SHORTER CONTRIBUTIONS

Vindicating Vitruvius on the Subject of Perspective

Vitruvius on Agatharchus

The definitive history of incipient vanishing point perspective in the antique world has yet to be written. It may be that the fixation on the fully developed central-ized 'Renaissance perspective' has led scholars to neglect signs of early, still tentative explorations of the principle in Late Classical/Early Hellenistic art. It is my thesis that the evidence is there but has been overlooked in the search for more accomplished manifestations than the nature of the sources would indicate.

A passage in Vitruvius' *Ten books on architecture* presents a perpetual challenge to art historians as it seems to say that the Greek painter Agatharchus of the fifth century BC knew the theory and practice of vanish-ing point perspective. The statement is found in the preamble to the seventh book and reads in M.H. Morgan's translation:

> In the first place Agatharcus, in Athens, when Aeschy-lus was bringing out a tragedy, painted a scene, and left a commentary about it. This led Democritus and Anaxagoras to write on the same subject, showing how, given a centre in a definite place, the lines should naturally correspond with due regard to the point of sight and the divergence of the visual rays, so that by this deception a faithful representation of the appear-ance of buildings might be given in painted scenery, and so that, though all is drawn on a vertical flat façade, some parts may seem to be withdrawing into the background, and others to be standing out in front.[1]

The potential implications of Vitruvius' statement are fascinating, but the lack of supporting evidence is frustrating. Three quarters of a century ago, J. Six first extolled Agatharchus' perspectival stage design that 'lasted one single day, but revolutionised art for ever', then despaired at the lack of circumstantial evidence and wished 'that some fortunate find of Greek house-ruins or Etruscan graves may give us new light in a case that seems hopeless'.[2]

No such find did surface, and half a century later J.J. Pollitt voiced the same predicament: 'In ascribing the invention of this system to Agatharchus at a time when *Aeschylo docente tragoediam*, Vitruvius is placing its invention before 456 BC, the year of Aeschylus's death. This date is surprising and unsettling to modern art historians because the extant monuments, such as they are, reveal hardly any trace of the use of perspective at

such an early date'.[3] With growing acceptance of focused perspective in Roman-Campanian murals, Vitruvius has gained credibility as far as his comments on contempor-ary techniques are concerned; still, scepticism prevails with respect to his statement on Agatharchus and early stage painting.[4]

Little is known about Agatharchus, though he appar-ently had a long career in Athens and was in demand as a mural decorator into his ripe old age (after *c*. 430 BC). None of his paintings are preserved or even described. It is tempting to dismiss Vitruvius' comment on Agath-archus' treatise as a scrambled tradition. On the other hand, we are relatively well informed about Anaxagoras and Democritus and have no compelling reason to doubt Vitruvius' report on their lost treatises. Anaxagoras' optical theories are known, and Democritus' interest in optics and painting (colour theory) is attested by extant titles and fragments.[5] Besides, Vitruvius' veneration for the Greek theorists, the declared founders of Roman scientific thought, is entirely convincing. Furthermore, Vitruvius' text can no longer be dismissed as incompre-hensible, since the most difficult problems in the rel-evant passage seem to have been cleared up.[6]

In the 1950s and 1960s, John White convincingly argued that artists of Late Republican Rome understood the principle of vanishing point perspective, whereas the roots of this knowledge were not to be found in 'the meagre pictorial remains' of the Early Hellenistic period. Eventually White left the question of Vitruvius' credibility pending: 'There is at present no way of deciding the extent to which Vitruvius may have been merely attemp-ting to give ancient lineage to a relatively new invention'.[7]

---

[1] Published by Harvard University Press, 1914; reprint by Dover, New York, 1960.
De architectura vii. *praef*. 11: namque primum Agatharchus Athenis Aeschylo docente tragoediam scaenam fecit et de ea commentarium reliquit. ex eo moniti Democritus et Anaxagoras de eadem re scripserunt, quemadmodum oporteat, ad aciem oculorum radiorumque extentionem certo loco centro constituto, ad lineas ratione naturali respondere, uti de incerta re certae imagines aedificiorum in scaenarum picturis redderent speciem et, quae in directis planisque frontibus ·sint figurata, alia abscedentia, alia prominentia esse uideantur.
For variant manuscript traditions, see J.J. Pollitt, *The Ancient View of Greek Art* (London 1974) 240-42.
[2] 'Agatharchos', *JHS* 40 (1920) 180-89.

