Visualizing *asperitas*: Vitruvius (3.3.9) and the 'asperity' of Hermogenes' pseudodipteral temple

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Asperitas, a key term of Hellenistic-Roman art criticism for the assessment of columnar architecture, is anchored in two passages in Vitruvius, which both point to 'asperity' as the decisive criterion for achieving an unparalleled, truly eye-catching visual effect. In the best known of the two passages (3.3.8-9), praise is piled on Hermogenes for having systematically established this effect in the design of temples. In fact, he is credited with the invention of the theory (*ratio*) of pseudodipteral temple colonnades. And this column arrangement, with ambulatories of greatly increased (double) depth around the *cella*, is supposed to have been invented to provide dignified grandeur (*auctoritatem*) in its appearance *propter asperitatem intercolumniorum*: 3.3.9. This visual effect came with the practical advantage that those deep pseudodipteral colonnades also provided rain-protected space for crowds to circumambulate around the temple's *cella* (*in aede circa cellam*). Vitruvius' other reference to *asperitas,* in a visual sense, appears in the context of wall-painting (7.5.5), where a certain Apaturios of Alabanda is reported to have created a deceptively dazzling effect *propter asperitatem* in his rendering of colonnades and temples, so much so that the visual effect of the painting outshone its deficiencies in logic (which, when pinpointed by the mathematician Likynos, the artist hastened to correct: 7.5.6-7).[1] Here we will analyze a reconstructed 3D computer model of Hermogenes' well-documented pseudodipteral temple at Magne-

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Abbreviated works:

Magnesia 1904	C. Humann, *Magnesia am Maeander. Bericht über die Ergebnisse der Ausgrabungen der Jahre 1891-1893* (Berlin), especially 9-172: "Die Bauwerke," by J. Kohte.
Krischen 1938	F. Krischen, *Die griechische Stadt. Wiederherstellungen* (Berlin) pl. 39 (view of Magnesia Temple of Artemis by H. Horn under Krischen's direction).
Ferri 1960	S. Ferri, *Vitruvio. Architettura, dai libri I-VII* (Rome), especially 108-11 and 272 (on *asperitas*).
Drerup 1964	H. Drerup, "Zum Artemistempel von Magnesia," *Marburger Winckelmann-Programm*, 13-21.
Gruben 1966	G. Gruben, *Die Tempel der Griechen* (1st edn., Munich) 367-72 (on Hermogenes and Magnesia).
Gros 1990	P. Gros, *Vitruve de l'architecture. Livre III* (Paris) 112-16 (on Hermogenes and *asperitas*).
Hermogenes 1990	W. Hoepfner and E.-L. Schwandner (edd.), *Hermogenes und die hochhellenistische Architektur* (Mainz).
Gros 1991	P. Gros, "De la rhétorique à l'architecture: l'ambiguïté de l'*asperitas*," *Voces* (Univ. Caen & Salamanca) 2, 73-79.
Rumscheid 1994	F. Rumscheid, *Untersuchungen zur kleinasiatischen Bauornamentik des Hellenismus* I-II (Mainz) 198-214 (temple), 214-17 (altar).
Schmaltz 1995	B. Schmaltz, "*Aspectus* und *effectus* — Hermogenes und Vitruv," *RömMitt* 102, 133-40, with pl. 1 (foldout).
Bingöl 2007	O. Bingöl, *Magnesia on the Meander. An archaeological guide* (Istanbul), especially 51-95.
Gros 2008	P. Gros, "The theory and practice of perspective in Vitruvius's *De architectura*," in M. Carpo and F. Lemerle (edd.), *Perspective, projections and design* (London) 5-17.
Haselberger 2012	L. Haselberger, "Zur *ratio* des hermogenischen Pseudodipteros: Die Säulenhöhe des Artemistempels in Magnesia," in T. Schulz (ed.), *Dipteros und Pseudodipteros* (Byzas 12) 123-35.

1 References to Vitruvius are to the standard edition and commentary in the *Les Belles Lettres* series (Coll. Budé) with multiple authors: *Vitruve de l'architecture. Livres I-X* (Paris 1969-2009); for an updated English edition, with exceptional visual explanations, see I. Rowland and T. N. Howe, *Vitruvius. Ten books on architecture* (Cambridge 1999). Other than the two references to *asperitas* in a figurative sense considered above, the term appears in a literal sense at Vitr. 2.3.1 and 2.4.1, both referring to the 'coarse' granularity of sand.

sia in order to tease out the visual effect and on-site experience of that *asperitas* which is described by Vitruvius in such tantalizing terms.

The presence of *asperitas* is of fundamental importance to the visual appearance of temples and their colonnades (*species aedium*: 3.3) which form the context in which Vitruvius addresses the phenomenon.[2] *Asperitas* comes to the fore in the space between and behind the columns around the *cella*; this effect is causally connected to a type of temple derived from the grand dipteral tradition (with a double ring of colonnades around the *cella*) by simply omitting its inner colonnade, a 'trick' of design resulting in a new category of temple, the *pseudo*-dipteros (a dipteros 'by deception'); and the fame of having first discovered (*primus invenit*) the theoretical potential of this arrangement (*pseudodipteri rationem*) goes to Hermogenes. It is this architect, in precisely this context (3.3.8-9), whom Vitruvius praises with such palpable involvement that the passage has long been recognized as the culminating point, "l'éloge le plus vibrante" (P. Gros), in Vitruvius' presentation of temple building, indeed in virtually all Vitruvius has to say in his treatise.[3] That incomparable Hermogenes was also famous, we hear, for defining the proportions (*symmetrias*) of the only 'good' column spacing, the eustyle (3.3.6-8); further for his drastic rejection of the Doric order with its 'faulty' proportions (4.3.1); and as the author of a volume on the two temples he built, the eustyle Temple of Bacchus at Teos and the pseudodipteros of Artemis at Magnesia (*quae est Magnesia pseudodipteros:* 7.pr.12, cf. 3.3.8). Fortunately for posterity, that ingenious Hermogenes not only created built works of grand effect, but also left sources from which one can learn exhaustively about the theoretical aspects (*reliquisseque fontes unde posteri possent haurire disciplinarum rationes:* 3.3.9). Clearly, the concept and theory of *asperitas* must have played a pivotal rôle in those written sources left by Hermogenes and quoted by Vitruvius in his bibliographic catalogue (7.*pr*.11-14), but sadly, like all other treatises listed there, they too are lost.

Still, not all is lost. While we are guided by Vitruvius' account on the achievements of Hermogenes, the primary evidence to pursue this architect's famed theorizing of the pseudodipteros, and the quality of *asperitas*, lies in the preserved remains of his pseudodipteral Temple of Artemis at Magnesia.[4] The intent of the present study is to visualize the effects of *asperitas* in a pseudodipteral temple with the help of modern digital technology. At stake is a fuller insight into the last grand innovation we know of in Greek temple building, as acknowledged two centuries later by Augustus' contemporary, Vitruvius.

Asperitas in *Bauforschung* and philology: the state of affairs

We are not the first to recognize the heuristic possibilities of visualizing Hermogenes' pseudodipteros at Magnesia. The seminal study for the term *asperitas* is that of H. Drerup (1964). Drawing on F. Schlikker's deliberations (1940) on Hermogenes' artistic feat of exploiting the deep shade of pseudodipteral, wide-hall temples for a 'rough' rhythm of their colonnades, Drerup was the first to realize the potential of the Magnesia temple,[5] as

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2 On the significance of *species aedium* (3.3.1) and its rôle as 'chapter title' for Vitr. 3.3, see Gros 1990, 98-99; cf. ibid. 77 (*aedium principia*: 3.2.1).

3 On the exceptionality of Vitruvius' praise of Hermogenes, see Gros 1990, 116, with reference to H. Knell, *Vitruvs Architekturtheorie* (Darmstadt 1985) 83; further Gros 1991, 77 (quoted).

4 Standard publication on the Magnesia Temple of Artemis: *Magnesia* 1904, especially 11-105; further, see *Hermogenes* 1990; Rumscheid 1994; Bingöl 2007; Haselberger 2012.

5 Drerup 1964 (further below with n.9), referring to F. W. Schlikker, *Hellenistische Vorstellungen*

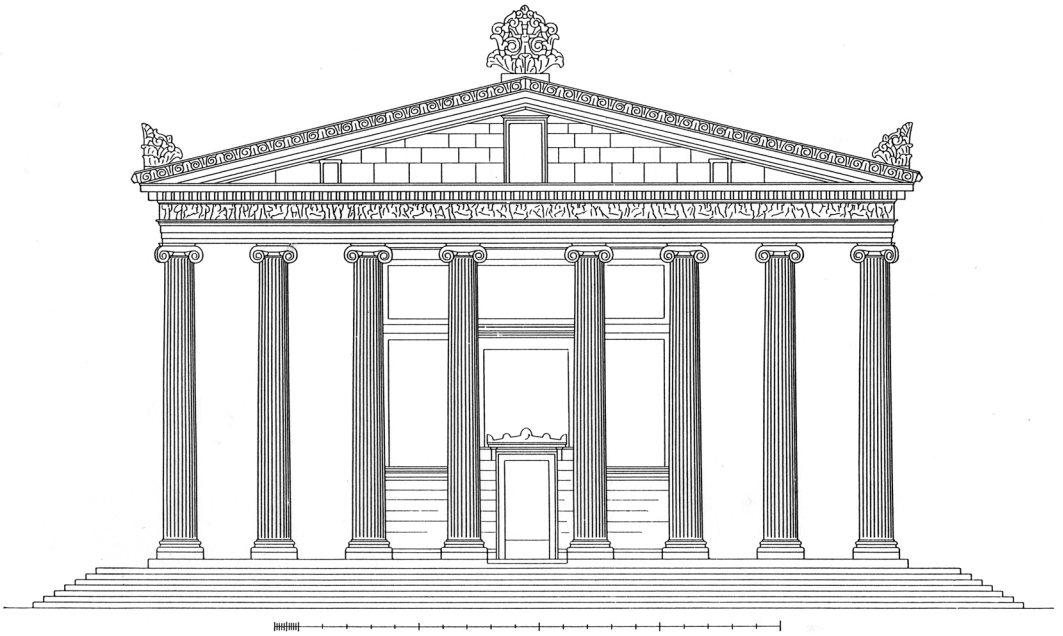

Fig. 1. Temple of Artemis at Magnesia, traditional reconstruction of main (W) façade, as first presented in the 1904 publication. Reduced to plain, 'objective' lines and orthogonal projection, the new drawing style dispenses with shadows or other indications of spatial depth (*Magnesia* 1904, 47 fig. 32).

excavated by the Berlin Museums in 1891-93 and presented in 1904 (fig. 1). Yet the very newness of that publication's 'objective' style of presentation, avoiding all Beaux-Arts exuberance in favor of plain, orthogonal line-drawings, supported by photographic documentation of fragments, made the situation unfavorable for a visual exploration of Hermogenes' temple. All perspectival rendering and, in particular, shading were excluded and replaced by photography (under 'correct' light and viewing conditions, as advocated by H. Wölfflin), setting the example for nearly a century.[6] Virtually up to the present day, the visual appearance of Hermogenes' temple has been accessible essentially in the flat, line-drawn façade elevation of small scale (see fig. 1), an even smaller shaded perspective having been relegated to the status of a title vignette (fig. 2). The visual gap was only partly closed by the grand-scale perspective that F. Krischen delivered in 1938, as there too any shading is strictly avoided (fig. 3).[7] Nor could the pair of Magnesia temple columns reconstructed at full scale in the Pergamon Museum serve as a substitute for the lost extended colonnade and its pseudodipteral arrangement (not to mention the fact that the Prussian excavations were unable to establish the actual column height and had to resort to a Vitruvius-based conjecture[8]). Drerup cut the Gordian knot, ordering a photographic view of the model in

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von der Schönheit des Bauwerks nach Vitruv (Berlin 1940), especially 22-26 (Hermogenes), 90-93 (*asperitas*). Our translation 'wide-hall temple' renders the German *Weithallentempel*, first introduced by Schlikker (23) as a generic term also comprising, but not limited to, its specific pseudodipteral appearance, cf. below, n.27. For an alternative translation, see F. E. Winter, *Studies in Hellenistic architecture* (Toronto 2006) 278 n.63: "wide-colonnade plan".

