is that the standard type of the ancient temple had a rectangular *cella*. Thus his introduction culminating in the praise of the round temple is a challenge to his contemporaries rather than the result of an analysis of ancient temple architecture. This can be illustrated by a curious interpolation in Palladio's survey of classical temples. He shows half-way through the book the plan and elevation of Bramante's Tempietto in Rome and explains in the text: 'Since Bramante was the first who brought good and beautiful architecture to light, which from the time of the ancients to his day had been forgotten, it seemed to me reasonable that his work should have a place among the ancients.' Bramante's Tempietto (Fig. 20) appears here as visible evidence for Palladio's programme. This circular

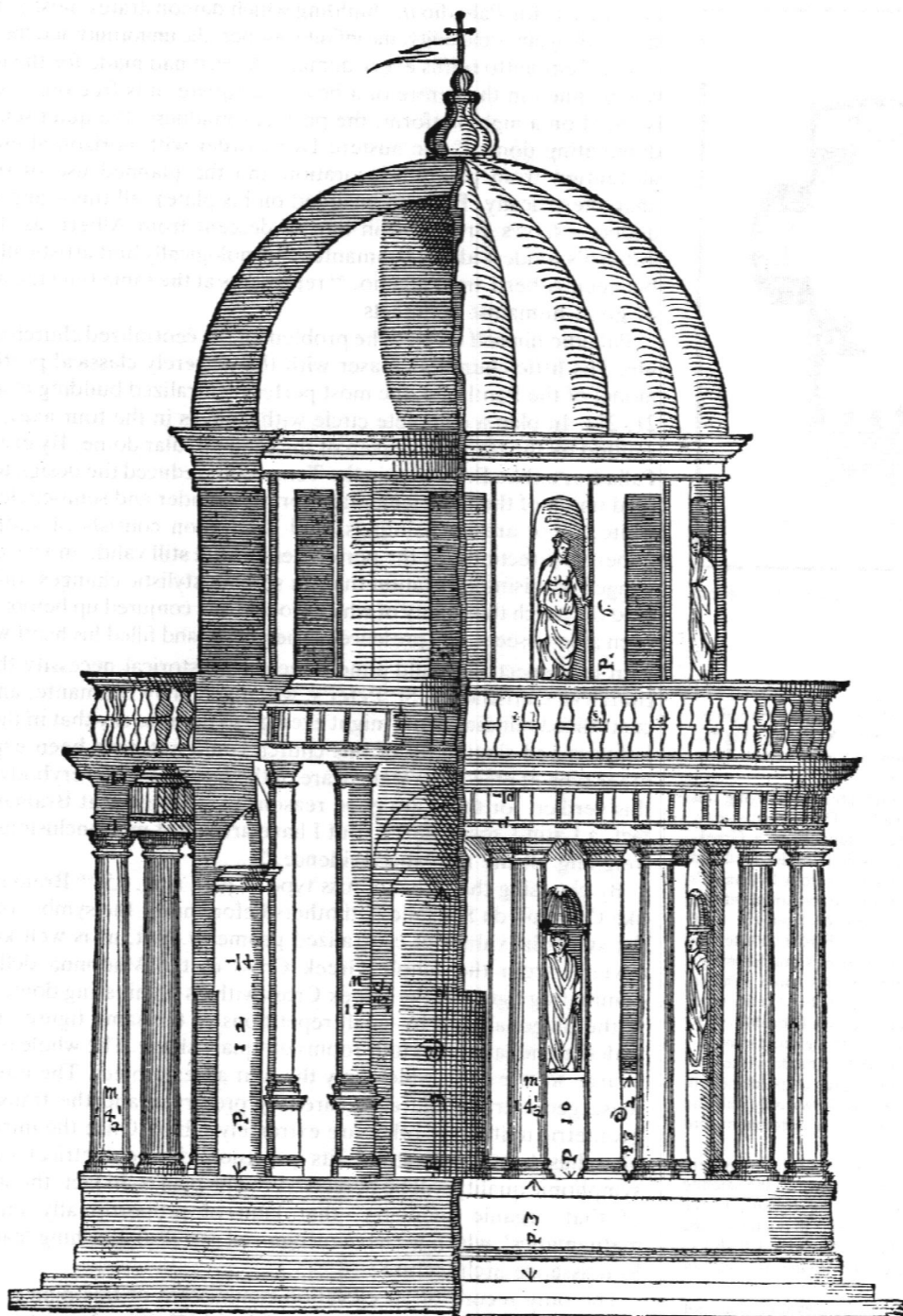
98 *ibid.*, chap. ii.

99 *ibid.* Attention to this passage was first drawn by Anthony Blunt, *Artistic Theory in Italy*, 1450-1600, Oxford, 1940, p. 129.

100 Bk. IV, Preface. The whole passage runs as follows: 'E veramente considerando noi questa bella machina del Mondo di quanti meravigliosi ornamenti ella sia ripiena, & come i Cieli co'l continuo lor girare vadino in lei le stagioni secondo il natural bisogno cangiando, & con la soauissima armonia del temperato lor mouimento se stessi conseruino non possiamo dubitare, che douendo esser simili i piccioli Tempj, che noi facciamo; à questo grandissimo dalla sua immensa bontà con vna sua parola perfettamente compiuto, non siamo tenuti à fare in loro tutti quelli ornamenti, che per noi siano possibili.'

