

VITRUVIUS ON MODULE

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The reintroduction of modular coordination in modern architecture¹ revived the Vitruvian theory² on modular composition.

Vitruvius (1.2.2) teaches that "Order is a suitable disposition of members of a building and the coordination of modular sizes³ implying proportion for the single element and for the whole. It consists of dimensions, which are called *posotes* in Greek. Dimension itself is the determination of modules⁴ from the building proper and from individual parts of members which results conveniently to the whole building."

A detailed description of what is a *modulus* is offered by Vitruvius (1.2.4) in the following passage: "Modular sizes⁵ are a convenient coordination of members of the work itself and the corresponding appearance of the whole

¹ A short history of modular coordination since the Vitruvian *commodulatio* find in the paper by Mark Hartland Thomas, 'Modular coordination Hind-sight and Foresight' (*The Modular Quarterly* No 3, London 1967). See also Enzo Frateili, 'I tempi profetici e sagistici della coordinazione modulare (*Prefabbricare* XI/1, Milano 1968).

² There are many modern translations of Vitruvius. Though linguistically correct, they obscure the Vitruvius' modular and proportional theory with the use of terms which have changed or lost their original meaning, with the misinterpretation of the generic singular, and with the not understanding of the system of the Roman standard sizes.

³ *Comparatio ad symmetriam* is equivalent to our "coordination of sizes". See note 5.

⁴ *Modulorum sumptio* means "determination or selection of modules". Note

the plural! There are many modules to be determined in a building. Compare with the notes 6 and 8.

⁵ *Symmetria* means "modular sizes". cf *Graeci... modulorum mensuras* συμμετρίαν... *appellaverunt* meaning "Modular sizes were called *symmetria* by Greeks". The quotation is from M. Ceti Faventini, *De Diversis Fabricis Architectonicae*, in the text of *Valentine Rose's* Large Edition, published in Hugh Plommer, *Vitruvius and Later Roman Manuals* (Cambridge, 1973). A module in Roman architecture is equivalent to a whole multiple of a standard Roman unit of length (see *illustration 1*). Modern translations offer for *symmetria* terms "symmetry", "symetrie", "Symmetrie", "simmetria", "simetrija", etc. This is linguistically correct, but it obscures the most important passages of *Vitruvius*. *Symmetria* is not what is understood with "symmetry" today.

figure arising from the selection of the unit of measure⁶ for every single part. As in the human body the system of measures appears in the eurhythmy between cubit, foot, palm, finger, and other particles (**illustration 2**), so it is in the perfect buildings (**illustrations 1, 3, 12, 13**). The selection of standard modular units⁷ can be found in temples either from the thickness of a column, or from the triglyph, or from any other rhythmically repeated unit (**illustrations 4, 5, 6, 7**); in the *ballista*, from the bore or *peritreton*, as called by Greeks (**illustration 8**); in the ship, from the space between two tholepins, two cubit apart (**illustration 9**); and in other works, from their component members" (**illustrations 10, 11, 12, 13, 14, 15, 16**).

The most strongly emphasized Vitruvian praecept is in the following paragraph (3.1.1): "Composition of buildings depends upon modular sizes,⁵ the ratios of which must be most diligently observed by architects. It arises from proportion, called *analogia* by Greeks. Proportion is the selection of a unit of sizes⁸ for every member and for the whole of the building and their coordination, from which appears the ratio of modular sizes.⁵ For without modular sizes⁵ and proportion there is no rational composition for any building,⁹ it must follow the ratio of members of a well shaped man" (**illustration 2, 3**).

The Vitruvian modular theory was used in practice.¹⁰ Dimensions of building components were modular, expressible with the whole multiples of one of the units of the standard system of measures (**illustration 10**). The Roman buildings, as compositions of components, were modular too^{11, 12} (and

⁶ *Ex partibus separatis ratae partis responsus* means "coordination of modules selected from single parts". The singular *ratae partis* is a generic genitive, meaning "of every calculated part" or "of all coordinated modules". See notes 4 and 8. The generic singular is misleading, hence the simplistic belief in modern modular coordination that only one module is sufficient. Since a module is mathematically a common denominator of two or more quantities, the absurdity of only one module in a composition is evident. Number one is a universal common denominator only for prime numbers.

⁷ *Symmetriarum ratiocinatio* means "selection of modular units". A modern attempt to calculate a system of composable units resulted in a series of numbers in a ratio equal to the ratio of standard Roman units of length. See note 14.

⁸ *Ratae partis commodulatio* means "coordination of selected modules". The generic singular is misleading. One element only can not be coordinated; the

term *commodulatio* implies more than one module. Compare the notes 4 and 6.

⁹ More about modules and proportion in: Tine Kurent, 'Proportio and Commodulatio after Vitruvius Compared to Proportion and Modules of Diocletian's Palace in Split' (*Ziva antika* XXI/1, Skoplje 1971).

¹⁰ Tine Kurent, 'The Roman Modular Way' (*Official Architecture and Planning* 12, London 1971).

¹¹ Tine Kurent, Franc Možek, Janez Lapajne, Poskus rekonstrukcije emonske inzule VII (*Varstvo spomenikov* XII, Ljubljana 1967); — Tine Kurent: *The Modular Eurhythmia of Aediculae in Šempeter* (Dissertationes Musei Nationalis Labacensis, Ljubljana 1970); — Tine Kurent, 'The Modular Analogy of the Roman Palaces in Split and Fishbourne' (*Archaeometry* 12/1, Oxford University 1970); — Tine Kurent, 'The Modular Composition of Diocletian's Palace in Split' (*Ziva antika*, Skoplje 1970); — Tine Kurent, 'Avgustov tempelj v Pulju' (*Arheološki vestnik* XXIII, Ljubljana 1972).

illustrations 12, 13). Finally, the Roman new towns were modular^{12, 21} (and illustration 14).

Unfortunately, after the fall of Rome, the Roman standard sizes were replaced by a host of systems of measures, having only a local validity (illustration 1). Therefore, the architects of the Gothic style resorted to geometrical proportioning (*quadratura, triangulatura*). Renaissance means the rebirth of the modular method, but without its coordinating and compositional power (see the text at the illustration 6). The aesthetic role of the Renaissance module¹³ was of a limited application and the introduction of metre one hundred years ago obscured the role of the system of composable anthropometric sizes in the architectonic composition. Therefore modern architects do not "most diligently" observe the ratio of modular sizes as postulated by Vitruvius. Modern efforts are still generally ignored or misunderstood¹⁴ and the only civilisation without standard composable sizes (= preferred sizes = selected modules) is the present one.

The modular principle,¹⁵ the oldest known account of which is Vitruvius, has been adopted by architects since time immemorial all over the world.¹⁶ The neolithic Stonehenge (note 23) and the (illustration 17) and the old Chinese architecture (illustrations 15, 16) are good examples for modular compositions of civilisations far away in space and time.

¹² Tine Kurent. 'The Analogy in Modular Composition of Roman Fortresses at Caerleon and at Mogorjelo' (*Živa antika* XX/2, Skoplje 1971); — Tine Kurent, 'Silchester the Vitruvian Octagonal town' (*Živa antika* XXII, Skoplje 1972); — Tine Kurent, 'La Composition Modulaire de la Ville Romaine de Lambaesis' (*Živa antika* XXIV/1—2, Skoplje 1974).

¹³ O. B. Scamozzi, *Le fabbriche e i disegni di Andrea Palladio* (facsimile edition by Alec Tiranti, London 1968); — Vincenzo Scamozzi, *L'idea della Architettura universale* (facsimile edition by The Gregg Press Inc., Ridgewood, N. J., U.S.A., 1964); — Giacomo Barozzi da Vignola, *Gli ordini di Architettura* (Fratelli Vallardi, Milano 1810).

¹⁴ Tine Kurent, *Izbor preferencialnih modularnih mer za dimenzioniranje gradbenih elementov* (Univerza v Ljubljani 1961); — Tine Kurent, *Preporuka za dimenzioniranje građevinskih elementa s komponibilnim modularnim merama* (Dokumentacija za građevinarstvo i arhitekturu, DGA — 1189 sveska 227, Beograd 1972); — Tine Kurent, *Priporočilo za dimenzioniranje gradbenih prefabrikatov s komponibilnimi modularnimi merami* (Kompozicija modularnih mer, Univerza v Ljubljani 1974).

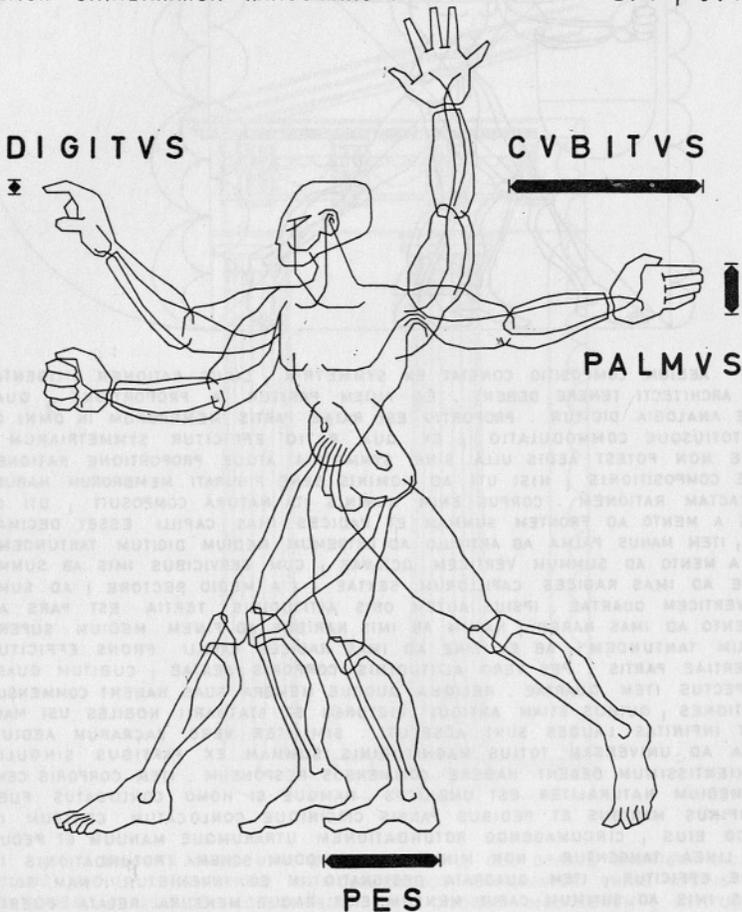
¹⁵ Tine Kurent, 'Il principio modulare' (*Belfagor* XXX/II, Casa editrice Leo S. Olschki, Firenze 1975); — Tine Kurent, 'Modularni princip' (*Sinteza* julij 1976, Ljubljana).