6 H. Wölfflin, "Wie man Skulpturen aufnehmen soll," *Z. f. Bildende Kunst* 7 (1896) 224-28; ibid. 8 (1897) 294-97; ibid. 26 (1915) 237-44. On this: G. A. Johnson, "(Un)richtige Aufnahme: Renaissance sculpture and the visual historiography of art history," *Art History* 36 (2013) 12-51.

7 Krischen 1938, pl. 39 (by H. Horn, according to instructions by Krischen).

8 *Magnesia* 1904, 52. For a photographic view of the reconstructed two-column set of the Magnesia colonnade in the Pergamon Museum, see Bingöl 2007, fig. on 3.

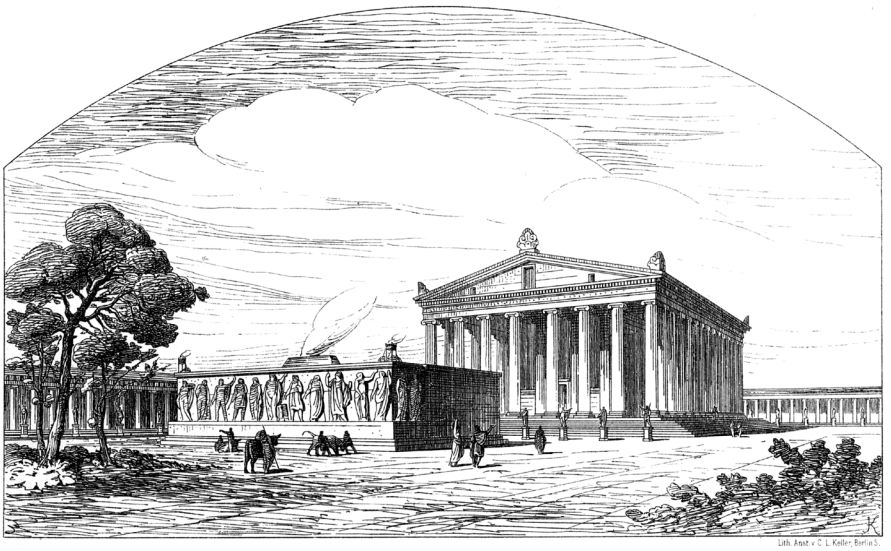

Fig. 2. Title vignette of the Magnesia publication (J. Kohte), with reconstructed Temple of Artemis and its precinct. This small vignette is the sole drawing to use shadows while rendering the temple in a perspectival view (*Magnesia* 1904, p. ii).

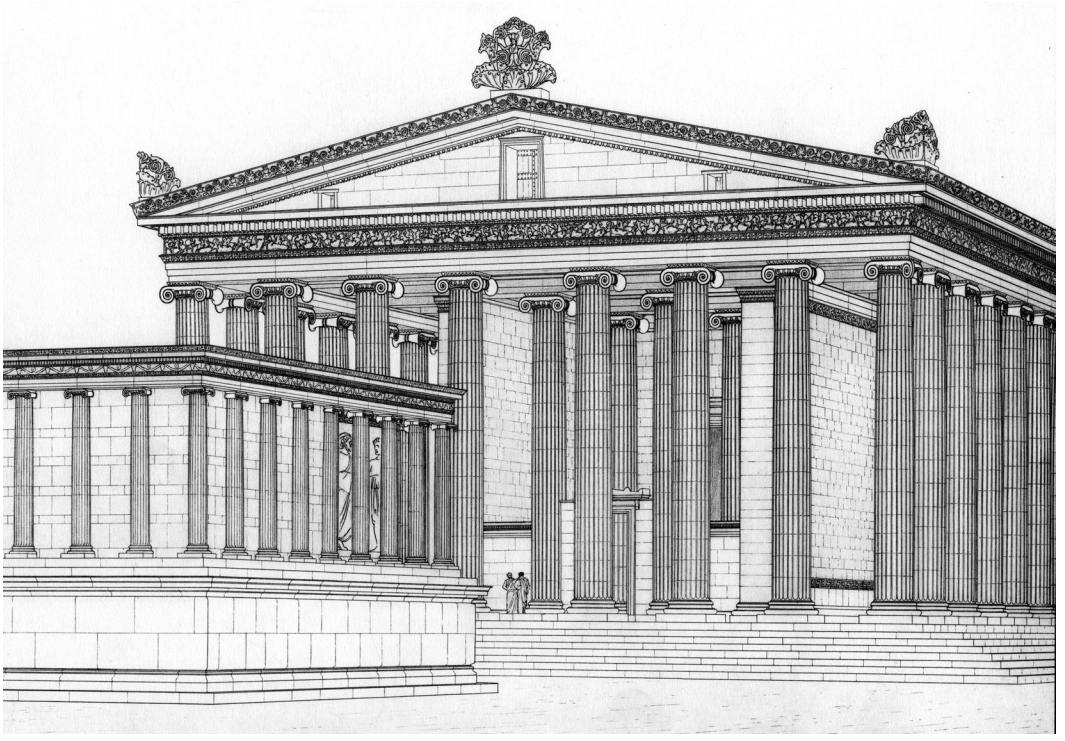

Fig. 3. Magnesia Temple of Artemis, view of façade with altar, the first (1938) perspectival rendering created in some detail. The flank colonnade is shown only partially, and all shadows are avoided (Krischen 1938, pl. 39).

the Istanbul Archaeological Museums (fig. 4). Despite its various shortcomings, this model in its "sculpted, space-embracing and light-exposed" form leads us "in any case somewhat closer to the actual conditions of appearance (*Wirkungsbedingungen*) of the ruined monument." On this basis, he acutely analyzes the effects that space and volume, light and shadow in the colonnades of Hermogenes' temple must have exerted, identifying *asperitas* as the consciously-deployed dark contrast (*Dunkelkonstrast*) in the intercolumniations (just

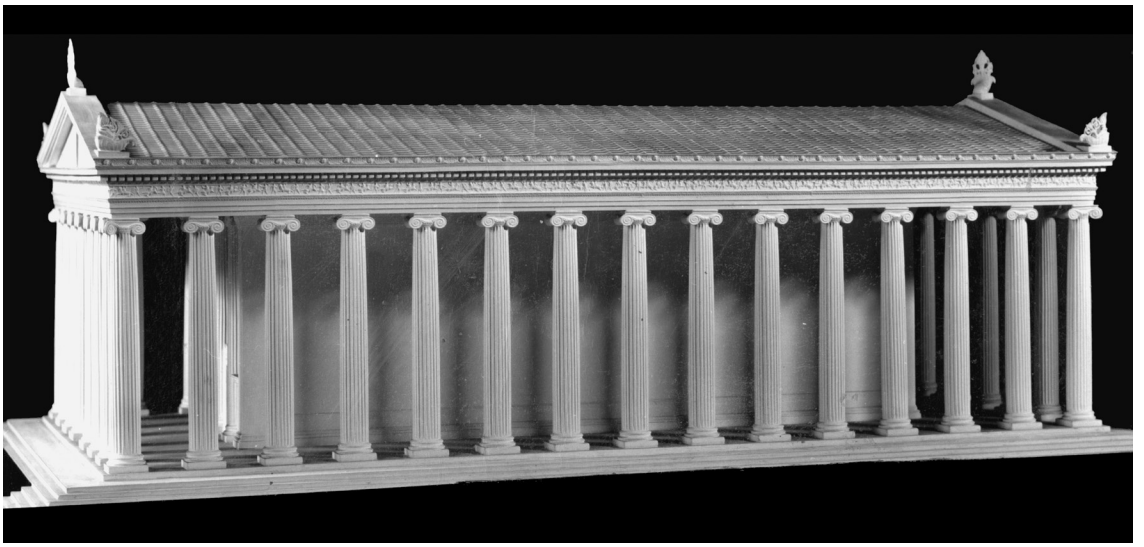

Fig. 4. Model (1964) of the Magnesia Temple of Artemis in the Istanbul Archaeological Museums. It served for decades as the only representation of the light and shadow effects determining the visual appearance of Hermogenes' work (courtesy DAI Istanbul, neg. no. 64/332; P. Steyer).

as in ancient rhetoric *asperitas* meant the 'contrast' of style to heighten a speech's effect). What Hermogenes must have pursued with his theoretically redefined pseudodipteros was "no less than the intercolumnar dark contrast in itself". And in this, Drerup continues, we have to see "a fundamental aesthetic principle of Hellenistic architecture", already palpable in sculpture (e.g., the grand frieze of the Pergamon Altar). An intercolumnar shadow certainly was (so Drerup) a familiar reality, notably in porticoed market buildings with the striking light-shadow contrast of their front colonnades against their deep interiors, but, with Hermogenes, *asperitas* had now become a programmatic, theoretically-defined value, as the leading principle of a reformulated aesthetic of his day.[9]

Only G. Gruben immediately picked up on Drerup's approach, using the same photographic view of the temple model in Istanbul, in order to characterize Hermogenes' work: of utmost "rational clarity" in its plan, it is at once a testimony of the master's grandiose control of "light and shadow," as a new "pictorial" medium in architecture.[10] Yet because of Hermogenes' reported theoretical approach, in particular his proportional categorization of intercolumniations (Vitr. 3.3.1-8), his reputation remained essentially that of a theorist, whose "place in history depends more on his books than on his buildings" (J. J. Coulton), while J. J. Pollitt assigned him a place in the rule-bound "didactic tradition" of Pytheos with his "icy, intellectual elegance".[11] Other than by H. Lauter (1986), Hellenistic

9 Drerup 1964, especially 13 (quote on 16), arguing (15) against the interpretation of Ferri (1960, 110), who emphasizes the 'rhythm' of a temple colonnade created by *asperitas*, followed in this by C. Fensterbusch, *Vitruv. Zehn Bücher über Architektur* (Darmstadt 1964) 544 n.178. Still, Fensterbusch (149) prefers the translation of "Herbheit (krasse Wirkung)" for *asperitas* (Vitr. 3.3.9).