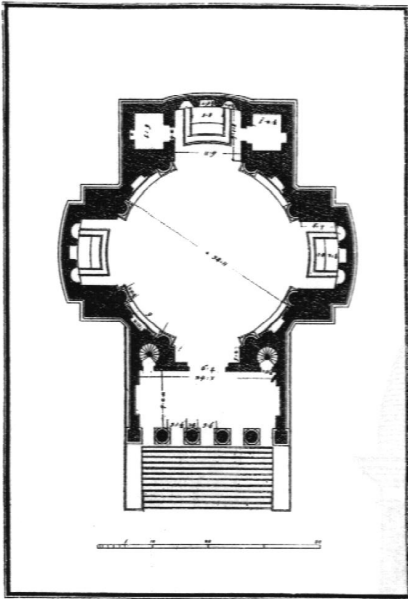
101 *Timaeus*, 33 B ff. The knowledge of this passage may have reached Palladio with the broad current of Renaissance Platonism.

102 Bk. IV, p. 37: the Minerva Medica as 'Tempio vulgarmente detto le Galluce'; p. 59: Baptistery of Constantine: 'Questo Tempio per mia opinione è opera moderna fatta delle spoglie de edificij antichi'; p. 83: S. Constanza: 'Io credo, ch'egli fosse una sepoltura'; others believed that it was a temple of Bacchus (see e.g. Serlio, Bk. III, fol. 56v), 'e perchè questa è la commune opinione, . . . io l'ho posto infra i tempj'; p. 86: Sepulchral temple of Romulus, son of Maxentius, near S. Sebastiano fuori le Mure, not named by Palladio.



20. Bramante's Tempietto. From Palladio's *Quattro Libri*, Venice, 1570

ARCHITECTURAL PRINCIPLES IN THE AGE OF HUMANISM



21. Palladio's Church at Maser. Plan. From Bertotti Scamozzi

103 The lantern is, of course, of later date. For Bramante's original intention cf. his drawing, illustrated in Venturi, *STORIA DELL'ARTE*, XI, I, Fig. 62.

104 For Bramante's formative influence on Palladio cf. Part III, p. 75 ff.

105 I have to resist the temptation of laying this evidence before the reader. Three points may, however, be mentioned in support of a Greek-Cross design: (1) Michelangelo later declared that all the architects who departed from Bramante's plan (to which he, Michelangelo, returned with his Greek-Cross plan) had departed from the truth (letter to Ammanati, 1555); (2) Egidio da Viterbo's contemporary report which proves that Bramante had centralized concepts on his mind (Pastor, *History of the Popes*, III, 2, p. 1140); (3) the spate of later Greek-Cross churches would be difficult to account for without Bramante's great example.

106 The plan here illustrated is a modern interpretation of Bramante's famous plan on parchment in the Uffizi (Florence), which shows only half the design and would also permit a different reconstruction.

107 A few of the most important ratios may here be given. The main dome is related to the satellite domes as 2:1; the arches of the crossing to the arches of the arms as 2:1; the diameter of the crossing to the length of the arms as 1:1. Cf. also T. Hofmann, *Entstehungsgeschichte des St. Peter in Rom*, 1928, p. 66.

108 It will be noticed that the elevation does not entirely correspond to the plan.

structure is for Palladio *the building which demonstrates most perfectly – to use his words again – 'the unity, the infinite essence, the uniformity and the justice of God.'*

The Tempietto fulfils every demand Alberti had made for the ideal church; it was planned in the centre of a beautiful square, it is free on all sides, it stands isolated on a high platform; the perfect roundness, the quiet semi-circle of the dominating dome,¹⁰³ the austere Doric order with horizontal entablature, the abstention from painted decoration and the planned use of statues (which, characteristically, Palladio included on his plate): all this – and more could be added – shows Bramante in line of descent from Alberti as the executor of Alberti's fondest ideas. Bramante, chronologically and artistically the mediator between Alberti and Palladio,¹⁰⁴ represents at the same time the apex of this trio of great humanist architects.