¹⁶ Tine Kurent, 'Modularna kompozicija v Stari Egiptovski arhitekturi' (Katalog: *Spomeniki starega Egipta*, Narodni muzej v Ljubljani 1974); — Tine Kurent, 'Proportions modulaires dans la Composition du monument des Lacédémoniens à Delphes' (*Živa antika* XXII, Skopje 1972).

¹⁷ F. Hultsch, *Griechische und römische Metrologie* (Berlin 1862); — H. Nissen, *Metrologie*, Handbuch der Klassischen Altertums-Wissenschaft (München 1892); — T. Kurent, L. Muhič, 'Pertica nova' (*Arheološki vestnik* XXIV, Ljubljana 1973).

ITEM SYMMETRIA EST EX IPSIUS OPERIS MEMBRIS CONVENIENS CONSENSUS; EX PARTIBUSQUE SEPARATIS AD UNIVERSAE FIGURAE SPECIEM RATEA PARTIS RESPONSUS . UTI IN HOMINIS CORPORE E CUBITO , PEDE , PALMO , DIGITO CETERISQUE PARTICULIS SYMMETROS EST EURYTHMIAE QUALITAS , SIC EST IN OPERUM PERFECTIONIBUS . ET PRIMUM IN AEDIBUS SACRIS AUT E COLUMNARUM CRASSITUDINIBUS AUT TRIGLYPHO AUT ETIAM EMBATERE , BALLISTA E FORAMINE , QUOD GRAECI PERITRETON VOCITANT , NAVIBUS INTERSCALMIO , QUAE DIPECHYAIA DICITUR , ITEM CETERORUM OPERUM E MEMBRIS INVENITUR SYMMETRIARUM RATIOCINATIO .

L. I , C. II , 4



NAMQUE NON POTEST AEDIS ULLA SINE SYMMETRIA ATQUE PROPORTIONE RATIONEM HABERE COMPOSITIONES , NISI UTI HOMINIS BENE FIGURATI MEMBRORUM HABUERIT EXACTAM RATIONEM .

L. III , C. I , 1

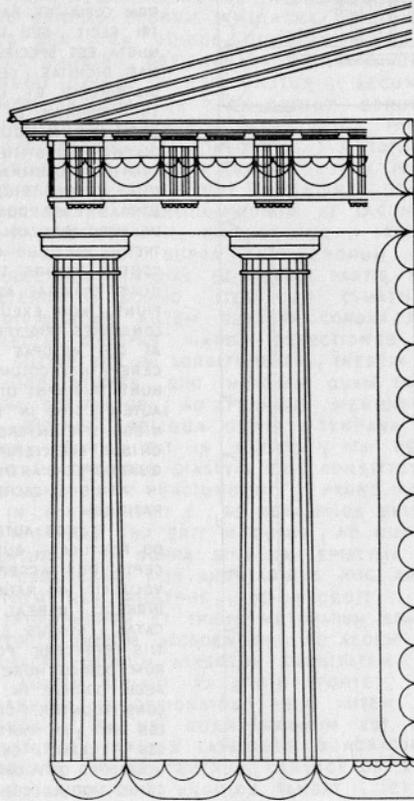
ERGO SI ITA NATURA COMPOSUIT CORPUS HOMINIS , UTI PROPORTIONIBUS MEMBRA AD SUMMAM FIGURATIONEM EIUS RESPONDEANT , CUM CAUSA CONSTITUISSE VIDENTUR ANTIQUI , UT ETIAM IN OPERUM PERFECTIONIBUS SINGULORUM MEMBRORUM AD UNIVERSAM FIGURAE SPECIEM HABEANT COMMENSUS EXACTIONEM

L. III , C. I , 4

Illustration 2

As in the human body, from cubit, foot, palm, digit and other small parts comes the eurhythmic quality of modular sizes,⁵ so it is in the completed building (1.2.4).

ITEM SYMMETRIA EST EX IPSIUS OPERIS MEMBRIS CONVENIENS CON-
 SENSUS EX PARTIBUSQUE SEPARATIS AD UNIVERSAE FIGURAE SPECIEM RATEAE
 PARTIS RESPONSUS . UTI IN HOMINIS CORPORE E CUBITO | PEDE | PALMO |
 DIGITO CETERISQUE PARTICULIS SYMMETROS EST EURYTHMIAE QUALITAS | SIC
 EST IN OPERUM PERFECTIONIBUS . ET PRIMUM IN AEDIBUS SACRIS AUT E
 COLUMNARUM CRASSITUDINIBUS AUT TRIGLYPHO AUT ETIAM EMBATERE | BAL-
 LISTA E FORAMINE | QUOD GRAECI PERITRETON VOCITANT | NAVIBUS INTER-
 SCALMIO | QUAE DIPECHYAIA DICITUR | ITEM CETERORUM OPERUM E MEMBRIS
 INVENITUR SYMMETRIARUM RATIOCINATIO . L. I | C. II | 4



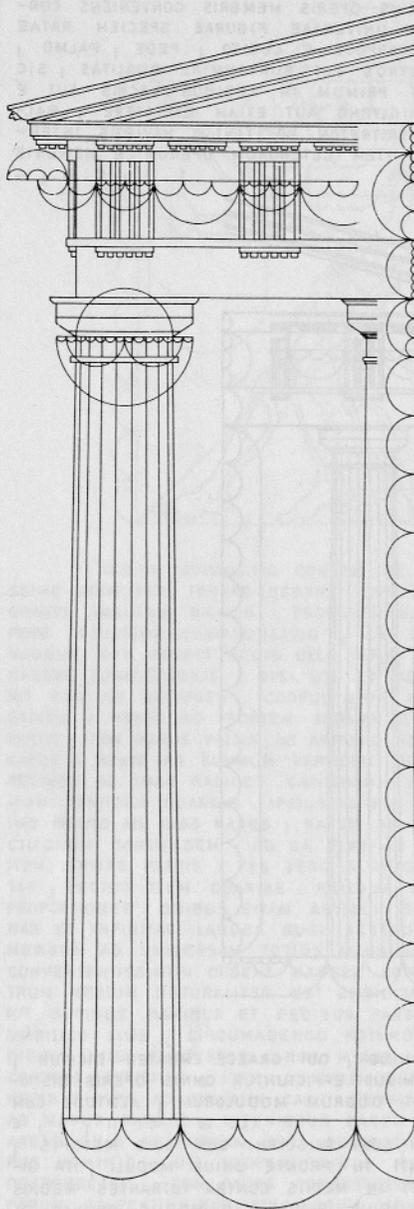
EX HIS PARS UNA ERIT MODULUS | QUI GRAECE EMBATER DICITUR |
 CUIUS MODULI CONSTITUTIONE RATIOCINATIONIBUS EFFICIUNTUR OMNIS OPERIS DISTRI-
 BUTIONES . CRASSITUDO COLUMNARUM ERIT DUORUM MODULORUM | ALTITUDO CUM
 CAPITULO XIII . L. IV | C. III | 3 | 4

SUPRA EPISTYLIUM CONLOCANDI SUNT TRIGLYPHI CUM SUIS METOPIS |
 ALTI UNIUS ET DIMIDIATI MODULI | LATI IN FRONTE UNIUS MODULI | ITA DI-
 VISI | UT IN ANGULARIBUS COLUMNIS ET IN MEDIIS CONTRA TETRANTES MEDIOS
 SINT CONLOCATI | ET INTERCOLUMNIIS RELIQUIS BINI | IN MEDIIS PRONAO ET
 POSTICO TERNI . L. IV | C. III | 4

Illustration 4

Modular sizes⁵ ... in temples ... can be calculated ... from the thickness of columns, or a triglyph and also from the embater (1.2.4).

Embater, translated as 'module' by Bury, means a standard size. The verb ἐμβάτεω, meaning 'to walk', implies the movement of a human body, analogous to the latin *passus* and *gradus*. In extension, *embater* means any other rhythmically repeated unit of sizes.



NONNULLI ANTIQUI ARCHITECTI
 NEGAVERUNT DORICO GENERE AEDES SACRAS
 OPORTERE FIERI, QUOD MENDOSAE ET DISCONVENIENTES IN HIS SYMMETRIAE CONFICIEBANTUR. ITAQUE NEGAVIT ARCESIUS, ITEM PYTHIUS, NON MINUS HERMOGENES. NAM IS CUM PARATAM HABUISSET MARMORIS COPIAM IN DORICAE AEDIS PERFECTIONEM, COMMUTAVIT EX EADEM COPIA ET EAM IONICAM LIBERO PATRI FECIT. SED TAMEN NON QUOD INVENUSTA EST SPECIES AUT GENUS AUT FORMAE DIGNITAS, SED QUOD INPEDITA EST DISTRIBUTIO ET INCOMMODA IN OPERE TRIGLYPHORUM ET LACUNARIORUM DISTRIBUTIONE. NAMQUE NECESSE EST TRIGLYPHOS CONSTITUI CONTRA MEDIOS TETRANTES COLUMNARUM, METOPASQUE, QUAE INTER TRIGLYPHOS FIENT, AEQUE LONGAS ESSE QUAM ALTAS. CONTRAQUE IN ANGULARES COLUMNAS TRIGLYPHI IN EXTREMIS PARTIBUS CONSTITUUNTUR ET NON CONTRA MEDIOS TETRANTES. ITA METOPA QUAE PROXIMAE AD ANGULARES TRIGLYPHOS FIUNT, NON EXEUNT QUADRATAE SED OB LONGIORES TRIGLYPHI DIMIDIA LATITUDINE. AT QUI METOPAS AEQUALES VOLUNT FACERE, INTERCOLUMNIA EXTREMA CONTRAHUNT TRIGLYPHI DIMIDIA LATITUDINE. HOC AUTEM, SIVE IN METOPARUM LONGITUDINIBUS SIVE INTERCOLUMNIORUM CONTRACTI-
 ONIBUS EFFICIETUR, EST MENDOSUM. QUAPROPTER ANTIQUI VITARE VISI SUNT IN AEDIBUS SACRIS DORICAE SYMMETRIAE RATIONEM

NOS AUTEM EXPONIMUS, UTI ORDO POSTULAT, QUEMADMODUM A PRAECEPTORIBUS ACCEPIMUS, UTI, SI QUI VOLUERIT HIS RATIONIBUS ADTENDENS ITA INGRESI, HABEAT PROPORTIONES EXPLICATAS, QUIBUS EMENDATAS ET SINE VITIIS EFFICERE POSSIT AEDIUM SACRARUM DORICO MORE PERFECTIONES. FRONS AEDIS DORICAE IN LOCO, QUO COLUMNAE CONSTITUUNTUR, DIVIDATUR, SI TETRASTYLOS ERIT, IN PARTES XXVII, SI HEXASTYLOS, XXXXII. EX HIS PARS UNA ERIT MODULUS, QUI GRAECE EMBATER DICITUR, CUIUS MODULI CONSTITUTIONE RATIOCINATIONIBUS EFFICIUNTUR OMNIS OPERIS DISTRIBUTIONES. CRASSITUDO COLUMNARUM ERIT DUORUM MODULORUM, ALTITUDO CUM CAPITULO XIII. CAPITULI CRASSITUDO UNIUS MODULI, LATITUDO DUORUM ET MODULI SEXTAE PARTIS. CRASSITUDO CAPITULI DIVIDATUR IN PARTES TRES, E QUIBUS UNA PLINTHUS CUM CYMATIO FIAT, ALTERA ECHINUS CUM ANULIS, TERTIA HYPOTRACHELION. CONTRAHATUR COLUMNA ITA,

Illustration 5 a and b

Vitruvius' prescription for the modular composition of the Doric order.