10 Gruben 1966, 367-72 (370-71: "malerisch"); thus up to latest edition in *Griechische Tempel und Heiligtümer* (Munich 2001) 429-30.

11 J. J. Coulton, in *Macmillan encyclopedia of architects* 2 (New York 1982) 359-61 *s.v.* Hermogenes (quote on 361); J. J. Pollitt, *Art in the Hellenistic age* (Cambridge 1986) 242-47 (quote on 244). Even in his seminal re-evaluation of the Hellenistic period of 1986, H. Lauter (*Die Architektur des*

architecture was not at the forefront of scholarly investigation until the 13th Congress of Classical Archaeology (1988) changed the situation: Hellenistic architecture and the entire Hellenistic period now shifted into the limelight of a new interest.[12] Special attention was given to Hermogenes; a colloquium was dedicated exclusively to him (published 1990), and while little agreement could be found as to his actual achievements (surmised perhaps to lie more in city planning than in architecture), consensus could be found in the long-debated question of Hermogenes' *floruit*, placed *c.*200 B.C. and thus *not* dependent on the Pergamon Altar and its innovations. But what, precisely, constituted Hermogenes' allegedly important contributions to architecture? The volatile effects of light and shadow escaped attention entirely, the analytical tools to address having fallen into oblivion.[13]

In 1995, B. Schmaltz countered this dissatisfying situation with an effort to reconsider Drerup's position in light of the emerging novel possibilities of digital visualization.[14] The 'dark zones' created by the *cella*-embracing colonnades of a temple, as they appeared to the ancient viewer from the surrounding urban space, are key, he argued, to an understanding of what Hermogenes accomplished. In collaboration with computer experts H. O. Svenshon and D. Vogel, he launched a new visual attempt to cope with the extraordinary 'aspects' and 'effects' that Hermogenes' works were famous for. The resulting frontal view of the Magnesia temple within its porticoed precinct (fig. 5) re-inserted the dramatic effects of light and shadow, spaces and views into the discourse on Hermogenes. Overall, the scenario he presented may well be too fixated on an observation from the precinct's propylon (dating, as preserved, from the Augustan period) and too confident about the

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Hellenismus [Darmstadt 1986]) comes to the conclusion that Hermogenes' achievement consisted in having brought "some movement — but no more than that" into the rigid traditionality of the Greek peripteral temple (188); however, following Drerup, he recognizes "light and shadow" as an "essential and independent device" in Hermogenes' design (187). For F. E. Winter, in J. Turner (ed.), *The dictionary of art* 14 (London 1996) 461 *s.v.* Hermogenes, the architect is still remarkable only as the writer of "descriptive and theoretical treatises"; cf. id. 2006 (supra n.5) 12-14 and 237 (marking "the culmination of Hellenistic architectural theory"). A. Stewart, *Art in the Hellenistic world* (New York 2014) also emphasizes Hermogenes' manifesto and proportional schemes, along with his promotion of the pseudodipteral plan (314-15), while stressing (158-61) Hermogenes' rôle in making the pseudodipteral ambulatory "more spacious, impressive, and practical for accommodating religious processions". For the discrepancy between ancient praise and modern criticism of Hermogenes, see already R. A. Tomlinson, "The Doric order: Hellenistic critics and criticism," *JHS* 83 (1963), especially 136 with n.7.

12 *XIII. International Congress of Classical Archaeology, Berlin 1988* (Mainz 1990), especially the summarizing remarks by E. Buchner (5), N. Himmelmann (13-16) and P. Zanker (649-50).

13 *Hermogenes* 1990: for broad agreement on the 'early date' of Hermogenes (end of 3rd/ beginning of 2nd c. B.C.), see especially Hoepfner (29-30), Kreeb (103-9), but contradicted for stylistic reasons by Akurgal (123-27); for an assessment of Hermogenes' importance, especially Hoepfner (28-29: Hermogenes "entgegen der Darstellung bei Vitruv kaum mit eigenen Erfindungen hervorgetreten;" novelties perhaps "monumentale und symmetrische Platzanlagen"). For a detailed follow-up on Hermogenes' date, in favor of his 'early' activity at the Temple of Artemis, see Rumscheid 1994, 25-28, a date not contested any more. On the consequences of this for reversing its relationship with the Pergamon Altar, see below with n.30. More explicit than before on Hermogenes' artistic importance is Hoepfner, in R. Vollkommer (ed.), *Künstlerlexikon der Antike* 1 (Munich 2001) *s.v.* Hermogenes, especially 309: 'highest importance' through his creation of built prospects (*scenographies*) and monumental, portico-surrounded piazzas ("Gestaltung von gebauten Bildern [Skenographien] und monumentalen, hallenumstandenen Platzanlagen").

14 Schmaltz 1995; on the use and limits of computer visualization, ibid. 134 with n.11 and 135 n.13.

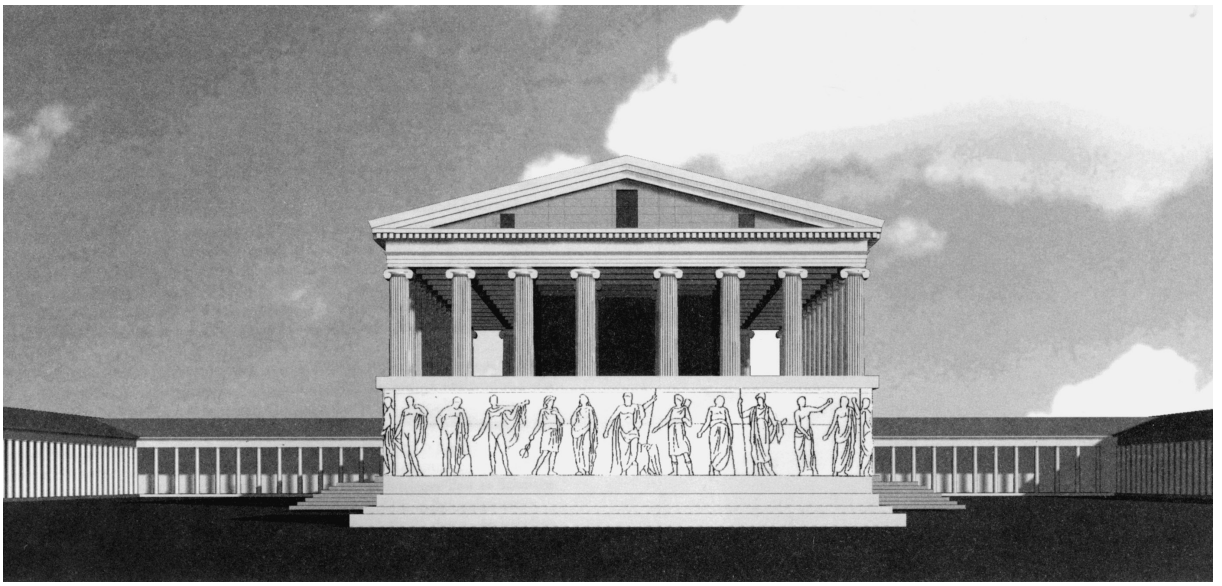

Fig. 5. Magnesia Temple of Artemis within its precinct. Computer-generated view (1995) detailing the light and shadow effects. Other than the photograph of the model (here fig. 4) no such visualization previously existed. Missing are the well-preserved acroteria, while the reconstruction of the altar is tentative (Schmaltz 1995, fig. 1, trimmed; with permission).

presence of precinct-framing porticoes (not attested for Hermogenes's day);[15] it also had to resort to assumptions in the unresolved reconstruction (even orientation) of the altar; it strangely omits the temple's well-preserved akroteria (nearly the height of the pediment) and leaves the temple's uncertain column height out of consideration; and as acknowledged, it was affected by the computer's limited capacity. Still, at last the 'photographic' quality of architecture was brought to scholarly attention again, and discussion could focus on the nuances of light and shadow, and their staggered distribution and intensity; on the orchestration of open and restricted views (*Durch- und Einblicke*) in deep perspectives contrasting with flat prospects; and on the articulation of space within the pseudodipteral colonnades as a hall-like interior of its own, rather than a mere distance (*Innenraum*, not *Zwischenraum*).[16] What the multiplicity of effects had in common was a deliberate "staging of contrasts". Only a detailed reconstruction in a *Gesamtbild* of effects, he emphasized, allows us to assess the "radical" change in the perception and presentation of architecture that Hermogenes pursued, in which the pseudodipteral concept was "fundamentally important". The mindset of Vitruvius, Schmaltz surmises, must have felt reassurance in such an effectful redefinition of architecture that had now been digitally re-created.

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15 Regarding the propylon's date, Rumscheid (1994, 170-75) has no doubt that, based on multiple characteristics of its ornamentation, the building in its preserved form belongs not to the Hellenistic but to the Augustan period. As for the porticoes around the temple precinct, *Magnesia* 1904, 100 already assumed a Roman Imperial date for the rebuilding ("Erneuerung") of the extant buildings, confirmed (again for stylistic reasons) by Rumscheid (vol. II, 40 no. 140). All this does not exclude the earlier existence (or planning) of both propylon and porticoes (cf. Rumscheid 40) but certainly leaves their inclusion within a holistically-designed placement of the Artemis temple open. As for the Artemis altar (dated to the decades between 221 and *c.*200 B.C.: Rumscheid 28, 214-17) Schmaltz (135 n.11) is aware of the unresolved problems of its reconstruction and orientation.

16 For Schmaltz' concepts of "Durch- und Einblicke" and "Zwischenraum als Innenraum", see id. 1995, 140; for the subsequent quotes, 136 n.14 ("Inszenierung von Gegensätzen"), 138, and 140.