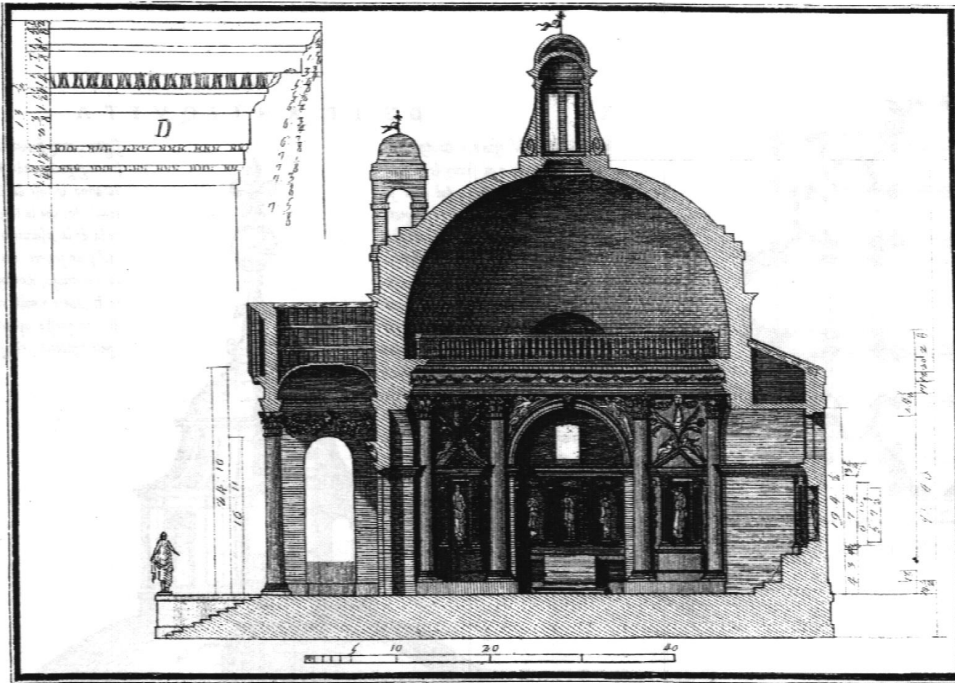
Palladio himself tackled the problem of the centralized church at the end of his life. His little church at Maser with the austere classical portico follows the model of the Pantheon, the most perfect centralized building of antiquity (Figs. 21, 22). In plan a complete circle with chapels in the four axes, the cylinder is vaulted by the tranquil heaven of the semi-circular dome. By excluding a drum, Palladio, unlike Bramante in the Tempietto, reduced the design to an unadulterated union of the two elementary forms, cylinder and semi-circle. The walls are white, there are no paintings, and decoration consists of statuary (Fig. 24). Alberti's directions for the perfect temple are still valid, and we can say without danger of misinterpretation that, in spite of stylistic changes, this is exactly the kind of church the beauty of which would have conjured up before Alberti, had he been able to see it, the presence of the Divine and filled his heart with deep piety.

In retrospect, it would almost seem an historical necessity that the mother church of Christianity, St. Peter's, was planned by Bramante, and planned as a centralized building. One might even go so far as to say that in the year 1505 the holiness and singularity of this church could not have been expressed by any other type of plan. I am well aware of the fact that not everybody will agree with this verdict, for there are good reasons to presume that Bramante planned, in fact, a Latin-Cross Church. But I have arrived at my conclusions after carefully weighing all the available evidence.¹⁰⁵

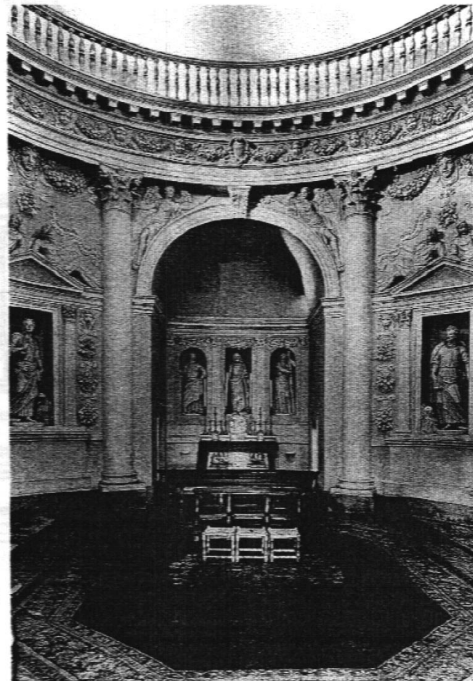
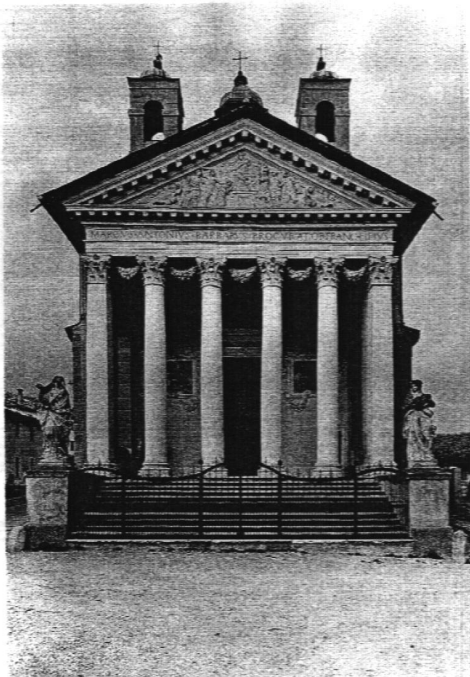
By choosing the Greek-Cross type of plan (Fig. 25)¹⁰⁶ Bramante combined – like Giuliano da Sangallo and others before him – the symbol of the Cross with the symbolic values of centralized geometry. But, as is well known, this plan deviates from the simple Greek Cross of the Madonna delle Carceri. The dominating figure of the Greek Cross with its dominating dome is accompanied in the diagonal axes by small repetitions of the same figure, and to these are added in the same axes four rooms of square shape. The whole is confined within a large square from which only the four apses project. The integrity of each of these geometrical figures is carefully preserved and the transitions from one geometric unit to the other are extremely subtle. Once the intrinsic logic of the plan has been understood, its precision, its geometrical economy and its symphonic quality will be perceived.¹⁰⁷ The plan is, in fact, the supreme example of that organic geometry, that kind of proportionally integrated 'spatial mathematics', which we have recognized as a distinguishing feature of humanist Renaissance architecture.