UTI IN TERTIO LIBRO DE IONICIS EST SCRIPTUM . EPISTYLII ALTIUDO UNIUS MODULI CUM TAENIA ET GUTTIS ; TAENIA MODULI SEPTIMA ; GUTTARUM LONGITUDO SUB TAENIA CONTRA TRIGLYPHOS ALTA CUM REGULA PARTE SEXTA MODULI PRAEENDEAT . ITEM EPISTYLII LATITUDO IMA RESPONDEAT HYPOTRACHELIO SUMMAE COLUMNNAE . SUPRA EPISTYLIUM CONLOCANDI SUNT TRIGLYPHI CUM SUI METOPIS , ALTI UNIUS (ET) DIMIDIATI MODULI , LATI IN FRONTE UNIUS MODULI , ITA DIVISI , UT IN ANGULARIBUS COLUMNNIS ET IN MEDIIS CONTRA TETRANTES MEDIOS SUNT CONLOCATI , ET INTERCOLUMNNIS RELIQUIS BINI , IN MEDIIS PRONA O ET POSTICO TERNI . ITA RELAXATIS MEDIIS INTERVALIIS SINE INPEDITIONIBUS ADITUS ACCEDENTIBUS ERIT AD DEORUM SIMULACRA . TRIGLYPHORUM LATITUDO DIVIDATUR IN PARTES SEX , EX QUIBUS QUINQUE PARTIBUS IN MEDIO , DUAE DIMIDIAE DEXTRA AC SINISTRA DESIGNENTUR REGULA . UNA IN MEDIO DEFORMETUR FEMUR , QUOD GRAECE MEROS DICITUR ; SECUNDUM EAM CANALICULI AD NORMAE CACUMEN INPRIMANTUR ; EX ORDINE EORUM DEXTRA AC SINISTRA ALTERA FEMINA CONSTITUANTUR ; IN EXTREMIS PARTIBUS SEMICANALICULI INTERVERTANTUR . TRIGLYPHIS ITA CONLOCATIS , METOPAE QUAE SUNT INTER TRIGLYPHOS , AEQUE ALTAE SUNT QUAM LONGAE ; ITEM IN EXTREMIS ANGULIS SEMIMETOPTIA SUNT INPRESSA DIMIDIA MODULI LATITUDINE . ITA ENIM ERIT , UT OMNIA VITIA ET METOPARUM ET INTERCOLUMNNIORUM ET LACUNARIORUM , QUOD AEQUALES DIVISIONES FACTAE ERUNT , EMENDENTUR . TRIGLYPHI CAPITULA SEXTA PARTE MODULI SUNT FACIENDA . SUPRA TRIGLYPHORUM CAPITULA CORONA EST CONLOCANDA IN PROIECTURA DIMIDIAE ET SEXTAE PARTIS HABENS CYMATIUM DORICUM IN IMO , ALTERUM IN SUMMO . ITEM CUM CYMATIIS CORONA CRASSA EX DIMIDIA MODULI . DIVIDENDAE AUTEM SUNT IN CORONA IMA AD PERPENDICULUM TRIGLYPHORUM ET MEDIAS METOPAS VIARUM DERECTIONES ET GUTTARUM DISTRIBUTIONES , ITA UTI GUTTAE SEX IN LONGITUDINEM , TRES IN LATITUDINEM PATEANT . RELIQUA SPATIA , QUOD LATIORES SUNT METOPAE QUAM TRIGLYPHI , PURA RELIQUANTUR AUT NUMINA SCALPANTUR , AD IPSUMQUE MENTUM CORONAE INCIDATUR LINEA QUAE SCOTIA DICITUR . RELIQUA OMNIA , TYMPANA , SIMAE , CORONAE , QUEMADMODUM SUPRA SCRIPTUM EST IN IONICIS , ITA PERFICIANTUR .

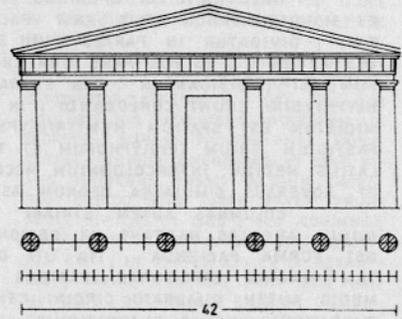
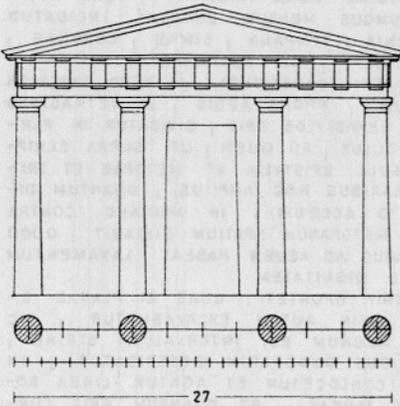
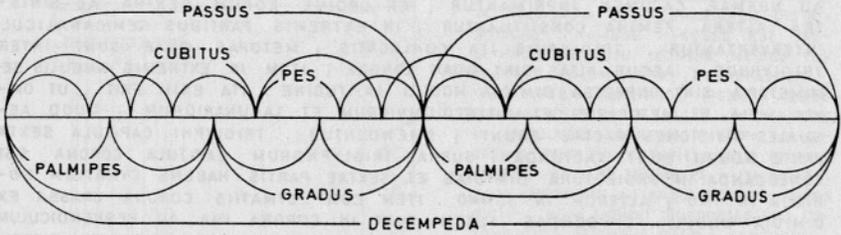
HAEC RATIO IN OPERIBUS DIASTYLI ERIT CONSTITUTA . SI VERO SYSTYLOS ET MONOTRIGLYPHON OPUS ERIT FACIUNDUM , FRONS AEDIS , SI TETRASTYLO ERIT , DIVIDATUR IN PARTES XVIII S , SI HEXASTYLOS ERIT , DIVIDATUR IN PARTES XXVIII S . EX HIS PARS UNA ERIT MODULUS , AD QUEM , UTI SUPRA SCRIPTUM EST , DIVIDANTUR . ITA SUPRA SINGULA EPISTYLIA ET METOPAE ET TRIGLYPHI BINI ERUNT CONLOCANDI ; IN ANGULARIBUS HOC AMPLIUS , QUANTUM DIMIDIATUM EST SPATIUM HEMITRIGLYPHI , ID ACCEDIT . IN MEDIANO CONTRA FASTIGIUM TRIUM TRIGLYPHORUM ET TRIUM METOPARUM SPATIUM DISTABIT , QUOD LATIUS MEDIUM INTERCOLUMNNIUM ACCEDENTIBUS AD AEDEM HABEAT LAXAMENTUM ET ADVERSUS SIMULACRA DEORUM ASPECTUS DIGNITATEM .

COLUMNAS AUTEM STRIARI XX STRIIS OPORTET . QUAE SI PLANAE ERUNT , ANGULOS HABEANT XX DESIGNATOS . SIN AUTEM EXCAVABUNTUR , SIC EST FORMA FACIENDA , ITA UTI QUAM MAGNUM EST INTERVALLUM STRIAE , TAM MAGNIS STRIATURAE PARIBUS LATERIBUS QUADRATUM DESCRIBATUR ; IN MEDIO AUTEM QUADRATO CIRCINI CENTRUM CONLOCETUR ET AGATUR LINEA ROTUNDATIONIS , QUAE QUADRATIONIS ANGULOS TANGAT , ET QUANTUM ERIT CURVATURAE INTER ROTUNDATIONEM ET QUADRATAM DESCRIPTIONEM , TANTUM AD FORMAM EXCAVENTUR . ITA DORICA COLUMNNA SUI GENERIS STRIATURAE HABEBIT PERFECTIONEM . DE ADIECTIONE EIUS , QUA MEDIA ADAUGETUR , UTI IN TERTIO VOLUMINE DE IONICIS EST PERSCRIPTA , ITA ET IN HIS TRANSFERATUR .

QUONIAM EXTERIOR SPECIES SYMMETRIARUM ET CORINTHIORUM ET DORICORUM ET IONICORUM EST PERSCRIPTA , NECESSE EST ETIAM INTERIORES CELLARUM PRONAQUE DISTRIBUTIONES EXPLICARE .

ITEM SYMMETRIA EST EX IPSIUS OPERIS MEMBRIS CONVENIENS CON-
 SENSUS EX PARTIBUSQUE SEPARATIS AD UNIVERSAE FIGURAE SPECIEM RATAE
 PARTIS RESPONSUS . UTI IN HOMINIS CORPORE E CUBITO | PEDE | PALMO |
 DIGITO CETERISQUE PARTICULIS SYMMETROS EST EURYTHMIAE QUALITAS | SIC
 EST IN OPERUM PERFECTIONIBUS . ET PRIMUM IN AEDIBUS SACRIS AUT E
 COLUMNARUM CRASSITUDINIBUS AUT TRIGLYPHO AUT ETIAM EMBATERE | BAL-
 LISTA E EORAMINE , QUOD GRAECI PERITRETON VOCITANT | NAVIBUS INTER-
 SCALMIO | QUAE DIPECHYAIA DICITUR | ITEM CETERORUM OPERUM E MEMBRIS
 INVENITUR SYMMETRIARUM RATIOCINATIO .