At the same time, unparalleled scholarly attention was being given to the Vitruvian text. In 1990 there appeared P. Gros' exhaustive commentary on Vitruvius' book 3. In 1992 there followed Gros' edition of book 4, in 1995 M.-T. Cam's commentary on book 7, each containing the other passages on Hermogenes (4.3.1 and 7.*pr*.12).[17] One aspect that attracted Gros' particular attention was the meaning and pivotal rôle of *asperitas*. He addressed the issue fully in "L'ambiguïté de l'*asperitas*" in ancient architecture and rhetoric (1991).[18] *Asperitas* emerges for him (following Ferri) as the "impression of relief" that it creates, be this through the appearance of deep space between the intercolumniations of a pseudodipteral colonnade (3.3.9) or the attractive effect in Apaturios' painting of columnar architecture (7.5.5). This latter passage served Gros explicitly as the 'justification' for his interpretative translation as "l'impression de relief" in 3.3.9. But how come, he asks, that a term connoting 'savage rawness' in its Greek equivalents (τραχύτης, ἀγριότης, ὠμότης) was used by Vitruvius for the very opposite, to imply artistic elaboration? For Cicero (e.g., *Orat.* 5.20; 44.150), just as later for Quintilian (*Inst.* 10.2.23), an *asper* speech entailed roughness, a "cacophonie" of sounds, or at best a "mannered archaism". But starting with the Hellenistic period, Gros observes a rather favorable metaphorical use of "austere" qualities by critics and historians of art, with three passages being of particular relevance: Aristotle (*Probl*. 19.49) hesitantly, but finally in a positive sense, uses the characterization τραχύ τι καὶ κινητικόν to describe, in music, a form of roughness in melody and rhythmic enlivening. Even more important according to Gros, indeed a 'gloss' on the Vitruvian passage, is the comparison that his Greek contemporary Dionysios of Halikarnassos (*De comp. verb*. 22) uses to characterize the "austere" genre in speech, in which words must be set like columns, solidly but with perceptible distances from one another, so that, due to such "harsh (τραχείαις) and dissonant collocations", words are perceived by the ear just like columns by the eye.[19] Finally, a passage in Pliny (*NH* 35.29), while not using the term *asperitas*, describes the effect in question, namely the introduction of light and shadow in art which, in mutually reinforcing opposition, creates what is called *tonos*, a transliterated Greek term, Gros adds, comprising the notions of rhythm, vigor, and tension. In view of these testimonia, Gros deduces behind the Vitruvian term *asperitas*, first, a Hellenistic use in a positive sense of its Greek equivalent in architecture, with Hermogenes as "the most efficient intermediator" in this process; and, second, a Vitruvian re-interpretation of the term, with *auctoritas* being the key for a successful incorporation of *asperitas* into the Roman context, now devoid of "ruggedness". *Asperitas* in architecture had become the refined, yet striking visual effect caused by the brightness of columns together with the reinforcing darkness of the intercolumniations, resulting in a powerful appearance of plasticity and relief. Picking up on *asperitas* later (2008), Gros positioned the term within the

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17 Gros 1990; id., *Vitruve de l'architecture. Livre IV* (Paris 1992); B. Liou, M. Zuinghedau and M.-T. Cam, *Vitruve de l'architecture. Livre VII* (Paris 1995); on the series, see supra n.1.

18 Gros 1991, especially 74-78 for the following points and references. The translation of *asperitas* as "illusion of relief" was first advocated by Gros (1990, 18 and 115-16) for Vitr. 3.3.9, but had already been introduced by Ferri (1960, 273) for Vitr. 7.5.5 ("la perfetta illusione del relievo"), while for Vitr. 3.3.9 Ferri (110-11) prefers "rottura ottica", explained as "ritmo, rottura, interuzione periodica", a solution not accepted by Drerup (1964, 15 with n.3).

19 Gros 1991, 75-76, first utilizing the Dionysios passage in the given context. The part of the passage quoted here uses the fine English translation by S. Usher in *Dionysius of Halicarnassus. Critical essays* II (Loeb edn., Cambridge, MA 1985) 169 (notwithstanding a full line of omitted text in his translation nearby). For the subsequent characterization of Hermogenes as "médiateur", see Gros 1991, 77 (quoted).

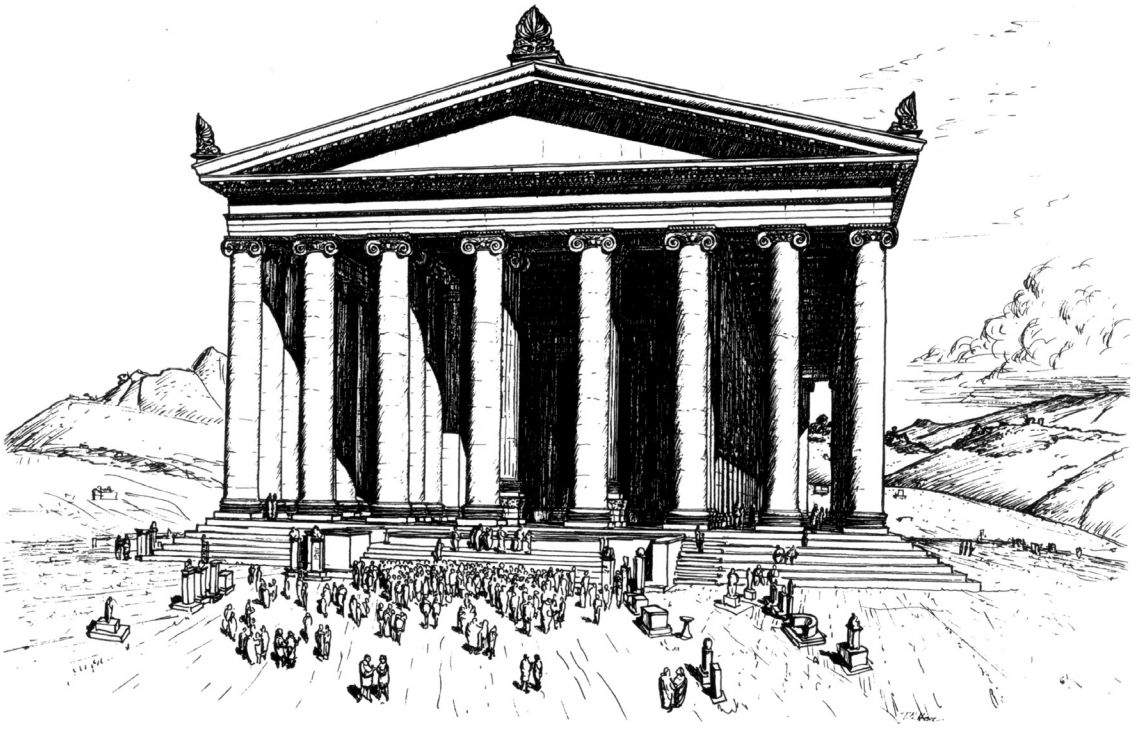

Fig. 6. Sardis Temple of Artemis in its Imperial phase, in a hand-drawn visualization of pseudodipteral colonnades, showing light, shadow and spatial depth (even scale figures feature shadows) (T. N. Howe, in *Appearance and essence* [1999] 206 fig. 11.5; with permission).

ancient practice of architectural design.[20] The concept of *asperitas* now served as a weighty indicator of visual perception exploited beyond the mere projection of planar geometry, in ways that included the theory of "accumulated layers of air" (*crebritas aeris*, as in Vitr. 3.3.11; 3.5.9), "which deprived space of its homogeneity". Thus, the preparatory type of drawing which Vitruvius presents as *scenographia* (1.2.2) is defined through the term *adumbratio*, a translation from the Platonic *skiagraphia*, which, according to Gros, indicates that such a scenographic-perspectival drawing was really one "with shadows." In short,

> The many commentators on references to perspective in *De architectura* have barely noted this concept of *asperitas*, which better than any other term in the treatise expresses the idea of 'high relief' engendered by the play of shadow and light.

Thanks to Gros' efforts to tease from the term *asperitas* its several layers of meaning and their origins, the field had been scoured for evidence from a textual point of view, but the *visual* analysis of the term, based on reconstructions, has not been pursued in tandem. No new effort was launched after B. Schmaltz's study of 1995 to cope with the key monument. Only T. N. Howe has advanced the pursuit of making the pseudodipteral effects of a temple accessible to our eyes through a masterly, hand-drawn rendering of the Temple of Artemis at Sardis (fig. 6). His drawing evokes space through light and shadow brilliantly, demonstrating that it is not technology that stands in the way of visualizing *asperitas*. The digital age has widened the availability of architectural rendering techniques, and this is where our attempt starts, as we aim to surmount Hermogenes' 'image problem'.

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20 Gros 2008, especially 8-9 (with subsequent quotes).

Hermogenes' 'image problem': a new approach

It is time to address the dearth of images for Hermogenes' Magnesia temple through 3D modeling, even if the rapid advances of digital technology may shortly render our visualization obsolete. We also have to accept that the medium of print cannot capture the experiential vitality we discovered through real-time 'walk-throughs' projected at a large scale. Still, the deficient state of affairs deserves every effort. Our experiment was made possible by the convergence of three felicitous facts: the uncertainty about the column height of the Magnesia temple has been resolved; digital architectural modeling software and the computers capable of running it are now widely available and easy to use; and the Department of the History of Art at the University of Pennsylvania provided the opportunity to devote a graduate seminar to modeling the temple at Magnesia.[21]

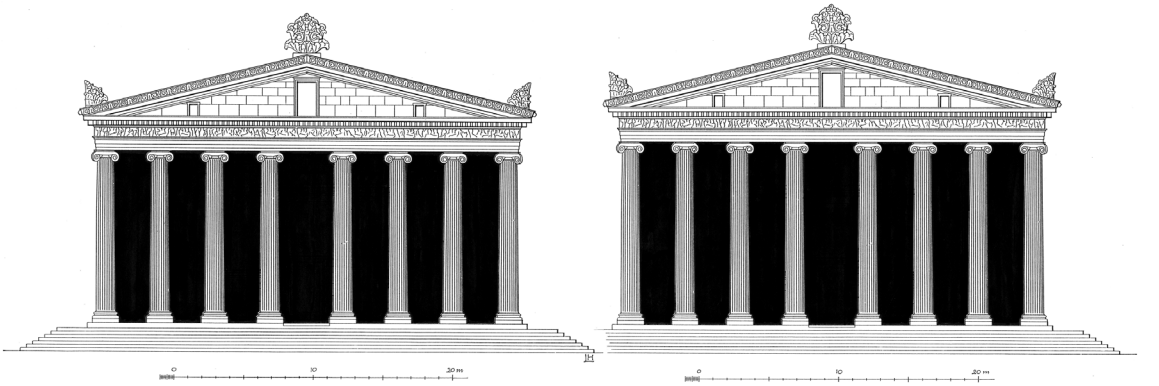

Fig. 7. Magnesia Temple of Artemis, façade with darkened intercolumniations. At right, the traditional reconstruction with estimated column height of *c.*13.10 m, as reprinted since 1904, in juxtaposition (left) with the considerably lower column height of 12.40 m measured by J.-J. Clerget in 1842 (Haselberger 2012, 129 fig. 3).