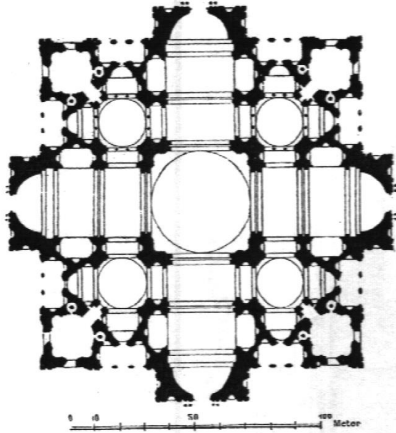
The only record of an elevation reminiscent of this plan is to be found on Caradosso's famous foundation medal of 1506 (Fig. 26).¹⁰⁸ Here the dominant

THE CENTRALLY PLANNED CHURCH



22-24. Church at Maser: (above) section (from Bertotti Scamozzi), (below left) façade, (below right) view of altar



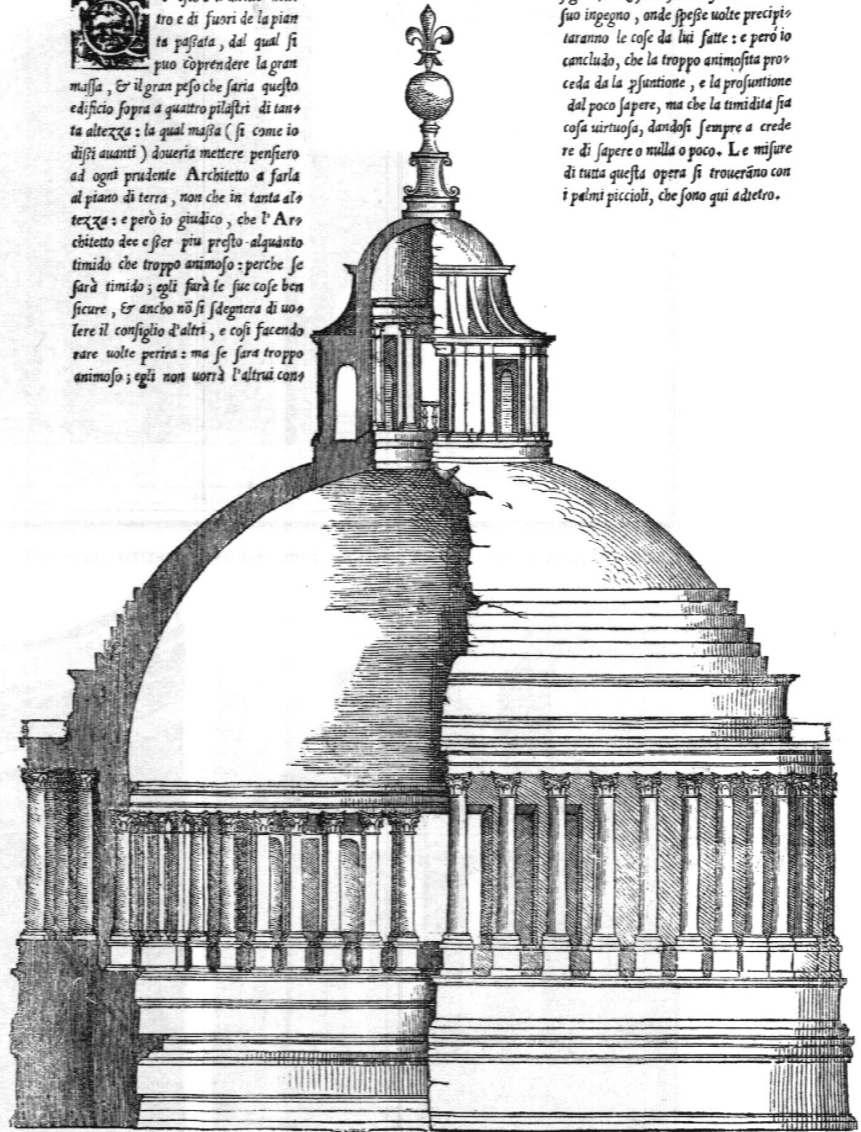


25. Bramante's plan of St. Peter's, Rome

XL DE LE ANTIQVITA

V esto è il diritto dentro e di fuori de la pianta passata, dal qual si può cōprendere la gran massa, Et il gran peso che sarà questo edificio sopra a quattro pilastri di tanta altezza: la qual massa (si come io di si auanti) doueria mettere pensiero ad ogni prudente Architetto a farla al piano di terra, non che in tanta altezza: e però io giudico, che l'Architetto dee esser più presto alquanto timido che troppo animoso: perché se farà timido; egli farà le sue cose ben sicure, Et ancho nō si sdegnera di uolare il consiglio d'altri, e così facendo rare uolte perira: ma se sarà troppo animoso; egli non uorrà l'altra cons