L. I | C. II | 4



FRONS AEDIS DORICAE IN LOCO | QUO COLUMNAE CONSTITUUNTUR |
 DIVIDATUR SI TETRASYLOS ERIT | IN PARTES XXVII | SI HEXASYLOS | XXXXII
 EX HIS PARS UNA ERIT MODULUS | QUI GRAECOE EMBATER DICITUR | CUIUS
 MODULI CONSTITUTIONE RATIOCINATIONIBUS EFFICIUNTUR OMNIS OPERIS DISTRI-
 BUTIONES CRASSITUDO COLUMNARUM ERIT DUORUM MODULORUM | ALTITUDO CUM
 CAPITULO XIII .

L. IV | C. III | 3

Illustration 6

The modular composition of a Doric temple.

The front of a Doric temple is to be divided along the line where columns are set, in 27 parts if it is tetrastyle, in 42 parts if it is hexastyle.²⁰ Of these one part will be the module, which in Greek is called embater, and when it is constituted its multiples affect the distribution of the whole work. The diameter of the column will be two modules; the height including capital 14, the height of the capital is one module. . . Above the architrave are to be placed the triglyphs with the methopes; the triglyphs being a module and a half high and one module wide in front . . . (4. 3. 3—4.)

This and other prescriptions for modular composition of temples suggest that Vitruvius had in mind Greek examples, but without knowing the Greek standard sizes, used as modules. Therefore he equated the module with the column's diameter, and the dimensions of triglyphs and methopes, which were obviously expressible with Greek units of length. The same misjudgement occurred in the Renaissance, when the modular principle was reintroduced, but without regard to a standard system of sizes. The universal Roman sizes were supplanted by a host of measures. In Italy there were *piede Vicentino*, *piede Veneto*, *canna di Roma*, Palermo, Genova, Toscana, Sicilia, Sardegna, etc, which introduced the confusion of the tower of Babel in the architectural composition of sizes. Therefore the Renaissance architecture arbitrarily, and under the influence of Vitruvius, proclaimed as module the diameter (or radius) of a column. Since one only module was not enough, the diameter was divided in 12, 18, or more, partes.¹³ Consequently the module lost its power to coordinate sizes and degenerated into an aesthetic tool.

¹⁸ Tine Kurent, 'Modularna kompozicija' (*Arhitektura — urbanizam* br. 26, Beograd 1964); — Tine Kurent, 'The Basic Law of Modular Composition' (*The Modular Quarterly*, winter 1964/65, London); — Tine Kurent, *Osnovni zakon modularne kompozicije* (Univerza v Ljubljani, Fakulteta za arhitekturo 1967); — Tine Kurent, *La legge fondamentale della composizione modulare* (Politecnico di Torino, Facoltà di Architettura, Edizione Quaderni di Studio, Torino 1968); — Tine Kurent, *Kompozicija modularnih mer* (Univerza v Ljubljani, Fakulteta za arhitekturo 1974).

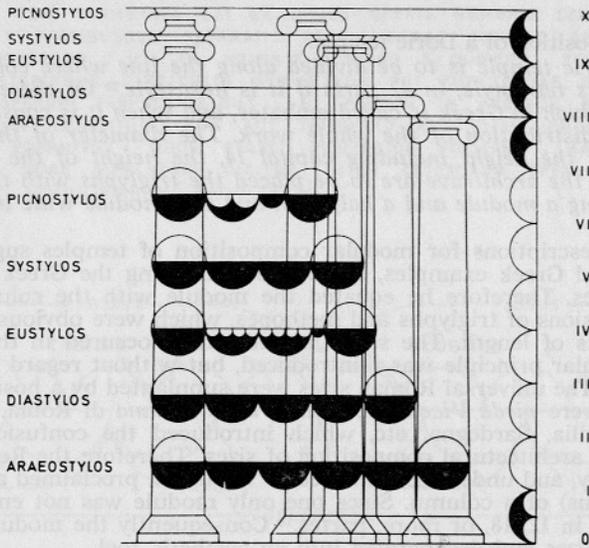
¹⁹ T. Kurent, L. Muhič, 'Merska analiza rimskih posod' (*Arheološki vestnik* XXIII, Ljubljana 1972).

²⁰ An attempt to explain the antique proportions with the Vitruvian numbers without resorting to the Greek and Roman standard sizes is in C. J. Moe, *Numeri di Vitruvio* (Edizioni del Milione, Milano 1945).

²¹ Milica Detoni, Tine Kurent, *The Modular Reconstruction of Emona* (Dissertationes Musei Nationalis Labacensis, Ljubljana 1963).

²² Tine Kurent, 'La composizione modulare della Porta Palatina a Torino' (*Prefabbricare* 5, Milano 1969).

²³ Tine Kurent, 'Stonehenge and the Vitruvian Amusium' (*Architectural Association Quarterly*, vol. 7 number 3, London 1975).



SPECIES AUTEM AEDIIUM SUNT QUINQUE, QUARUM EA SUNT VOCABULA :
 PYCNOSTYLOS, ID EST CREBRIS COLUMNIS; SYSTYLOS PAULO REMISSIORIBUS; DIA-
 STYLOS AMPLIUS PATENTIBUS; RARE QUAM OPORTET INTER SE DUCTIS ARAEO-
 STYLOS; EUSTYLOS INTERVALLORUM IUSTA DISTRIBUTIONE. ERGO PYCNOSTYLOS
 EST, CUIUS INTERCOLUMNIO UNIUS ET DIMIDIATAE COLUMNAE CRASSITUDO INTER-
 PONI POTEST, QUEMADMODUM EST DIVI IULII ET IN CAESARIS FORO VENERIS
 ET SI QVAE ALIAE SIC SUNT COMPOSITAE. ITEM SYSTYLOS EST, IN QUO DUARUM
 COLUMNARUM CRASSITUDO IN INTERCOLUMNIO POTERIT CONLOCARI, ET SPI-
 RARUM PLINTHIDES AEQUE MAGNAE SINT ET SPATIO, QUOD FUERIT INTER DU-
 AS PLINTHIDES, QUEMADMODUM EST FORTUNAE EQUESTRIS AD THEATRUM LAPI-
 DEUM RELIQUAEQUE, QVAE EISDEM RATIONIBUS SUNT COMPOSITAE. HAEC UTRAQUE
 GENERA VITIOSUM HABENT USUM. MATRES ENIM FAMILIARUM CUM AD SUPPLICA-
 TIONEM GRADIBUS ASCENDUNT, NON POSSUNT PER INTERCOLUMNIA AMPLEXAE A-
 DIRE, NISI ORDINES FECERINT; ITEM VALVARUM ADSPICITUS ABSTRADITUR CO-
 LUMNARUM CREBRITATE IPSAQVE SIGNA OBSCURANTUR; ITEM CIRCA AEDEM PROP-
 TER ANGIUSTIAS INPEDIUNTUR AMBULATIONES. DIASTYLI AUTEM HAEC ERIT COM-
 POSITIO, CUM TRIUM COLUMNARUM CRASSITUDINEM INTERCOLUMNIO INTERPONERE
 POSSUMUS, TAMQAM EST APOLLONIS ET DIANAE AEDIS. HAEC DISPOSITIO HANC
 HABET DIFFICULTATEM, QUOD EPISTYLIA PROPTER INTERVALLORUM MAGNITUDINEM
 FRANGUNTUR. IN ARAEOSTYLIS AUTEM NEC LAPIDEIS NEC MARMOREIS EPISTY-
 LIIS UTI DATUR, SED INPONENDAE DE MATERIA TRABES PERPETVAE. ET IP-
 SARUM AEDIIUM SPICIES SUNT VARICAE, BARYCEPHALAE, HUMILES, LATAE, OR-
 NANTURQUE SIGNIS FICTILIBUS AUT AEREIS INAURATIS EARUM FASTIGIA TUSCANICO
 MORE, UTI EST AD CIRCUM MAXIMUM CERERIS ET HERCULIS POMPEIANI, ITEM
 CAPITOLI.

REDDENDA NUNC EST EUSTYLI RATIO, QVAE MAXIME PROBABILIS ET
 AD USUM ET AD SPECIEM ET AD FIRMITATEM RATIONES HABET EXPLICITAS. NAM
 QUAE FACIENDA SUNT IN INTERVALLIS SPATIA DUARUM COLUMNARUM ET QUARTAE PAR-
 TIS COLUMNAE CRASSITUDINIS, MEDIUMQUE INTERCOLUMNIUM UNUM, QUOD ERIT IN
 FRONTE, ALTERUM, QUOD IN POSTICO, TRIUM COLUMNARUM CRASSITUDINE. SIC
 ENIM HABEBIT ET FIGURATIONIS ASPECTUM VENUSTUM ET ADITUS USUM SINE IN-
 PEDIITIONIBUS ET CIRCA CELLAM AMBULATIO AUCTORITATEM. HUIUS AUTEM REI RA-
 TIO EXPLICABITUR SIC. FRONS LOCI QVAE IN AEDE CONSTITUTA FUERIT, SI TE-

Illustration 7 a and b

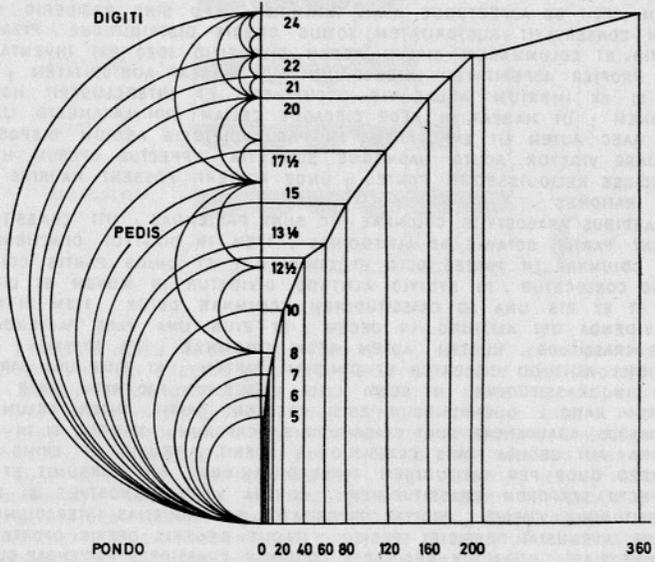
Vitruvius' instruction on how to compose the elevation of temples. The various arrangements of columns, i.e. the width and height of the axial *intercolumnium* with regard to the thickness of the column (= module) result in *pichnostylos*, *sy- stylos*, *eustylos*, *diastylos*, and *araeostylos*.