Our visualization of it is more accurate than any previous one because of the rediscovery of the documented height of the columns (fig. 7). The 1904 publication of the Prussian excavations had to admit that the column height could not be determined any more and that consulting the results preserved in the École des Beaux-Arts, Paris, which gave a height of 12.40 m as measured by J.-J. Clerget in 1842 from a sequence of column drums had been inconclusive.[22] It was thus not to be expected that another visit to the well-kept archives of that institution would lead to proof that the French measurement was based on the complete sequence of column drums (including base and capital) of the temple's W façade, which had fallen flat on the ground in its entirety, resulting in a perfectly reliable column height of 12.40 m ± 2 cm.[23] The strikingly shorter columns that Hermogenes arguably preferred run counter to all expectations based on Vitruvius's rules (3.3.10) and the ensuing estimate of the Magnesia publication (13.30 m, rounded off to 40 feet or 13.11 m), or the even taller height (*c.*13.40 m) used for the two reconstructed columns at the Pergamon Museum.[24] Contrary to the slender column height visible there, or in the oft-

21 See our Acknowledgements below.

22 *Magnesia* 1904, 53 ("... nicht mehr zuverlässig bestimmen"); ibid. n.2 with reference to Clerget's result of 12.40 m, dismissed as lacking specifics. Ibid. 13 and 16 on Clerget's documents archived in the École des Beaux-Arts in Paris and the (inconclusive) consultation of these documents *c.*1900 when the Magnesia publication was being prepared.

23 Haselberger 2012, 126-28, based on a visit at the École des Beaux-Arts in 1988.

24 *Magnesia* 1904, 54; Haselberger 2012, 125 with n.3 (height of reconstructed columns provided by

reproduced elevation drawings of the Magnesia publication, we must acknowledge that Hermogenes' columns were shorter by about one full meter (more than two-thirds of a Vitruvian module). Our visualization incorporates these palpably stouter columns and a consequently lower position of both pediment and roofline. It seems that Hermogenes, in advocating the Ionic order as the only universally valid one for temple design (cf. Vitr. 4.3.1), aimed for an elevation more commensurate with the Doric order, which itself was approaching Ionic slenderness during the Hellenistic period.

We reconstructed the Magnesia temple in *SketchUp 2014*, an intuitive architectural modeling software that debuted in 2000 and is now available for free in its tenth iteration.[25] This software lacks the robust modeling and rendering capacities of other professional software, but it embraces a rough simplicity well suited to the conjectural nature of reconstructing a classical building. The ease of learning the software combined with case-specific tutorials allowed the 6 students of our seminar (most with no prior experience in digital modeling) to develop a degree of fluency to re-create the Temple of Artemis within 6 weeks. Contemporary rendering software can now replicate the semi-specular, semi-luminous texture of polished marble with life-like results, but, in full awareness of our ignorance about the temple's polychrome scheme, we have eschewed any pretence at photo-realism. Because our simple rendering of a monochrome form illuminated only by the sun can obscure areas in complete light or shade, we found it necessary in certain cases to employ black outlines to delineate form.

SketchUp interfaces smoothly with *Google Earth*, allowing for quick shadow reconstructions based on geo-location. Although this contemporary shadow model is not accurate to the day and minute of an earlier millennium, it approximates with sufficient accuracy for our purposes the angle of shadows in different seasons based on the temple's SW alignment.[26] We preferred the angle of the sun at about a month from the equinox toward the winter solstice, when the light visibly entered the building, but not at the extreme degree seen on the shortest days of the year (fig. 8). The lighting of early afternoon, around 3 p.m., was selected because it fully illuminated the façade and flank while retaining an oblique angle necessary to produce shadows on the fluted column shafts that reveal their volumes. The necessity of sifting through the myriad of possible lighting scenarios caused us to avoid considering our temple under conditions that occur only at brief and seasonally variable moments, for the effect of the dignified appearance of a temple (*ut aspectus ... habeat auctoritatem*) due to the *asperitas* of its intercolumniations would hardly have been restricted to occasional, specific lighting but must be assumed to have been a generally-present phenomenon. Thus narrowing down our lighting scenarios to characteristic viewpoints was a chief consideration. Digital "walk-throughs" allowed us to scrutinize the temple from the many vistas possible around the precinct, all of which altered the appearance of the spacing of the columns. In 'flip-book style' succession, we present here (fig. 9) a sequence of 6 consecutive pedestrian perspectives at intervals of 15 m that simulate the glimpses one might have seen while walking along the temple's SW corner and S flank.

In order to grasp the specific effect of Hermogenes' pseudodipteros, it is useful to compare it with other major types, the dipteros and the peripteros. The dipteros must be under-

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V. Kästner).

25 *SketchUp* has been applied in archaeology and historic architecture for a variety of purposes, ranging from Virtual Reality simulations to modeling the historical acoustics of ruined buildings: K. A. Knabb *et al*., "Scientific visualization, 3D immersive virtual reality environments, and archaeology in Jordan and the Near East," *Near Eastern Archaeology* 77 (2014) 228-32; M. Azevedo, B. Markham and J. N. Wall, "Acoustical archaeology. Recreating the soundscape of John Donne's 1622 gunpowder plot sermon at Paul's Cross," *Proceedings of meetings on acoustics* 19 (2013), http://dx.doi.org/10.1121/1.4799054

26 For the speculative celestial alignment of the Temple of Artemis in Hermogenes' day, see O. Bingöl, "Epiphanie an den Artemistempeln von Ephesos und Magnesia am Mäander," in H. Friesinger and F. Krinzinger (edd.), *100 Jahre österreichische Forschungen in Ephesos* (Vienna 1999) 233-40 with pls. 42-44; Bingöl 2007, 70-73.

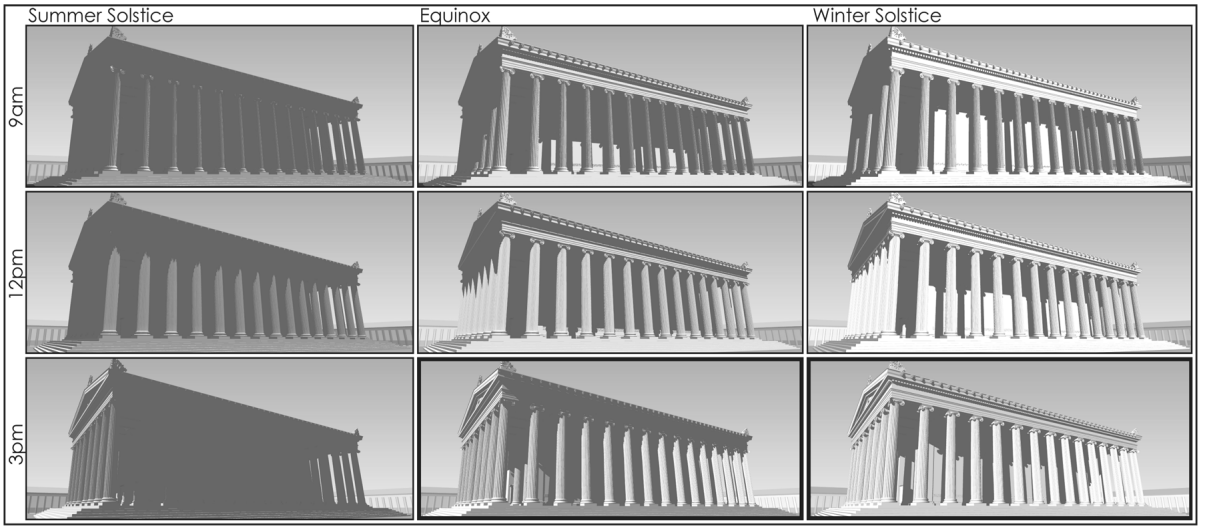

Fig. 8. Magnesia Temple of Artemis, rendered under 9 lighting conditions to show daily and seasonal variation at 9 am, 12 noon, and 3 pm at the summer solstice, equinox, and winter solstice. In all subsequent renderings, we utilize a preferred lighting angle in the early afternoon around 3 pm, at a seasonal time about 1 month from the equinox toward the winter solstice (roughly Nov. 2 and Feb. 8) (S.H.).

stood in juxtaposition to the pseudo-dipteros (Vitr. 3.2.6-7), and we have generated two experimental alternatives based on Magnesia: a dipteros with a second internal row of columns, and an octastyle peripteros after the Parthenon, with flank walls closer to the colonnade. Re-creating such contrasting scenarios will sharpen our attention toward the special appearance of the pseudodipteral arrangement. What are the striking effects *not* provided by a dipteral or peripteral solution? Why was, among all the fully-colonnaded options, the effect of a pseudodipteros the only one worth striving for? Theorizing about this, and spelling out the *ratio* (rationale) of the pseudodipteros, was, after all, perceived as Hermogenes' break-through, granting him the rank of "first inventor" (Vitr. 3.3.8: *primus invenit*).[27]

Asperitas visualized: the results of our attempt

Visualizing Hermogenes' pseudodipteral temple and the effect of its *asperitas* are at the core of what the following images are intended to accomplish. We present them, first, to pursue Vitruvius' testimony about Hermogenes' novel conception of seeing space, with *asperitas* as the fulcrum for successful design; and, second, to counter a history of scholarship that side-tracked Hermogenes' visual achievements and made them fall victim to

27 The old claim that Hermogenes 'invented' the pseudodipteros *as such* (cf. *Hermogenes* 1990, 10-11 and 123) is not only counter to Vitruvius' explicit point of the pseudodipteral *ratio* as the object of Hermogenes' invention (*Hermogenes* 1990, 81; Rumscheid 1994, 70; Haselberger 2012, 131-35), but also untenable in view of at least one pertinent pseudodipteros accepted as built *prior* to Hermogenes' time, namely the temple at Messa on Lesbos (for its date *c*.340-320 B.C. see Rumscheid 1994, 59-70). As for the rôle of 'wide-hall temples' in the Archaic Greek West, a region of its own, see already Drerup 1964, 14-15 and now D. Mertens, *Städte und Bauten der Westgriechen* (Munich 2006) 133, 141, 220-21, 232, 254, 418-19, and especially 296-302 (Ionic temple at Metapontum, *c*.470 B.C., in the Archaic tradition). For good reasons, Mertens separates these earlier, mostly Doric, wide-hall temples as "developmentally unrelated" (301) to the later pseudodipteroi. If the term *pseudodipteros* appears correctly in Vitruvius' mention of Hermogenes' treatise (7.*pr*.12: *de aede Dianae ionice quae est Magnesia pseudodipteros* ...), it can be traced back to Hermogenes' day, but extrapolating it to the much earlier West Greek wide-hall temples may well be an anachronism.

an 'objective' rendering. Vitruvius' account of *asperitas* as a visual quality that a master of Second Style wall-painting could convey in a two-dimensional rendering (7.5.5) gives us hope that our method of searching for *asperitas* through two-dimensional visualizations will be both effective and historically valid.