figlio, anzi si considera solamente nel suo ingegno, onde spesso uolte precipitaranno le cose da lui fatte: e però io concludo, che la troppo animosità proceda da la p̄suntione, e la p̄suntione dal poco sapere, ma che la timidità sia cosa uirtuosa, dandosi sempre a credere di sapere o nulla o poco. Le misure di tutta questa opera si trouerāno con i palmi piccioli, che sono qui adietro.

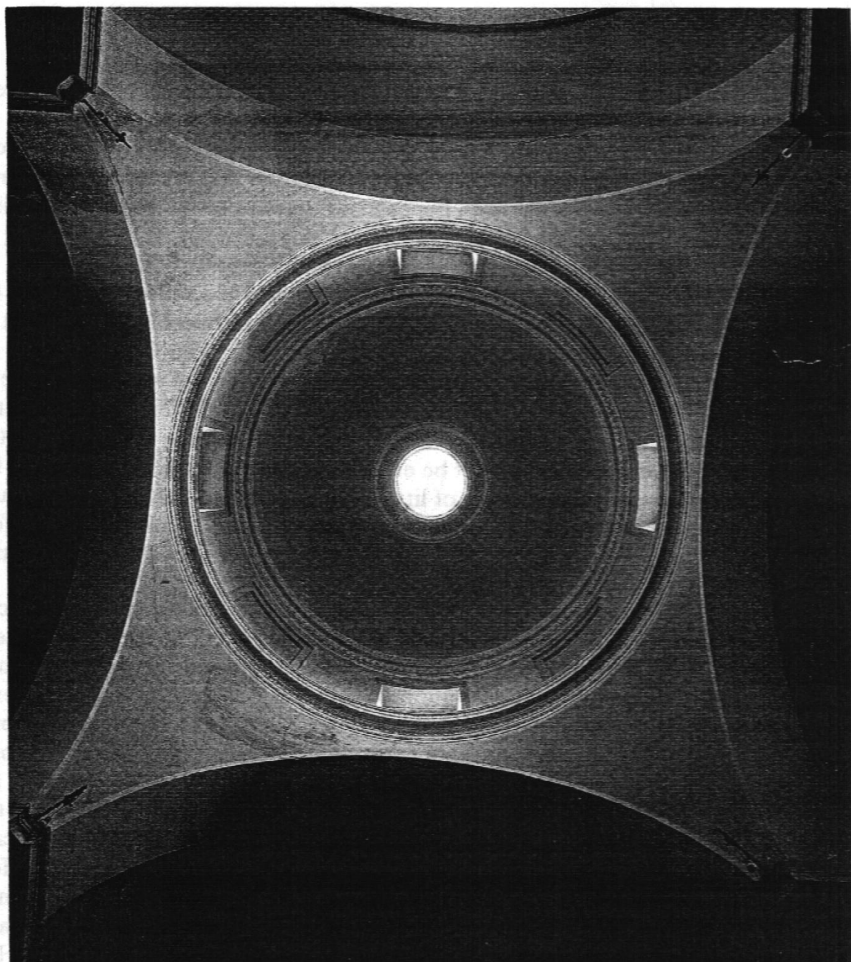


27. Bramante's Dome of St. Peter's. Woodcut from Serlio



26. Bramante's St. Peter's. Foundation medal by Caradosso, 1506

THE CENTRALLY PLANNED CHURCH



28. Raphael. S. Eligio degli Orefici, Rome.
View into dome

rôle of the dome is manifest, and the whole sub-structure appears to lead up to it. This church was to be crowned with the loftiest dome, an overwhelming image of the macrocosm. Its form, which we know from Serlio's woodcut (Fig. 27),¹⁰⁹ was to consist of the pure cylinder of the drum surmounted by the undisturbed and entirely balanced semi-sphere of the vault – the whole a monumental and simplified re-creation of Bramante's own Tempietto. It is this serenity of the structure expressed through the divine stillness of the geometry of the circle which leads man to God.

Although Bramante's plan underwent many and decisive changes, it remained a tremendous stimulus to architects all over Italy, and churches with the high dome over the Greek Cross rose everywhere.¹¹⁰ Raphael himself followed the lead in the little church of S. Eligio degli Orefici in Rome (Fig. 28), which in its pure whiteness, its austerity of forms, and the abstract clarity of its geometrical scheme combines the expression of the religious feeling of the Renaissance with that of the Counter-Reformation.¹¹¹

109 *Libro terzo*; in the edition of 1600, fol. 66v.
110 Cf., above all, Steccata, Parma; Madonna di Campagna, Piacenza; Chiesa della Madonna, Mongiovine; S. Maria Nuova, Cortona; S. Maria di Carignano, Genova; S. Maria della Vergine, Macerata; Madonna della Ghiara, Reggio; Cathedral, Brescia; S. Carlo ai Catinari, Rome.
111 Documents permit the conclusion that Raphael's design was adjusted and executed by Peruzzi. The dome was not finished until 1536. After 1600 Flaminio Ponzio was responsible for some important changes (1601-5); he also gave the interior its white coating; see Zocca, in *Atti P Congresso Nazionale di storia dell'architettura*, 1938, p. 102 ff.