TRASTYLOS FACIENDA FUERIT , DIVIDATUR IN PARTES XI S PRAETER CREPIDINES ET PROIECTURAS SPIRARUM ; SI SEX ERIT COLUMNARUM , IN PARTES XVIII ; SI OCTOSTYLOS CONSTITUETUR , DIVIDATUR IN XXIV ET SEMISSEM . ITEM EX HIS PARTIBUS SIVE TETRASTYLI SIVE HEXASTYLI SIVE OCTOSTYLI UNA PARS SUMATUR , EAQUE ERIT MODULUS . CUIUS MODULI UNIUS ERIT CRASSITUDINIS COLUMNARUM . INTERCOLUMNIA SINGULA , PRAETER MEDIA , MODULORUM DUORUM ET MODULI QUARTAE PARTIS ; MEDIANA IN FRONTE ET POSTICO SINGULA TERNUM MODULORUM . IPSARUM COLUMNARUM ALTITUDO MODULORUM HABEBUNT IUSTAM RATIONEM , HUIUS EXEMPLAR ROMAE NULLUM HABEMUS , SED IN ASIA TEO HEXASTYLON LIBERI PATRIS .

EAS AUTEM SYMMETRIAS CONSTITUIT HERMOGENES , QUI ETIAM PRIMUS EXO STYLON PSEUDODIPTERIVE RATIONEM . EX DIPTERI ENIM AEDIS SYMMETRIAE DISTULIT INTERIORES ORDINES COLUMNARUM XXXIV EAQUE RATIONE SUMPTUS OPERASQUE COMPENDII FECIT . IS IN MEDIO AMBULATIONI LAXAMENTUM EGREGIE CIRCA CELLAM FECIT DE ASPECTUQUE NIHIL INMINUIT , SED SINE DESIDERIO SUPERVACUORUM CONSERVAVIT AUCTORITATEM TOTIUS OPERIS DISTRIBUTIONE . PTEROMATOS ENIM RATIO ET COLUMNARUM CIRCUM AEDEM AEDM DISPOSITIO IDEO EST INVENTA , UT ASPECTUS PROPTER ASPERITATEM INTERCOLUMNIORUM HABEAT AUCTORITATEM , PRAETEREA , SI EX IMBRIUM AQUAE VIS OCCUPAVERIT ET INTERCLUSERIT HOMINUM MULTITUDINEM , UT HABEAT IN AEDE CIRCAQUE CELLAM CUM LAXAMENTO LIBERAM MORAM . HAEC AUTEM UT EXPLICANTUR IN PSEUDODIPTERIS AEDIIUM DISPOSITIONIBUS . QUARE VIDETUR ACUTA MAGNAQUE SOLLERTIA EFFECTUS OPERUM HERMOGENIS FECISSE RELIQUISSIQUE FONTES , UNDE POSTERI POSSENT HAURIRE DISCIPLINARUM RATIONES .

AEDIBUS ARAEOSTYLIS COLUMNAE SIC SUNT FACIENDAE , UTI CRASSITUDINES EARUM SINT PARTIS OCTAVAE AD ALTITUDES . ITEM IN DIASTYLO DIMIETIENDA EST ALTITUDO COLUMNAE IN PARTES OCTO ET DIMIDIUM , ET UNIUS PARTIS COLUMNAE CRASSITUDO CONLOCETUR . IN SYSTYLO ALTITUDO DIVIDATUR IN NOVEM ET DIMIDIAM PARTEM , ET EX EIS UNA AD CRASSITUDINEM COLUMNAE DETUR . ITEM IN PYCNOSTYLO DIVIDENDA EST ALTITUDO IN DECEM , ET EIUS UNA PARS FACIENDA EST COLUMNAE CRASSITUDO . EUSTYLI AUTEM AEDIS COLUMNAE , UTI SYSTYLI , IN NOVEM PARTIBUS ALTITUDO DIVIDATUR ET DIMIDIAM PARTEM , ET EIUS UNA PARS CONSTITUATUR IN CRASSITUDINE IMI SCAPI . ITA HABEBITUR PRO RATA PARTE INTERCOLUMNIORUM RATIO . QUEMADMODUM ENIM CRESCUNT SPATIA INTER COLUMNAS , PROPORTIONIBUS ADAUGENDAE SUNT CRASSITUDINIS SCAPORUM . NAMQUE SI IN ARAEOSTYLO NONA AUT DECIMA PARS CRASSITUDINIS FUERIT , TENUIS ET EXILIUS APPAREBIT , IDEO QUOD PER LATITUDINEM INTERCOLUMNIORUM AER CONSUMIT ET INMINUIT ASPECTU SCAPORUM CRASSITUDINEM . CONTRA VERO PYCNOSTYLIS SI OCTAVA PARS CRASSITUDINIS FUERIT , PROPTER CREBRITATEM ET ANGSTIAS INTERCOLUMNIORUM TUMIDAM ET INVENUSTAM EFFICIET SPECIEM . ITAQUE GENERIS OPERIS OPORTET PERSEQUI SYMMETRIAS . ETIAMQUE ANGULARES COLUMNAE CRASSIORES FACIENDAE SUNT EX SUO DIAMETRO QUINQUAGESIMA PARTE , QUOD EAE AB AERE CIRCUMCIDUNTUR ET GRACILIORES VIDENTUR ESSE ASPICIENTIBUS . ERGO QUOD OCULUS FALLIT , RATIOCIATIONE EST EXEQUENDUM . CONTRACTURAE AUTEM IN SUMMIS COLUMNARUM HYPOTRACHELIIS ITA FACIENDAE VIDENTUR , UTI , SI COLUMNA SIT AB MINIMO AD PEDES QUINOS DENOS , IMA CRASSITUDO DIVIDATUR IN PARTES SEX ET EARUM PARTIUM QUINQUE SUMMA CONSTITUATUR . ITEM QUAE ERIT AB QUINDECIM PEDIBUS AD PEDES VIGINTI , SCAPUS IMUS IN PARTES SEX ET SEMISSEM DIVIDATUR , EARUMQUE PARTIUM QUINQUE ET SEMISSE SUPERIOR CRASSITUDO COLUMNAE FIAT . ITEM QUAE ERUNT A PEDIBUS VIGINTI AD PEDES TRIGINTA , SCAPUS IMUS DIVIDATUR IN PARTES SEPTEM , EARUMQUE SEX SUMMA CONTRACTURA PERFICIATUR . QUAE AUTEM AB TRIGINTA PEDIBUS AD QUADRAGINTA ALTA ERIT , IMA DIVIDATUR IN PARTES SEPTEM ET DIMIDIAM ; EX HIS SEX ET DIMIDIAM IN SUMMO HABEAT CONTRACTURAE RATIONEM . QUAE ERUNT AB QUADRAGINTA PEDIBUS AD QUINQUAGINTA , ITEM DIVIDENDAE SUNT IN OCTO PARTES , ET EARUM SEPTEM IN SUMMO SCAPO SUB CAPITULO CONTRAHANTUR . ITEM SI QUAE ALTIORES ERUNT , EADEM RATIONE PRO RATA CONSTITUANTUR CONTRACTURAE . HAEC AUTEM PROPTER ALTITUDINIS INTERVALLUM SCANDENTIS OCULI SPECIES ADICIUNTUR CRASSITUDINIBUS TEMPERATURAE . VENUSTATES ENIM PERSEQUITUR VISUS , CUIUS SI NON BLANDIMUR VOLUPTATI PROPORTIONE ET MODULORUM ADIECTIONIBUS , UTI QUOD FALLITUR TEMPERATIONE ADAUGEATUR , VASTUS ET INVENUSTUS CONSPICIENTIBUS REMITTETUR ASPECTUS . DE ADIECTIONE , QUAE ADICITUR IN MEDIIS COLUMNIS , QUAE APUD GRAECOS ENTASIS APPELLATUR , IN EXTREMO LIBRO ERIT FORMATA RATIO EIUS , QUEMADMODUM MOLLIS ET CONVENIENS EFFICIATUR , SUBSCRIPTA .

ITEM SYMMETRIA EST EX IPSIUS OPERIS MEMBRIS CONVENIENS CONSENSUS EX PARTIBUSQUE SEPARATIS AD UNIVERSAE FIGURAE SPECIEM RATEAE PARTIS RESPONSUS . UTI IN HOMINIS CORPORE E CUBITO | PEDE | PALMO | DIGITO CETERISQUE PARTICULIS SYMMETROS EST EURYTHMIAE QUALITAS | SIC EST IN OPERUM PERFECTIONIBUS . ET PRIMUM IN AEDIBUS SACRIS AUT E COLUMNARUM CRASSITUDINIBUS AUT TRIGLYPHO AUT ETIAM EMBATERE | BALLISTA E FORAMINE | QUOD GRAECI PERITRETON VOCITANT | NAVIBUS INTERSCALMIO | QUAE DIPECHYAIA DICITUR | ITEM CETERORUM OPERUM E MEMBRIS INVENITUR SYMMETRIARUM RATIOCINATIO . L . I | C . II | 4



SED TAMEN NULLA BALLISTA PERFICITUR NISI AD PROPOSITAM MAGNITUDINEM PONDERIS SAXI | QUOD ID ORGANUM MITTERE DEBET .