The following observations serve as an ecphrastic commentary to our visualization, which must be scrutinized by the eye first. The images are not meant to illustrate our text, but to speak for themselves. They are the firstfruits of an attempt at reconstructing Hermogenes' pseudodipteral masterwork, with the explicit purpose of pinpointing the experience that so catalyzed the theorization of visual effects in columnar architecture.[28] They provide a novel source to pursue the visual effects, and the *asperitas* of intercolumniations in particular. We are guided by the classical concept of *enargeia*, a key component of ecphrasis in rhetoric, striving to bring an object (or any matter) 'before the eyes' of an audience in as vivid and animated ways as is possible.[29] Accordingly, we must beg the reader to apply enlivening imagination when studying the images: they are obviously but likenesses (*Abbilder*) of a state of reality we still have to 'animate' in our minds so as to approximate the effects we would like to be considered. The focus of our attention will be the colonnade, and the discrepancy between the columns and the intercolumnar spaces. What is the visual quality accentuated by the pseudodipteral plan, which might also be successfully mimicked by a scene-painting? Is it the harsh contrast between light and dark (as Drerup would have it), the contrasting effect between restricted and open sightlines (so Schmaltz), or the impression of relief between the perceived depth of foreground

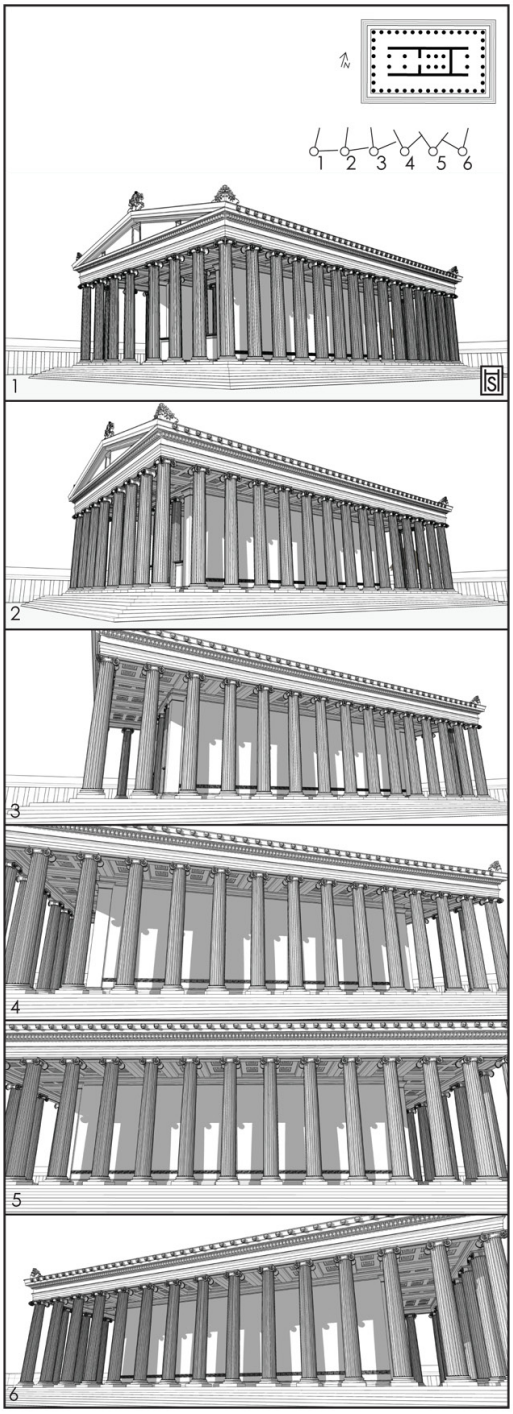

Fig. 9. Magnesia Temple of Artemis, shown in 6 consecutive perspectives, 15 m apart, to simulate in "flipbook style" the glimpses one might have while walking around the temple's SW corner (S.H.).

28 For B. Schmaltz' path-breaking but limited attempt of 1995, see above with fig. 5.

29 For *enargeia* as the distinct, vivid presentation of an object or topic, see, e.g., Arist., *Poet.* 17.1 (1455a 24): *enargestata*; id., *Rh.* 3.11.2-4 (1411b-1412a): *'pro ommaton', energeia, energounta*; Dion. Hal., *Lys.* 7: *enargeia*. On *enargeia* as main ingredient in the concept of *ekphrasis*, see S. Marino and A. Stavro (edd.), *Ekphrasis* (Rome 2013), especially 5-7 (Stavrou) and 23-34 (Lombardo); R. Webb, *Ekphrasis, imagination and persuasion in ancient rhetorical theory and practice* (London 2009), especially 87-106.

and background (Gros, following Ferri)? Exploring each of these possibilities is the more narrowly defined purpose of the three views of the temple presented here, with dipteral and peripteral alternatives systematically added.

Figure 10 (color on p. 387) shows the first unobstructed view of the façade for a person approaching the temple from south of the altar, at a point in line with the columns of the S flank. In the pseudodipteral arrangement (top) this image highlights the presence of open sightlines. In the S flank colonnade, one sees directly through the temple and out the other side; this long sightline through the shaded space gives a sense of internal volume. In the dipteral simulation (middle), the same area has become stuffed with columns obstructing the clarifying effect of spatial perceptions. In the peripteral version (bottom), sightlines are similarly restricted but without the busyness of repeated columns. The vantage point chosen here is particularly useful for considering the effect of *asperitas* in the pseudodipteral setting. Although the contrasting effect between light and dark is fundamental to the difference between columns and intercolumnar spaces, here 4 of the 7 intercolumniations reveal additional windows of bright daylight that more heavily contrast with the shaded interior and may even overpower the brightness of the columns. Unlike the alternatives, the pseudodipteral solution allows the eye to take in at once all sides of the columnar space created inside the colonnade, thereby parading the dissolution of its traditional corporeality.

The vantage point of fig. 11 (color on p. 388) approaches the S flank past the point of a three-quarter view. Such an oblique angle causes unusual changes in the appearance of the colonnade because its intercolumnar spaces collapse completely when the eye sees the colonnade at angles of less than *c.*20°. From this perspective the façade appears as a solid wall of columns while the intercolumnar spaces on the flank dwindle to a sliver at the far end. In the intercolumniations visible as such, the colonnade and its ceiling create strange, asymmetric shadows on the *cella* wall in the pseudodipteral arrangement. By contrast, the dipteral version produces a near-perfect balance between illuminated columns and shaded interior, while the peripteral simulation shows a similar, but slightly less pronounced, contrast. From this vantage point, the broad ceiling span inside the pseudodipteral colonnade is visible, whereas in the dipteral alternative the interior columns obstruct a glimpse of the ceiling. Even when viewed obliquely, the pseudodipteral colonnade presents the beholder with a fully open exterior.

Figure 12 (color on p. 389) shows the full flank view from a southern vantage point within the precinct (at position 5 in fig. 9). To capture the full length of the building, the angle of view has been stretched to a moderate panoramic perspective. In the pseudodipteral scheme the asymmetry of the shadows is striking. Although the shadows of the columns cast on the *cella* wall form a steady rhythm that duplicates the spacing of the columns, a rough asymmetry arises because the optical diminution of the distant shadows causes an interference of rhythm (syncopation) between the patterns. In the dipteral simulation the interior is too full of shadows and the sightlines too obstructed to reveal this pattern. In the peripteral version, the *cella* wall is too close behind the colonnade to produce a sizeable effect. It turns out that a critical faculty in perceiving depth while moving is the apparent displacement of stationary foreground objects at greater proximity to the viewer than objects farther away (known as "motion parallax", such as when, from the windows of a moving car, trees appear to whiz by, while mountains in the distance remain stationary). Because the open design of the pseudodipteros allows one to see so clearly into the building and compare the columns to their shadows, the effect of this sort of displacement is perceived clearly even in this stationary viewpoint. Then again, this optical phenomenon of perceived spatial displacement is visible only under certain lightning conditions and therefore is unlikely to be the soul of *asperitas*, even while it may contribute to its effect.

Where do we stand now in our search for *asperitas*? While precise definitions cannot be expected, there is a broad array of manifestations in which *asperitas* has become tangible. The conscious spatial juxtaposition of 'harsh', contrasting effects in the lighting and viewing of a colonnaded temple appears to be key in what *asperitas* was meant to achieve. More specifically, *asperitas* emerges as the systematic, reasoned exploitation of:

– clashing light-and-shadow contrasts, even within the shadow zones themselves;
– striking spatial depths, clarified by sightlines and by foreground and background planes;
– shaded space perceived as a volume worth shaping on its own terms.

These visual qualities were particularly pronounced in the arrangement of columns for a pseudodipteros. The effect of 'harshness' in the staging of light, shadow and spatial depth was now rationally expressed as a value that, potentially grating to the eye, included both risk and fascination. Consciously embracing this effect constituted no less than a novel way of looking at three-dimensional objects (and two-dimensional depictions of them), while the act of spelling out this new visuality as a strategy for temple design could count as a major feat in itself, bringing lasting fame to Hermogenes as the *primus inventor* of rationalizing the pseudodipteral design scheme as a whole.