5. The Religious Symbolism of Centrally Planned Churches

Renaissance artists firmly adhered to the Pythagorean concept 'All is Number' and, guided by Plato and the neo-Platonists and supported by a long chain of theologians from Augustine onwards, they were convinced of the mathematical and harmonic structure of the universe and all creation.¹¹² If the laws of harmonic numbers pervade everything from the celestial spheres to the most humble life on earth, then our very souls must conform to this harmony. It is, according to Alberti, an inborn sense that makes us aware of harmony;¹¹³ he maintains, in other words, that the perception of harmony through the senses is possible by virtue of the affinity of our souls. This implies that if a church has been built in accordance with essential mathematical harmonies, we react instinctively,¹¹⁴ an inner sense tells us, even without rational analysis, when the building we are in partakes of the vital force which lies behind all matter and binds the universe together. Without such sympathy between the microcosm of man and the macrocosm of God, prayer cannot be effective. A writer like Pacioli goes so far as to say that divine functions are of little value if the church has not been built 'with correct proportions' ('con debita proportione').¹¹⁵ It follows that perfect proportions must be applied to churches, whether or not the exact relationships are manifest to the 'outward' eye.

The most perfect geometrical figure is the circle and to it was given special significance. To understand fully this new emphasis we must turn for a moment to Nicholas of Cusa who had transformed the scholastic hierarchy of static spheres, of spheres immovably related to one centre, the earth, into a universe uniform in substance and without a physical or ideal centre.¹¹⁶ In this new world of infinite relations the incorruptible certitude of mathematics assumed unprecedented importance. Mathematics is for Cusanus a necessary vehicle for penetrating to the knowledge of God, who must be envisaged through the mathematical symbol. Cusanus, developing a pseudo-hermetic formula,¹¹⁷ visualizes Him as the least tangible and at the same time the most perfect geometrical figure, the centre and circumference of the circle;¹¹⁸ for in the infinite circle of sphere, centre, diameter and circumference are identical.¹¹⁹ Similarly Ficino, based on the authority of hermetic sources and on Plotinus, regards Him as the true centre of the universe, the inner core of everything, but at the same time as the circumference of the universe, surpassing everything immeasurably.¹²⁰

Renaissance architects were aware of all this. Their own treatises leave not a shadow of doubt. We do not maintain that all or even many of them were familiar with the intricacies of philosophical speculation. But they were steeped in these ideas which, with the surge of Platonism and neo-Platonism in the fifteenth century, had spread quickly and irresistibly.

The geometrical definition of God through the symbol of the circle or sphere has a pedigree reaching back to the Orphic poets.¹²¹ It was vitalized by Plato and made the central notion of his cosmological myth in the *Timaeus*; it was given pre-eminence in the works of Plotinus and, dependent on him, in the writings of the pseudo-Dionysius the Areopagite, which were followed by the mystical theologians of the Middle Ages. Why then – it may still be asked – did not the builders of the cathedrals try to give visual shape to this conception; why was it not until the fifteenth century that the centralized plan for churches was regarded as the most appropriate expression of the Divine?¹²² The answer lies in the new

112 Cf. also below, Part IV.

113 Bk. IX, chap. 5, ed. 1485, fol. xviii v: 'Ut vero de pulchritudine iudices non opinio: verum animis innata quaedam ratio efficit . . . Unde autem is animi sensus excitetur et perdeat etiam non requiro funditus.' Also y iiiii v: 'Sed nature sensu animis innato quo sentiri diximus concinnitas . . .'

All Platonic thinkers and theologians agree that beauty can only be perceived by virtue of a correspondence between the structure of the soul and the harmony in the object. Cf. for instance Ficino, according to whom the soul 'possesses the images of the divine things on which it depends itself and the concepts and originals of the lower things which in a certain sense it produces itself.' Cf. Kristeller, *Marsilio Ficino*, 1943, p. 119 f.

114 The Renaissance theory of intuition, discussed by E. Gombrich in *JOURNAL OF THE WARBURG AND COURTAULD INSTITUTES*, XI, 1948, p. 170 f., is here relevant. See also the inborn judgment and its relation to the corporeal world in Cusanus' *liber de mente* (E. Cassirer, *Individuum und Kosmos in der Philosophie der Renaissance*, 1927, p. 222 ff., 226, 230 ff.).

115 *Summa de Arithmetica*, Venice 1494, dist. VI, tract. 1, artic. 2.