NAM AUQE BALLISTA DUO PONDO SAXUM MITTERE DEBET | FORAMEN ERIT IN EIUS CAPITULO DIGITORUM V | SI PONDO IIII | DIGITORUM SEX | VI | DIGITORUM VII | DECEM PONDO DIGITORUM VIII | VIGINTI PONDO DIGITORUM X | XL PONDO DIGITORUM XII SK | LX PONDO DIGITORUM XIII ET DIGITI OCTAVA PARTE | LXXX PONDO DIGITORUM XV | CXX PONDO I PEDIS ET SESQUIDIGITI | C ET LX PEDIS 19 | C ET LXXX PES ET DIGITI V | CC PONDO PEDIS ET DIGITORUM VI | CC ET X PEDIS ET DIGITORUM VI | CCCLX | PEDIS I S . L . X | C . XI | 5

CUM ERGO FORAMINIS MAGNITUDO FUERIT INSTITUTA | DESCRIBATUR SCUTULA | QUAE GRAECE PERITRETOS APPELLATUR | CUIUS LONGITUDO FORAMINUM VIII | LATITUDO DUO ET SEXTAE PARTIS . L . X | C . XI | 4

Illustration 8

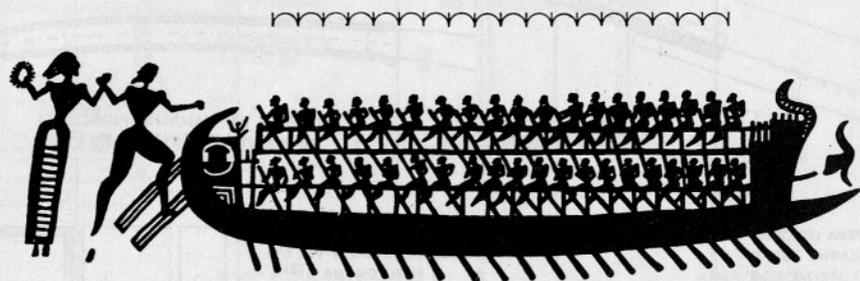
On the modular composition of ballista.

But no ballista is made without regard on the proposed amount of the weight of the stone which such a machine is supposed to eject (10.11.1). When, therefore, the size of the hole (= the caliber) is determined (as a module), the scutula, which in Greek is called peritretos, is to be drawn (10.11.4).

Follows the recipe what dimensions are to be taken to build a ballista and the detailed description of calibers, i.e. the interdependence of apertures of a foramen and of the weight of the projectile.

Obviously, the heavier the projectile, the larger the hole, the larger the module, and the larger the ballista itself. Te module is proportionate to the composition.¹⁸

ITEM SYMMETRIA EST EX IPSIUS OPERIS MEMBRIS CONVENIENS CON-
 SENSUS EX PARTIBUSQUE SEPARATIS AD UNIVERSAE FIGURAE SPECIEM RATAE
 PARTIS RESPONSUS . UTI IN HOMINIS CORPORE E CUBITO | PEDE | PALMO |
 DIGITO CETERISQUE PARTICULIS SYMMETROS EST EURYTHMIAE QUALITAS | SIC
 EST IN OPERUM PERFECTIONIBUS . ET PRIMUM IN AEDIBUS SACRIS AUT E
 COLUMNARUM CRASSITUDINIBUS AUT TRIGLYPHO AUT ETIAM EMBATERE | BAL-
 LISTA E FORAMINE | QUOD GRAECI PERITRETON VOCITANT | NAVIBUS INTER-
 SCALMIO | QUAE DIPECHYAIA DICITUR | ITEM CETERORUM OPERUM E MEMBRIS
 INVENITUR SYMMETRIARUM RATIOCINATIO L. I | C. II | 4



A GREEK SHIP FROM THE PERIOD OF THE IMIGRATIONS . THE
 ROWERS SIT ALONG BOTH SIDES . THIS SCENE | FROM A GEOMETRICAL VASE |
 SHOWS A MAN APPARENTLY LEADING A WOMAN ON BOARD | AND IT IS AN
 ATTRACTIVE GUESS THAT IT REPRESENTS THE ABDUCTION OF HELEN BY PARIS .
 THE BIRTH OF WESTERN CIVILIZATION - GREECE AND ROME | MICHAEL GRANT

... BY THE SPACE BETWEEN THE ROWLOCKS IN A SHIP WHICH IS
 CALLED DIPECHYAIA : ... GRANGER | L. I | C. II | 4 | LONDON MCMLXII
 ... IN A SHIP | FROM THE SPACE BETWEEN THE THOLEPINS (ὀλά-
 πηγμα ... MORGAN | L. I | C. II | 4 | NEW YORK 1960
 ... NAVIBUS | INTERSCALMIO | QUOD διάπηγμα DICITUR | ...
 POUR LES NAVIRES : D' APRÈS L' INTERVALLE DES TOLETS | QUI S' AP-
 PELLE διάπηγμα ... CHOISY | L. I | C. III | 3 | PARIS 1909
 SIMIGLIANTEMENTE NELLE NAVI DALLO SPACIO | CHE E TRA UN
 SCHELMO ALL' ALTRO | CHE PER ESSER DI MISURA DI DUE CUBITI | SI
 CHIAMA | DIPICHAICHI | ... BARBARO | VENEZIA 1584 | L. I | C. II

Illustration 9

The size of module for a ship is determined from the space between the rowlocks, which is called *dipechyaia* by Greeks.

Embater and *dipechyaia* are the only modules of Vitruvius defined with a specific unit of sizes (See **III. 4**). The interval of 2 cubits for rowlocks is about 3' or 90 cm. The same rhythm is still used as a module for the arrangement of seats in theaters, etc.

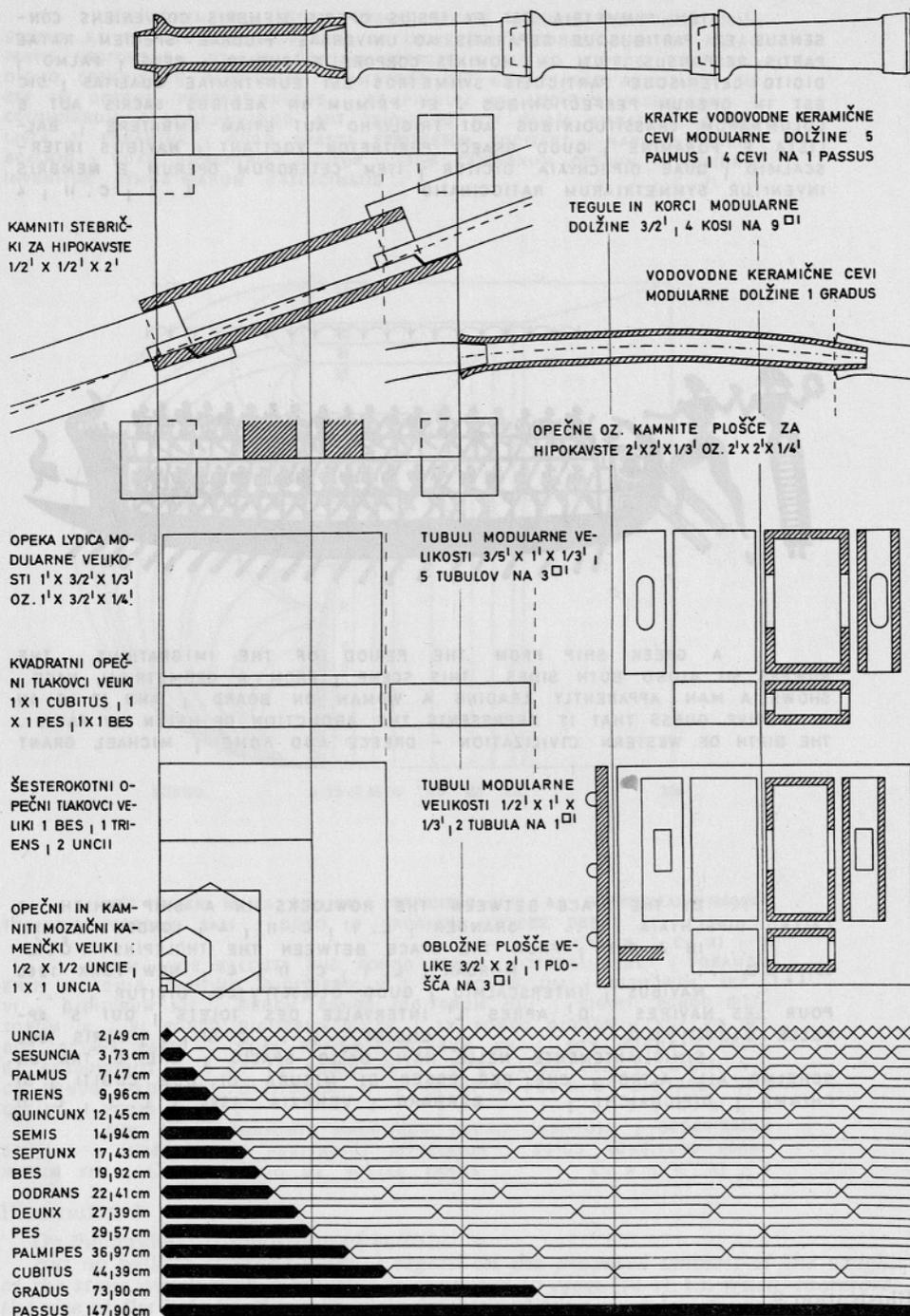


Illustration 10

The analysis of Roman building components²¹ disclosed that their sizes were modular and equal to small multiples of a Roman standard unit of sizes.

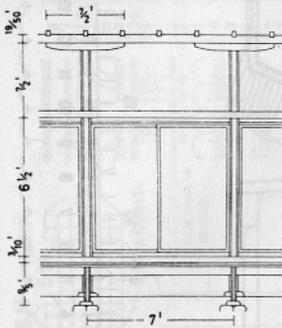
Since components were modular, the buildings, as their additive and/or multiplicative compositions, were modular too. (See illustration 13.)