The key criterion of this new strategy in temple design was the visual effect that became defined in Latin as *asperitas*: its presence was the guarantee for a temple to claim grandeur and dignity in its appearance, arguably without match in any other columnar arrangement. The result was the pseudodipteros as reconceived and newly articulated by Hermogenes in his programmatic temple at Magnesia; similarly incorporated in this temple, though in a modified form, was his other famed achievement, the definition of the eustyle rhythm, with its widened shadow space of the front axis (Vitr. 3.3.6-8). At Magnesia his work became accessible to personal experience (cf. Strabo 14.1.40), while his written account on the temple (Vitr. 7.*pr*.12) provided the underlying rationale for its design, making it accessible to art criticism. The reception of Hermogenes' concept of 'harsh contrast and disparity' in the treatment of light, shadow and spatial depth cannot have been silent or unanimous, or even courteous, as is attested by both the polemical nature of the term *pseudo*dipteros and the anecdote about Hermogenes' defense of the Ionic order (Vitr. 4.3.1). Soon enough, however, this new aesthetic value system made its grand-scale appearance in sculpture in the gigantomachy frieze of the Pergamon Altar, where the 'baroque' treatment of light-and-shadow contrasts has long been recognized (Drerup) as a constituting element in the change of artistic trends and viewing habits.[30] Hermogenes' novel approach toward visuality still enthused Vitruvius (3.3.8-9), who plainly wished to incorporate it into Roman building practice; and the prominent line of imperial cult temples in Asia Minor, beginning with the pseudodipteros of Roma and Augustus at Ankyra, testifies to its appropriation at the highest executive level.[31]

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30 Linking the light-and-shadow contrasts in Hermogenes' treatment of architecture with the "Pergamene technique of dark zones" in sculpture, especially in the gigantomachy frieze of the Pergamon Altar, was done by Drerup 1964, 17-18 (18: quote), but, following von Gerkan's 'late date' for Hermogenes (ibid. 14), Drerup saw his work as dependent on Pergamene art, a sequence no longer tenable. This even led Hoepfner (in W.-D. Heilmeyer [ed.], *Der Pergamonaltar* [Tübingen 1997] 45-46) to claim Hermogenes' building activity in Pergamon. The key rôle assigned to the Pergamon Altar in the formulation and transmission of High Hellenistic art has still to be modified in light of Hermogenes' achievements. The basic study on 'shadow-painting' (*skiagraphia*) in Greek art, criticized as 'deceptive' by Plato (e.g., *Resp*. 602 c-d), is J. J. Pollitt, *The ancient view of Greek art* (New Haven, CT 1974) 23-24 and 217-24, referring to both the importance of *skenographia* and the rôle of "*asperitas* = τραχύτης"(24).

31 On the Temple of Roma and Augustus in Ankyra and its most probable start of construction soon after 25 B.C., see Rumscheid 1994, 6; for a construction period definitely between 25/24 B.C. and A.D. 19/20, see B. Burrell, Neokoroi. *Greek cities and Roman emperors* (Leiden 2004) 166-73. For a selection of Hellenistic and Roman Imperial pseudodipteroi, including the imperial cult temples at Ankyra, Ephesos, Aizanoi and (redesigned) in Sardis, see T. Schulz, "Baukonstruktion und Bautechnik des Zeustempels von Aizanoi ... ," in M. Bachmann (ed.), *Bautechnik im antiken und vorantiken Kleinasien* (Byzas 9, 2009) especially 511 fig. 1 (plans) and 525 (probable connection of pseudodipteral ambulatories with the imperial cult); cf. ead. (ed.), *Dipteros und Pseudodipteros* (Byzas 12, 2012) 165-79 (Schulz) and 95-111 (Yegül).

Our attempt to pinpoint the meaning of *asperitas* comes with a new appreciation of Hermogenes' achievements, as a watershed in the history of architecture. Never before apparently had such volatile effects as light, shadow, shade volume, and the orchestration of spatial depth for the beholder become elements in a theory of design. This in turn has led us to a new understanding of the revolution in Greek visual perceptions that Hermogenes articulated, now tangible in the visualization of his Magnesia temple. Nearly all the individual aspects we identified in *asperitas* have been recognized by previous scholarship (Drerup and Gros), while W. Hoepfner's work on Classical and Hellenistic 'scenographies' has assigned Hermogenes an innovative place in the arrangement of urbanistic spaces and sight-lines.[32] But it is only with the visualization of Hermogenes' pseudodipteros that we can more safely discuss the broader range of meanings that must have come with the Greek equivalent of *asperitas*; indeed, we are now in a position to assess the meaning of that term in Hermogenes' built project.

The effects of stark contrast and jarring disparity at Magnesia were tied programmatically to the form of a *pseudo*dipteros, the 'dipteros by deception'. To some, the visual contrasts and disparities of this type of temple may have appeared attractive; to others, they may have been uncomfortable and precarious (also in view of the interruption of the rhythm by the enlarged frontal middle intercolumniation). Just as in rhetoric, the roughness of contrast was not an intrinsic advantage; in architecture it seems to have been embraced with a sense of its ambivalence and risk, alongside its intended attractiveness. As for a straightforward translation of *asperitas* at Vitr. 3.3.9 and 7.5.5, we might consider "harsh contrast" or "jarring disparity", applicable to both the context of eye-catching effect (in a *pseudo*dipteros) and of deceptive fascination (in a wall-painting).[33] Regarding the original Greek equivalent, the term *trachytes* (τραχύτης) appears to be particularly attractive, most importantly (as Gros pointed out) because of its use by Aristotle (in music) and Dionysius (in rhetoric, with reference to columns), but perhaps reinforced by the fact that *trachytes* (τραχύτης) remained alive as a category in Second Sophistic rhetoric throughout the 2nd c. A.D., designating the 'harsh style' among the 'ideal forms' of speech, thereby retaining its desirable, if ambivalent, connotations of earlier.[34] Meanwhile major pseudodipteral temples continued to be built in Asia Minor, keeping kindred effects and issues alive in architecture.[35]

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32 W. Hoepfner, "Hermogenes und Epigonos. Pergamon zur Zeit Attalos I.," *JdI* 1997, 109-48, stressing Hermogenes' rôle in exclusively urbanistic terms (111) and, allegedly, as a designer of the highest consequence in Pergamon (140-41); cf. id. in Vollkommer 2001 (supra n.13) 305-10.

33 For a selection of established translations of *asperitas* in the two Vitruvian passages, see Gros 1990, 16: "impression de relief" (3.3.9), and Liou *et al.* 1995 (supra n.17) 25: "relief" (7.5.5); Rowland and Howe (supra n.1) 50: "severity" (3.3.9), and "high relief" (7.5.5); Fensterbusch (supra n.9) 149 "Herbheit (krasse Wirkung)" (3.3.9), and "Kontrastwirkung" (7.5.5). For Ferri 1960 ("rottura ottica, ritmo" and "illusione del relievo," respectively) see n.18. Obviously, our results are closest to the translations of Fensterbusch, which do not overcharge the term. While *asperitas* in the given context must indeed be linked to the effects of both 'spatial depth' (as conveyed in 'relief') and light-and-shadow effects (as in Drerup's "Dunkelkontrast" [1964, 16]), these effects appear to be the objects of *asperitas* rather than ingredients of the term itself.

34 In his treatise *Peri ideon*, the 2nd c. A.D. rhetor Hermogenes of Tarsos expands on *trachytes* as one of the sub-categories of rhetoric grandeur, characterizing it as "unrhythmical, dissonant, grating to the ear" (ἄῤῥυθμον, δύσηχον, τραχύνουσαν τὴν ἀκοήν), see H. Rabe, *Hermogenis opera* (Rhetores Graeci VI; 1913/1969) 259-60; C. W. Wooten, *Hermogenes'* On types of style (Chapel Hill, NC 1989) xiv-xviii, 26-30, especially 30.

35 For a selection of pseudodipteroi in Imperial Asia Minor, see Schulz (supra n.31). A major 2nd-

Fig. 10. Magnesia Temple of Artemis, shown in its pseudodipteral form (top) in comparison to two simulations of invented alternative dipteral (middle) and peripteral plans (bottom). The temple is seen from an observer's first glimpse of it upon walking around the S side of the altar in front of the W façade (S.H.).

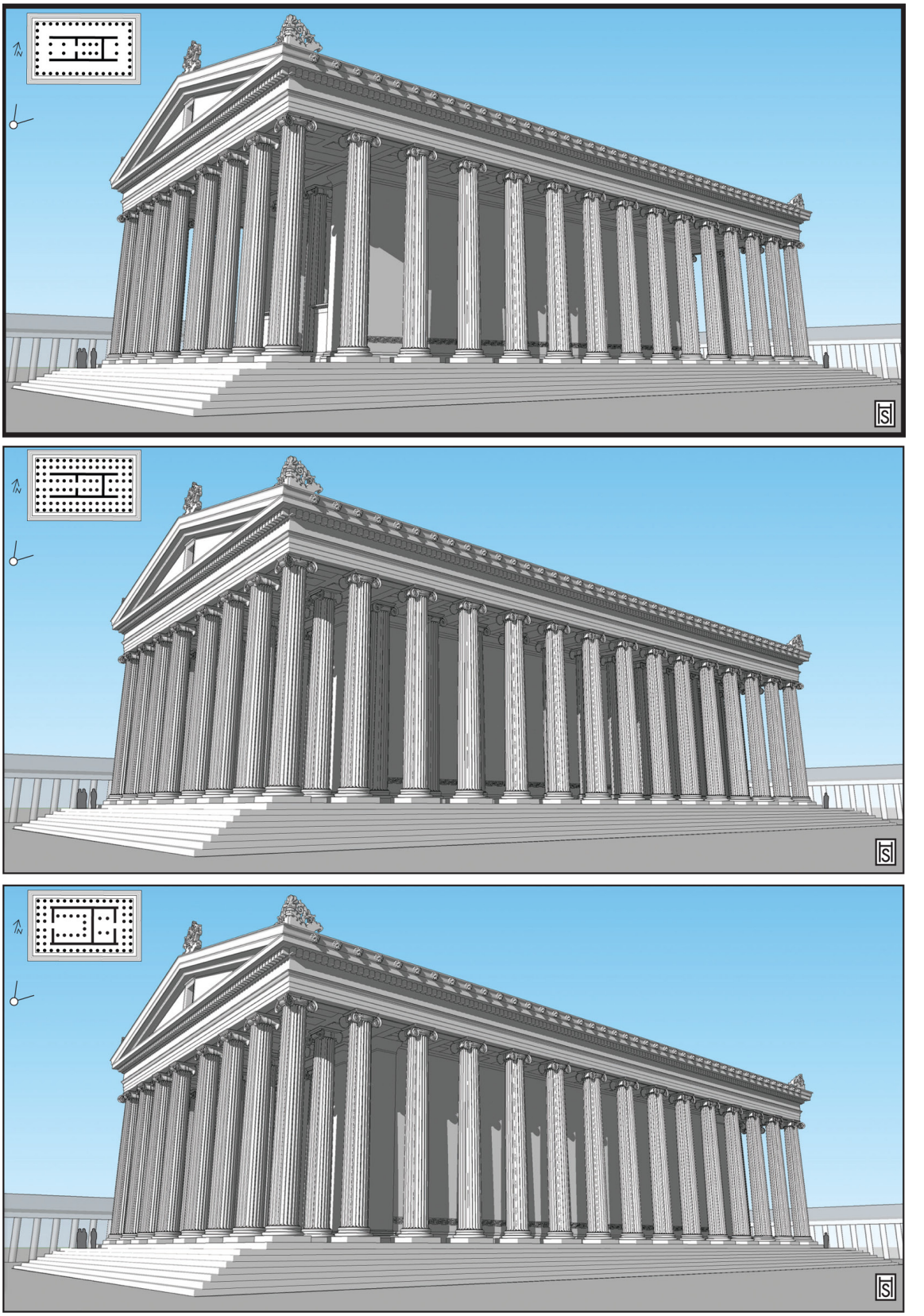

Fig. 11. Magnesia Temple of Artemis, shown in its pseudodipteral form (top) in comparison to two simulations of invented alternative dipteral (middle) and peripteral plans (bottom). The SW corner is seen in a three-quarter view from within the sanctuary (S.H.).