116 We believe that E. Cassirer's characterization of Cusanus' achievement (*Ind. und Kosmos*, chap. I) has not been seriously impaired by Duhem, Thorndike and others. The reader may also be referred to the symposium on fifteenth-century Italian science with contributions by Durand, Baron, Cassirer, Kristeller, Lockwood and Thorndike in *JOURNAL OF THE HISTORY OF IDEAS*, IV, 1943.

117 *Liber XXIV philosophorum*, propos. 2: 'Deus est sphaera infinita, cuius centrum est ubique, circumferentia nullibi'; cf. Nicolai de Cusa, *De docta ignorantia*, ed. E. Hoffmann and R. Klibansky, 1932, p. 104.

118 *ibid.*, Bk. I, chap. 12; II, chaps. 11, 12; pp. 25, 100, 101, 104.

119 *De docta ignor.* I, 21: 'Circulus est figura perfecta unitatis et simplicitatis . . . unitas est infinita, sicut circulus infinitus . . . Haec omnia

scientific approach to nature which is the glory of Italian fifteenth-century artists. It was the artists, headed by Alberti and Leonardo, who had a notable share in consolidating and popularizing the mathematical interpretation of all matter. They found and elaborated correlations between the visible and intelligible world which were as foreign to the mystic theology as to the Aristotelian scholasticism of the Middle Ages. Architecture was regarded by them as a mathematical science which worked with spatial units: parts of that universal space for the scientific interpretation of which they had discovered the key in the laws of perspective. Thus they were made to believe that they could re-create the universally valid ratios and expose them pure and absolute, as close to abstract geometry as possible. And they were convinced that universal harmony could not reveal itself entirely unless it were realized in space through architecture conceived in the service of religion.

The belief in the correspondence of microcosm and macrocosm, in the harmonic structure of the universe, in the comprehension of God through the mathematical symbols of centre, circle and sphere – all those closely related ideas which had their roots in antiquity and belonged to the undisputed tenets of mediaeval philosophy and theology, acquired new life in the Renaissance, and found visual expression in the Renaissance church. The man-created forms in the corporeal world were the visible materializations of the intelligible mathematical symbols, and the relationship between the pure forms of absolute mathematics and the visible forms of applied mathematics were immediately and intuitively perceptible. For the men of the Renaissance this architecture with its strict geometry, the equipoise of its harmonic order, its formal serenity and, above all, with the sphere of the dome, echoed and at the same time revealed the perfection, omnipotence, truth and goodness of God.

The realization of these ideas in the Renaissance church betrays by implication a shift in the religious feeling itself, a shift for which the change from the basilical to the centralized church is a more telling symbol than the changes in the philosophical interpretation of God and world. It should be remembered that the classical principle of analogy between form and content was never abandoned. The builders of the Middle Ages laid out their churches 'in modum crucis'¹²³ – their Latin-Cross plan was the symbolic expression of Christ crucified. The Renaissance, as we have seen, did not lose sight of this idea. What had changed was the conception of the godhead: Christ as the essence of perfection and harmony superseded Him who had suffered on the Cross for humanity; the Pantocrator replaced the Man of Sorrows.¹²⁴

* * * * *

Before concluding this chapter some points require further comment. First, polygonal and Greek-Cross churches are much more frequent than churches erected over circular plans. Even if one admits that, by virtue of the reference to the Cross, the Greek-Cross plan had a particular attraction, one may wonder about the contrast between the fervent eulogy of the circle and its restricted use in practice. But Alberti had demonstrated that all polygonal figures are derived from the circle and developed from it by simple operations (Fig. 1), and in his wake Palladio and others had emphasized that regular figures receive their measure from the round and quadrangular forms. Moreover, it was the dome

ostendit circulus infinitus sine principio et fine aeternus, indivisibiliter unissimus atque capacissimus. Et quia ille circulus est maximus, eius diameter etiam est maxima. Et quoniam plura maxima esse non possunt, est intantum ille circulus unissimus, quod diameter est circumferentia. Infinita vero diameter habet infinitum medium. Medium vero est centrum. Patet ergo centrum, diametrum et circumferentiam idem esse. Ex quo docetur ignorantia nostra incomprehensibile maximum esse, cui minimum non opponitur; sed centrum est in ipso circumferentia.' (ed. Hoffmann & Klibansky, 1932, p. 42 f.).

120 References are conveniently assembled in D. Mahnke, *Unendliche Sphäre und Allmittelpunkt*, Halle, 1937, p. 59 ff.

121 Cf. Mahnke, *op. cit.*

122 For the symbolism of round and polygonal churches in the early Middle Ages, cf. R. Krautheimer, 'Introduction to an "Iconography of Mediaeval Architecture"', *JOURNAL OF THE WARBURG AND COURTAULD INSTITUTES*, v, 1942, p. 9.

The impact of Greek scholars on the development of Renaissance architecture has never been investigated and would require a special study. In any case, there seems to be little doubt that the wholesale acceptance of the Greek Cross as a plan for churches belongs to the history of the Greek 'Invasion' of Italy during the fifteenth century.