KI-VA-RI-HO

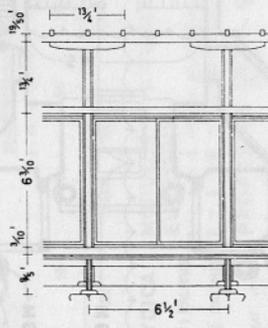
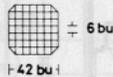
MODULARNO PRAVILO JAPONSKIH BIVALIŠČ IZVIRA IZ ZGODNJEGA MOMOYAMA OBDOBJA, IZ KONCA 16. STOLETJA. BESEDA KIVARI (PRAVILO O REZANJU LESA) SE JE PRVIČ POJAVILA V TESARSKEM PRIROČNIKU, V OBLIKI PETIH PAPIRNIH ZVITKOV, IMENOVANIH SHOMEI (LETA 1608). EDEN TEH ZVITKOV, IMENOVAN BANSHO-SHIKI-SHAKU, RAZLAGA SVETO UMETNOST STAVBE

1. IZVOR: MISTIČNO DARILLO BANSHO-SHIKI-SHAKU SHOTOKUJA, PRINCA, VLADARJA (570-621?)
2. POLOŽAJ: ORIENTACIJA STAVBE IN VRAŽEVEREN ODNOS DO SONCA, LUNE, VETRA IN VODE
3. OBRED: MOLITVE, BOŽJA SLUŽBA IN PRAZNOVANJA OB RAZLIČNIH STOPNJAH GRADNJE
4. IZVEDBA: MERA, PROPORCIJA, KONSTRUKCIJA IN POSTAVITEV STAVBE

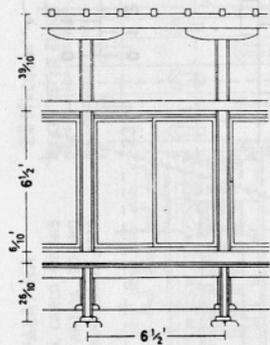
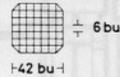
H. ENGEL, THE JAPANESE HOUSE, RUTLAND, VERMONT, TOKYO, JAPAN, 1964



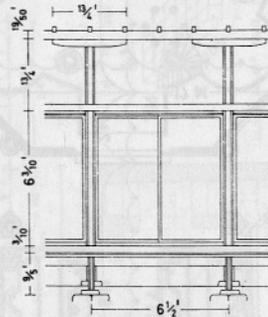
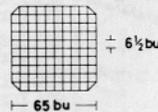
KIVARI MODUL V BANSHO-SHIKI-SHAKU ROKOPISU CELOTNA STAVBA OBSEGA 6×7 KEN ALI 42 TSUBO. ŠIRINA STEBRA JE MODULIRANA S 6×7-42 BU



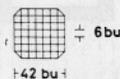
KIVARI MODUL (ZGODNJA OBLIKA) V SHOMEI ROKOPISU



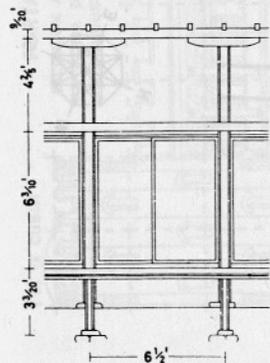
KIVARI MODUL (1608, POZNA OBLIKA) V SHOMEI ROKOPISU LESENI DELI POŠA MEZNIH ČLENOV SO MODULIRANI PO GLAVNEM STEBRNEM DELU, KI IZHAJA IZ STEBRNE RAZDALJE V RAZMERJU 1:10



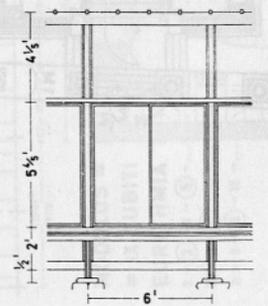
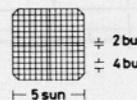
KIVARI MODUL V BUKU -HINIGATA ROKOPISU



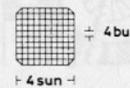
1' = 1 SHAKU = 10 SUN = 100 BU = 30,3cm



KIVARI MODUL V KOJO-IN ROKOPISU



SEDANJI KIVARI MODUL V TESARSKEM PRIROČNIKU PROPORCIJE STAVBE SO DoločENE S TOČNO MERO, KENOM. OSNI RAZPON JE 1/2, 1, 1 1/2, 2 KENA.



STANDARDIZIRANJE SVETLEGA RAZPONA (KYOTO), OZIROMA OSNEGA (EDO) POMENI ZARADI RAZLIČNO MOČNIH SOH SPREMENLJIV OSNI, OZIROMA SVETLI RAZPON.

Illustration 11

The traditional Japanese building components are modular since *ki-va-ri-ho*, or the system of cutting wooden components, was introduced in the 16. century A.D.

The Japanese modular system conforms with the traditional Japanese system of sizes.¹⁵

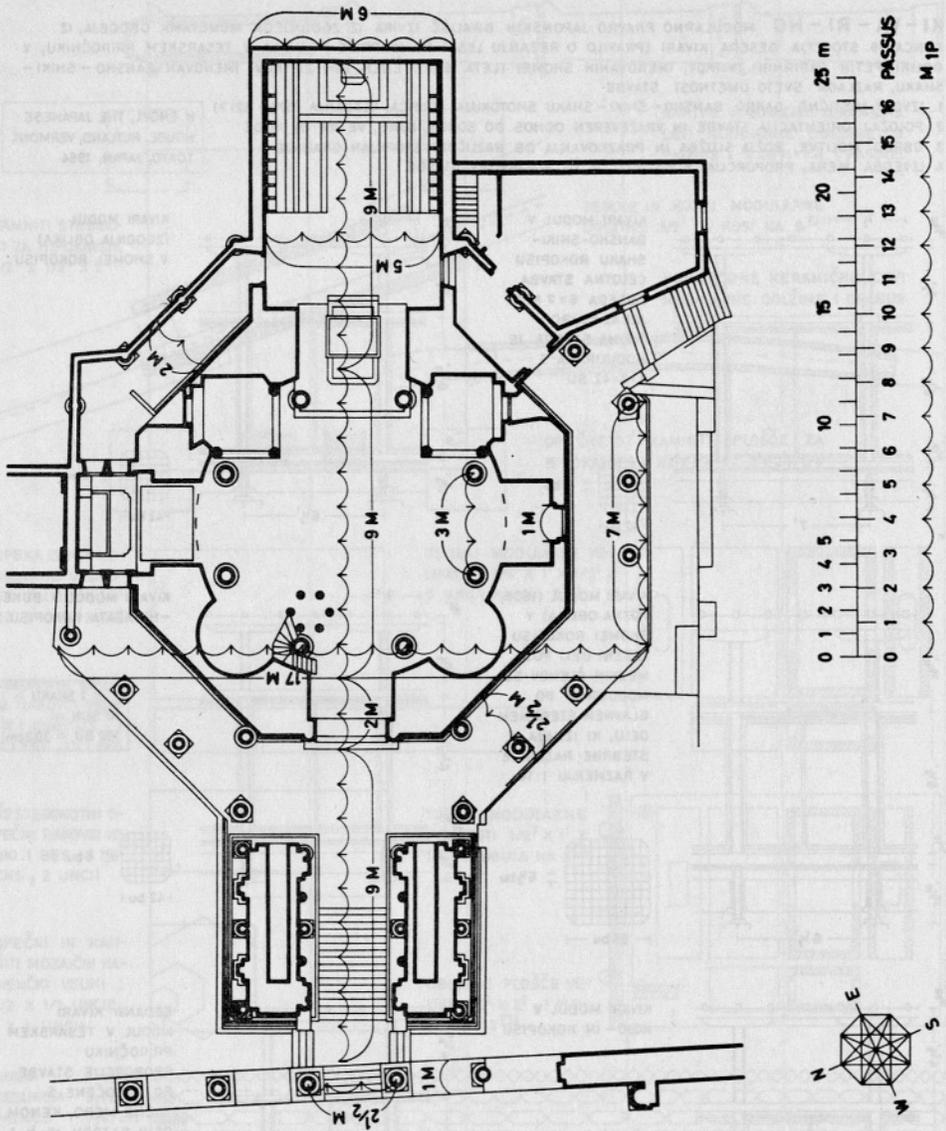
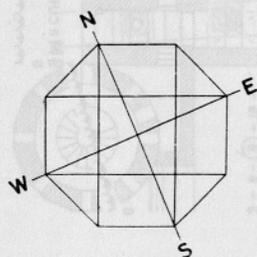
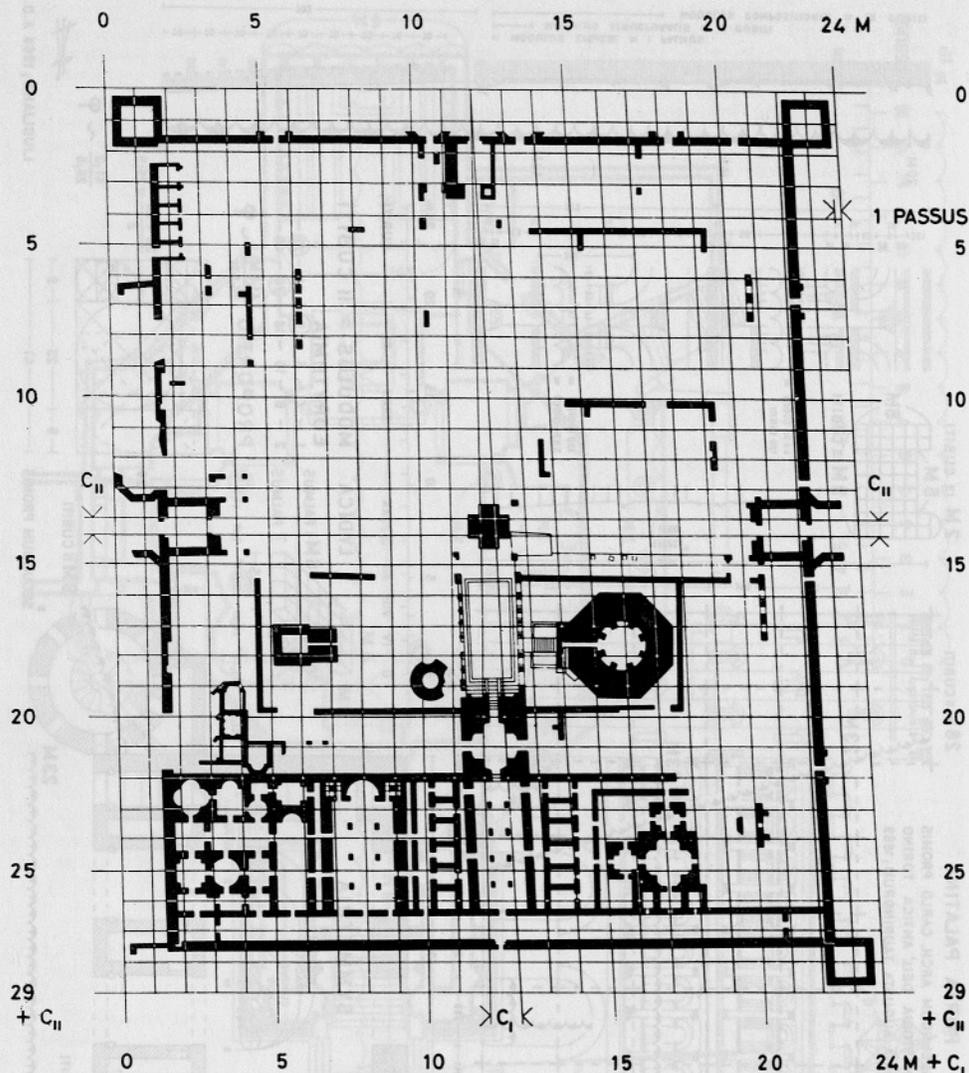


Illustration 12

The Roman buildings are modular. The still standing Diocletian's Mausoleum in Split is a modular composition. On this plan the rhythm of the module, 1 *passus* long, is shown.