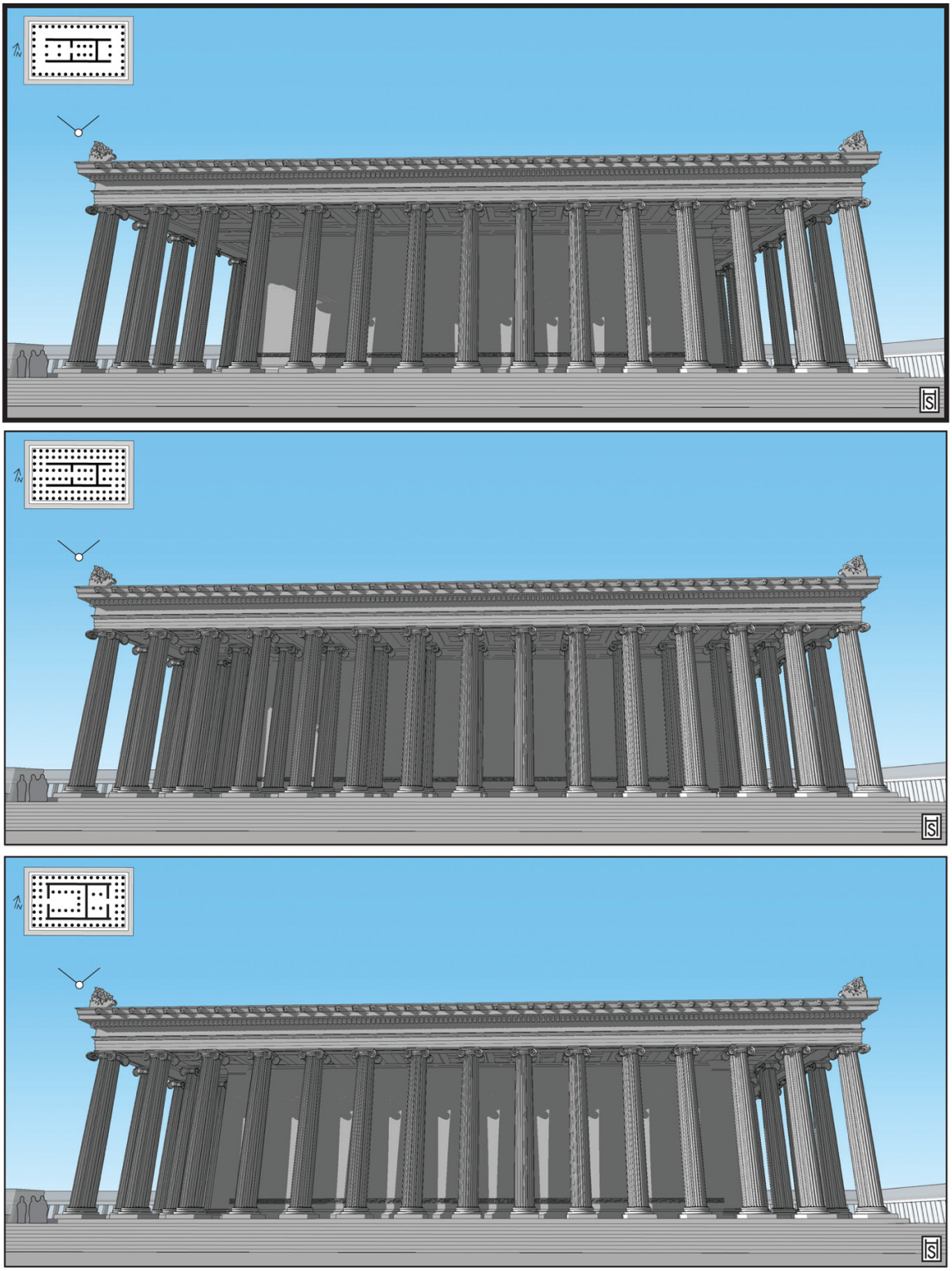

Fig. 12. Magnesia Temple of Artemis, shown in its pseudodipteral form (top) in comparison to two simulations of invented dipteral (middle) and peripteral (bottom) plans. The full S flank is shown in a panorama from a pedestrian's perspective within the sanctuary (S.H.).

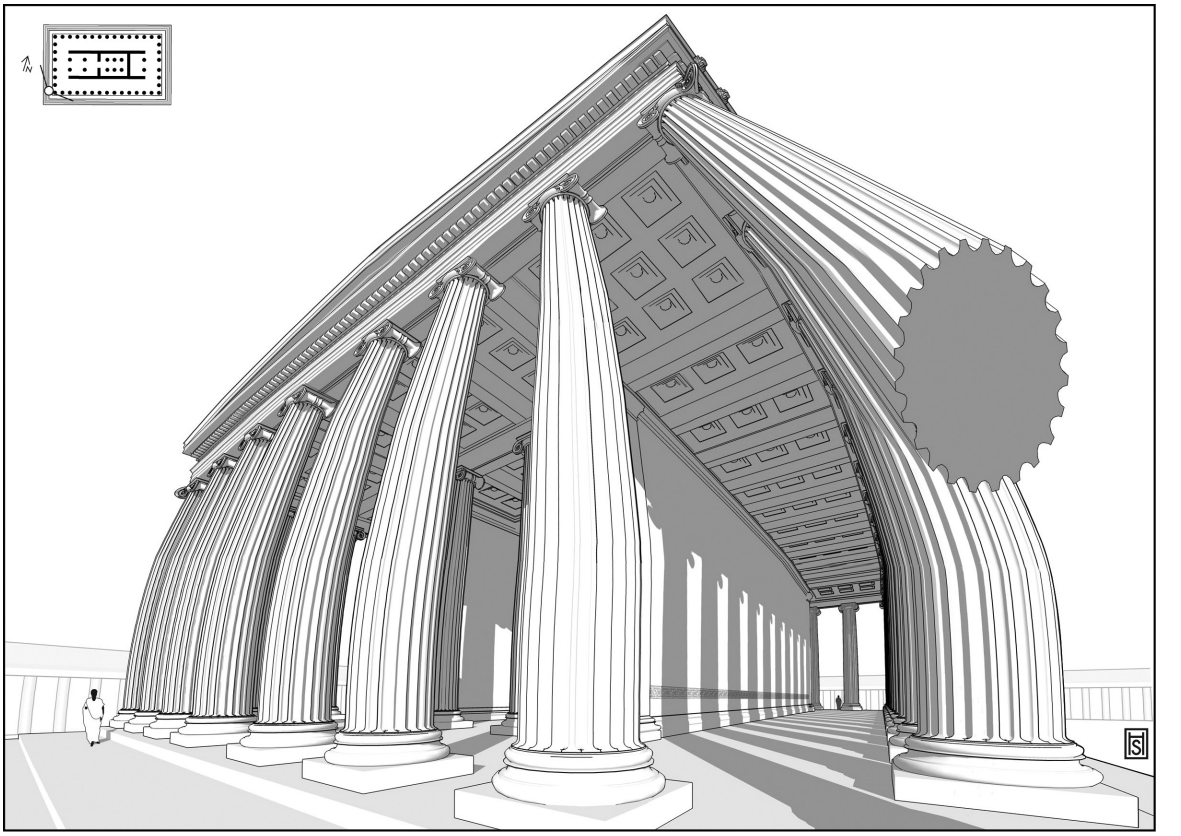

Fig. 13. Magnesia Temple of Artemis, shown in a wide-angle panorama similar to that of a photograph through a fish-eye lens; for lighting angle see fig. 8. This abstraction presents a summary of views that one might have at the moment of entering the façade colonnade through the southernmost intercolumniation (S.H.).

In the end, we hope to change, if nothing else, the conversation about Hermogenes' rôle in the history of architecture and visual perception. To understand his achievements to a fuller degree, we must visualize them. We have sought to realize through digital visualization the effects of light and shadow that Drerup first presented through one photograph of a small-scale model of the temple. We have attempted to press the boundaries of conventional rendering with sequences of panoramic images of varying viewpoints, light scenarios, spatial settings, and columnar alternatives. In this spirit, fig. 13 presents a highly experimental visual summary of Hermogenes' pseudodipteros in a non-standard wide-angle view, as a panoramic perspective meant to embed our conclusions on *asperitas* into a fuller spatial experience. Simulated is a wide-angle perspective, like that of a fish-eye lens, letting the viewer look 90° left, 90° right, and 90° up, at the moment of entering the colonnade through the southernmost façade intercolumniation. Unlike the standard perspective, it provides an exhilarating view of neck-craning magnitude, of the kind explored in the 18th-c. view of the Pantheon's interior by Giovanni Panini.[36] In our case,

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c. A.D. pseudodipteros is also the Hadrianeum (Olympieion) at Ephesos; see P. Scherrer (ed.), *Ephesos, der neue Führer* (Vienna 1995) 186-87 with 177 fig. 2 (model) and 251 (site plan). See too the gigantic late 2nd c. A.D. temple at Tarsos ('Tomb of Sardanapal'), as documented best by R. Koldewey in *Aus der Anomia. Festschrift Carl Robert* (Berlin 1890) 178-85.

36 For the unusual panoramic perspective that Giovanni Paolo Panini (*c.*1691-1765) used to capture

the perspective combines the inside-outside view so crucial for the overall perception of Hermogenes' pseudodipteros and its colonnades. Side by side, we see both the façade of regimented columns (at left) and (at right) the three-storey-tall light-flooded and, at the same time, dark-shaded pseudodipteral ambulatory (*Weithalle*) stretching away for more than 50 m. In a single view, we visualize the stark effects of spatial depth, sight-lines, shadow zones, and volumes of shade, highlighting the audacious discrepancy between exterior and interior of the temple's colonnades that, we think, was at the core of the pseudodipteral 'deception'.

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the encircling interior space of the Pantheon's dome, see N. C. Wixom and M. Linsey in *Bull. Cleveland Mus. Art* 62 (1975) 263-69. Among recent attempts to convey expansive architectural interiors through panoramic and fish-eye lens perspectives are the paintings of Rackstraw Downes: see S. Schwartz, R. Storr and R. Downes, *Rackstraw Downes* (Princeton, NJ 2005).

As for rendering the Artemis temple in a digital wide-angle panorama, it should be added that *SketchUp* only supports standard perspective and axonometric views. Thus many individual renderings from *SketchUp* were composited in *Photoshop* to produce the wide-angle view in fig. 13.