123 Cf. J. Sauer, *Symbolik des Kirchengebäudes*, Freiburg i.B., 1924, p. 292.

124 Burckhardt expressed this idea in the beautiful last sentences of the *Civilisation of the Renaissance*: 'While the men of the Middle Ages look on the world as a vale of tears . . . here, in this circle of chosen spirits (i.e. the Renaissance Platonists), the doctrine is upheld that the visible world was created by God in love, that it is the copy of a pattern pre-existing in Him, and that He will ever remain its eternal mover and restorer. The soul of man can by recognizing God draw Him into its narrow boundaries, but also by love to Him itself expand into the Infinite – and this is blessedness on earth.' But it never occurred to Burckhardt to interpret Renaissance architecture as an expression of this new vision of God.

raised over the circle that epitomized the symbolism of the Renaissance church.

It has been argued persuasively¹²⁵ that High Renaissance architects shunned theory; in other words, that they were practitioners rather than thinkers. Since the great mass of centrally planned churches belong to the period 1490-1530 (see p. 29), we would have to conclude that their plans were devised from habit rather than conviction. It is impossible to affirm conclusively what goes on in a person's mind. Nor would one dare to determine the tenuous interrelation between architectural design and symbol with any degree of precision.¹²⁶ But it seems permissible to attribute the lack of architectural theory around 1500 to chance circumstances, and not to lack of theoretical interest. The material assembled by us on page 22 confirms it.

The reader may have noticed that many centralized Renaissance churches, though by no means all, are dedicated to the Virgin. The growing importance of the cult of the Virgin from late mediaeval times on is well known. In 1439 the Council of Basel encouraged the doctrine of the Immaculate Conception and in 1476 Pope Sixtus IV approved it.¹²⁷ The Reformation gave new impetus to Catholic mariological devotion. From very early times the Virgin was glorified as the Queen of Heaven and the protector of the whole universe, owing to the accretion of ideas around her burial, assumption, and coronation.¹²⁸ The martyrdom erected over her tomb, the heaven in which she is received, the crown of the heavenly Queen and the crown of stars of the *Immacolata*, the roundness of the universe over which she presides – all these interrelated ideas played their part in giving preference to centralized plans of sanctuaries and churches dedicated to the Virgin. After the foregoing it is not to be wondered at that Renaissance architects, attuned to the 'divine harmony' expressed by the perfect geometry of centralized plans, were particularly responsive to this symbolism. Moreover, there always was the connotation that it was she who had reared the Child.

125 James S. Ackerman, 'Architectural Practice in the Italian Renaissance', *JOURNAL OF THE SOCIETY OF ARCHITECTURAL HISTORIANS*, XIII, 1954, p. 4.

126 Very rarely do we have an architect's statement that allows us to make definite assertions. For a seventeenth-century case, see my papers in *JOURNAL SOC. ARCH. HIST.* XVI, 1957, p. 6, and in *SAGGIE MEMORIE DI STORIA DELL'ARTE*, III, 1962, 127. Emile Mâle, *L'art religieux de la fin du moyen âge*, Paris, 1931, pp. 198 ff., 209.

128 R. Krautheimer, 'Santa Maria Rotunda,' in *Arte del primo millennio. Atti del Convegno di Pavia*, 1950, p. 21 ff. See also Wittkower in *SAGGIE MEMORIE (op. cit.)*.

129 Ed. E. van Drival, Paris-Arras, 1885, chap. 2, p. 15 f.; cf. A. Blunt, *op. cit.*, p. 128 f.

130 Cf. also Pietro Cataneo, *I quattro primi libri di architettura*, Venice, 1554, fol. 35v ff., who demands that the cathedral should be dedicated to Christ crucified who died for mankind's redemption and that it should therefore be built in the form of the Latin Cross. But he allows centralized forms which are 'pleasing to the eye' for minor churches of a town. Cf. also the criticism in 1595 of the Greek Cross plan of St. Peter's by the Master of Ceremonies, Gio. Paolo Mucante, in M. Cerrati, *Tiberii Alpharani De Basilicae Vaticanae antiquissima et nova structura*, Rome, 1914, p. 24 f.

* * * * *

The new interpretation of religious architecture was soon to be challenged. Carlo Borromeo in his *Instructionum Fabricae ecclesasticae et Superlectilis ecclesiasticae Libri duo*¹²⁹ of about 1572, applied the decree of the Council of Trent to church building; for him the circular form was pagan and he recommended a return to the 'formam crucis' of the Latin Cross.¹³⁰ But even amongst those who were surrounded by the fanaticism of the Catholic reform, the humanist conception of the ideal church maintained a firm grip. In his Utopian city-state of the *Città del Sole*, published in 1623, Tommaso Campanella describes thus the principal church: 'The temple is perfectly round, free on all sides, but supported by massive and elegant columns. The dome, an admirable work, in the centre or "pole" of the temple . . . has an opening in the middle directly above the single altar in the centre . . . On the altar is nothing but two globes, of which the larger is a celestial, the smaller a terrestrial one, and in the dome are painted the stars of the sky.' In spite of the Counter Reformation centralized churches played a prominent part in seventeenth- and eighteenth-century architecture: the neo-Platonic mathematical interpretation of the universe had still a long lease of life.