PELL SERIES 1 - 2 - 5 - 12 - 29 - 70 -
 2 - 4 - 10 - 24 - 58 - 140 - $\rightarrow \lim \frac{\theta}{2}$

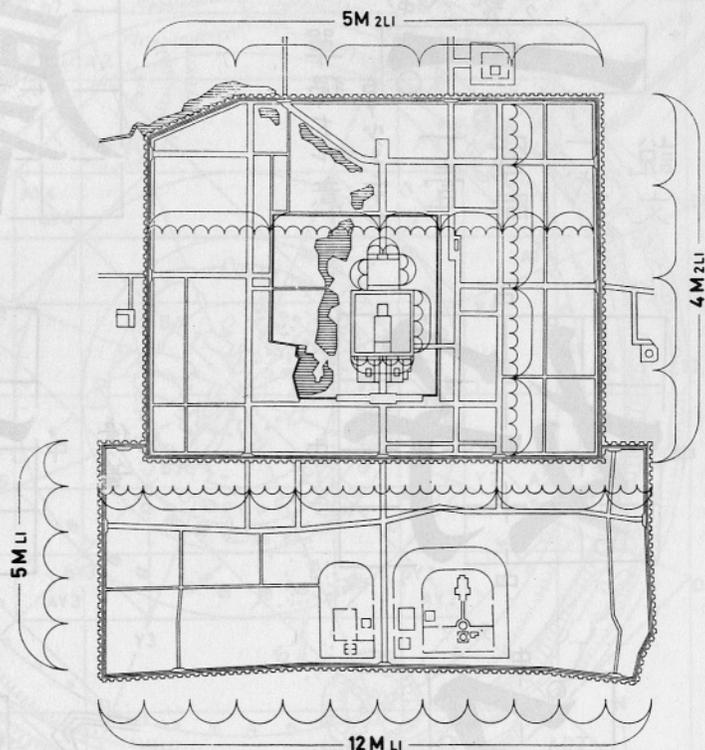
0 5 10 20 30 40 50 100 150m

0 5 10 15 M V PASSUS

Illustration 14

The Roman buildings and new towns^{11, 12} are modular. The Diocletian's Palace in Split, which is more than mere building and less than a town, is a good example for both. Its plan and elevations are modular.

PEKING, CAPITAL OF CHINA: TARTAR OR INNER CITY XIV. CENTURY A.D.
CHINESE OR OUTER CITY XVI. CENTURY A.D.



MODULES



LI \approx 680 m

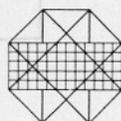
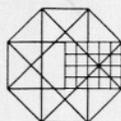
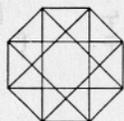
$M_2 LI = 2 M LI = 6 M \frac{1}{2} LI = 6 M_{60} \text{ CHANG} = 6 M_{100} \text{ KUNG} = 18 M \frac{1}{3} LI = 18 M_{20} \text{ CHANG}$

PROPORTION

1 : 1 PRIMA

5 : 4 QUADRAGON

12 : 5 DOUBLE QUADRAGON



EURHYTHMY

1 - 2 - 5 - ... $\rightarrow \frac{5}{2} \approx \frac{5}{4} \approx 1.25$
2 - 4 - 10 - ...

2 - 5 - 12 - ... $\rightarrow \frac{12}{5} \approx \frac{12}{5} \approx 2.40$
1 - 2 - 5 - ...

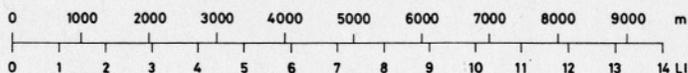


Illustration 15

The modular principle is not restricted only to the Roman architecture. The composition of Peking, the capital of China since the XIV century A. D., conforms with the traditional Chinese standard sizes, used as modules.

畫少キ
 文守ハ
 太ク執カ
 ヨクカク
 シ
 一
 右ヲ少シセザル
 單獨ナル意
 一壹
 皆同
 一弋
 說文

馨
 合ニ注意
 ヲタシマシテ

好
 中
 中
 中

意
 信筆
 中
 中
 中

弓
 中
 中
 中
 太ク
 中
 中
 中

國
 筆ヲ斜ニオシツケテ
 中
 中
 中

Illustration 16

The modular grid, used as a basis for the Chinese calligraphy, is comparable to the modular principle in design of Roman vases¹⁹ and to the modularity of ikebana, the traditional Japanese flower arrangement.¹⁵

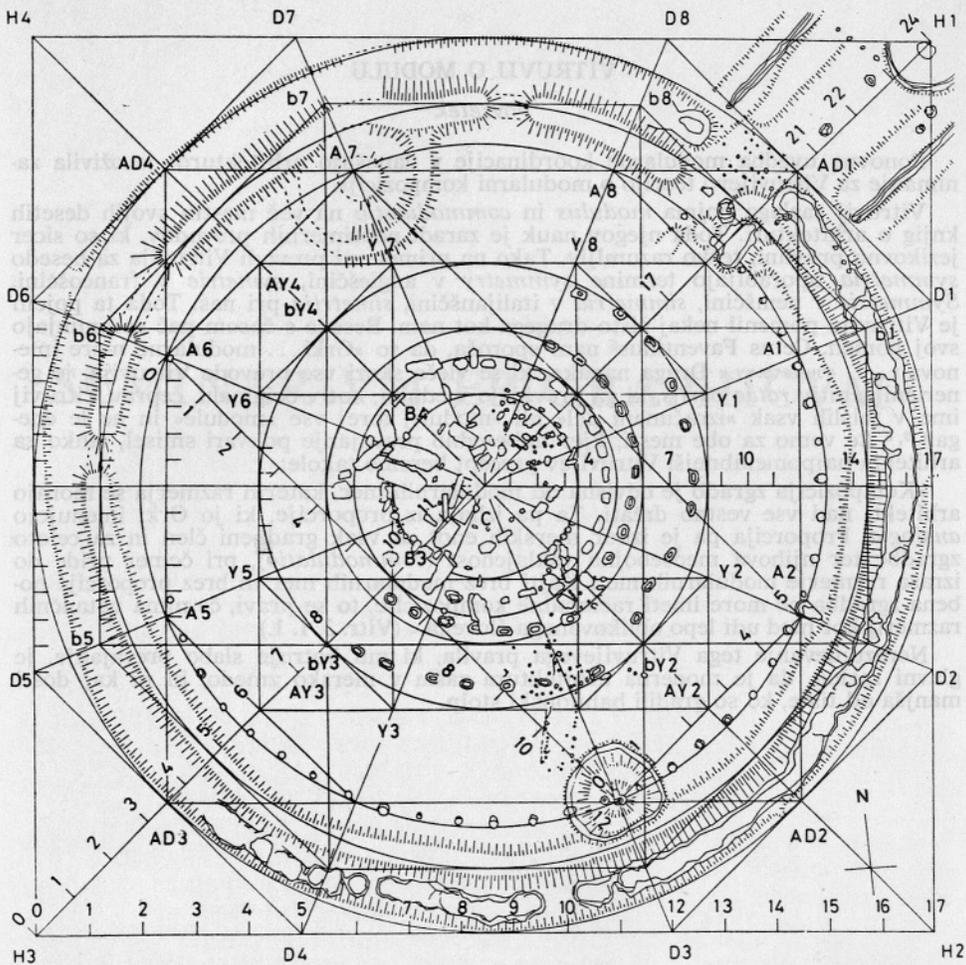


Illustration 17

The composition of Stonehenge, one of the oldest surviving architectural monuments, is modular. Diameters of its circles are in the ratio of 7, 10, 12, 17, 26, 29 and 34, modules.²³

VITRUVIJ O MODULU

Povzetek

Ponovna uvedba modularne koordinacije v današnjo arhitekturo¹ je oživila zanimanje za Vitruvijevo teorijo o modularni kompoziciji.

Vitruvij razlaga pojma *modulus* in *commodulatio* na več mestih svojih desetih knjig o arhitekturi. Toda njegov nauk je zaradi neprimernih prevodov, ki so sicer jezikovno pravilni, težko razumljiv. Tako na primer vsi prevodi Vitruvija za besedo *symmetria* uporabljajo termine *symmetry* v angleščini, *symetrie* v francoščini, *Symmetrie* v nemščini, *simmetria* v italijanščini, *simetrija* pri nas. Toda ta pojem je Vitruvij pomenil nekaj čisto drugega kot nam. Besede s časom pač spreminjajo svoj pomen. Cetus Faventinus⁵ nam sporoča, da so »Grki ... modularne mere imenovali ... συμμετριων.« Druga napaka, ki se vleče skozi vse prevode Vitruvija, je generični genitiv *ratae partis*, ki ga prevajajo v ednini, kot v originalu, čeprav Vitruvij ima v mislih vsak »izračunani del« ali »modul«, torej vse »module« in ne le enega.^{4, 6, 8} Če vemo za obe mesti, kjer dobesedno prevajanje pokvari smisel, lahko za arhitekta najpomembnejši Vitruvijeve precepte beremo takole:

»Kompozicija zgradb je odvisna od modularnih mer, katerih razmerja se morajo arhitekti nad vse vestno držati. Ta pa izhaja iz proporcije, ki jo Grki imenujejo *analogia*. Proporcija pa je izbor merskih enot za vsak gradbeni člen in za celoto zgradbe ter njihova medsebojna vsklajenost (*commodulatio*), pri čemer pride do izraza razmerje modularnih mer. Kajti brez modularnih mer in brez proporcije nobena zgradba ne more imeti racionalne kompozicije, to se pravi, če nima natančnih razmerij kot med udi lepo oblikovanega človeka.« (Vitr. 3. 1. 1.)

Nerazumevanje tega Vitruvijevega pravila, ki mu botruje slabo prevajanje, je glavni razlog, da je moderna arhitektura zašla v mersko zmedo, ki ni kaj dosti manjša od tiste, ko so gradili babilonski stolp.