[3] See (n.1) 242. Vitruvius could be referring to the premiere of Aeschylus' *Oresteia* trilogy in Athens, 458 BC, but the phrasing is equivocal and could mean simply 'when plays by Aeschylus were staged'.
[4] W. Posch, *Antike Kunst* 37 (1994) 21-30, rejects the notion of systematic perspective in the fifth century BC and reads the above text to mean that Agatharchus built a stage, not that he decorated one. Posch's distinction between *scaena* and *scaeno-graphia* seems factitious in the context of Vitruvius' seventh book. L. Wright, *Perspective on Perspective* (London 1983) 35, questions any knowledge of methodical geometric construction for this period. C. Hobey-Hansher's article on Agatharchus in the Macmillan/Grove *Dictionary of Art* (1996) assumes that the artist's decorations used numerous unrelated points of view for individual objects and parts of objects.
[5] The title of a lost treatise, *Aktinographia*, 'The drawing of rays', seems relevant to our subject.
[6] Mainly by virtue of John White's scrutiny in *Perspective in Ancient Drawing and Painting* (London 1956), and *The Birth and Rebirth of Pictorial Space*[2] (Boston 1967).
J.J. Pollitt, *The Art of Ancient Greece* (New Haven 1965), called the passage on Agatharchus 'probably the most obscure and problematical of all the ancient texts on art', but later, in *The Ancient View* (n.1), he accepted White's arguments regarding Vitruvius' use of *responsus (respondere)* for 'conver-gence' and White's reading of *circinique centrum* (Vitruvius i 2.2) as the vanishing point: 'Hence, when Vitruvius says that "the lines correspond by a natural law" to "the sight of the eyes and the extension of the rays", he means that drawn lines converging on a central vanishing point in a painting are analogous to the rays of vision which converge at the apex of the Euclidian visual cone' (241).
[7] See *Birth and Rebirth* (n.6) 257-58.

Adjusting the Methodology

White's conclusion has never been seriously challenged, and I believe it is due for a revision. Art historians have too long ignored subtle nuances in extant materials while searching for images with 'unified' perspective, scenes with an 'integrated system of perspective with a single vanishing point'.[8] This is asking too much, and the application of such stringent criteria to the tender signs of beginning centralization is all the more unreasonable as even the most virtuoso perspectival murals of Augustan Rome, three or four centuries later, remain limited and deficient in some areas (portions of architectural designs are not focused and the position of objects in space is often indeterminable). Even among fifteenth- and sixteenth-century Renaissance paintings we find few entirely consistent examples of truly unified single vanishing point perspective. We will have to fine-tune our inquiry to match the tentative, even hesitant, explorations of the still experimental techniques in pre-Roman materials, otherwise we shall pass by the evidence with seven-mile boots.

We should, furthermore, expect vanishing point perspective in Early Hellenistic art to co-exist with alternative techniques for representing space. We should be prepared to deal with images in which only one section of a depicted building uses a vanishing point while the rest of the structure rejects it in favour of a more traditional, softer approach, one that avoids the strong obliques that tend to accompany centralized perspective.

In the absence of murals and panels by Agatharchus and contemporary Greek painters we must turn to the fourth-century vases of Magna Graecia for evidence of advanced perspective. This body of art holds a particular interest because it displays new techniques for rendering buildings with a sense of depth. Though these buildings look primitive and remind us of telephone booths rather than of temples and palaces, they served to introduce crucial means for generating spatial illusion. Later chapters of art history teach us that the convergence of parallel lines in architectural structures—buildings, tiled floors, coffered ceilings—helped artists negotiate the idea of spatial depth, and we will therefore pay particular attention to those parallel lines that are perceived as perpendicular to the picture plane, the orthogonals, the ones that converge as they seem to go into space.

For sure, none of the foreshortened structures on the Late Classical/Early Hellenistic vases show consistent convergence of all orthogonals; rather, they all seem at a cursory glance to be either carelessly jumbled or, at best, designed in such a way that all the orthogonals recede at the same angle and thus do not converge. (That is, in three-quarter views, for in frontal views this principle produces the effect that Erwin Panofsky termed 'fishbone' perspective, in which all the parallel orthogonals to the viewer's right cross their counterparts to the left along an imaginary, central, vertical 'vanishing-axis'.) This is the type of perspective commonly associated with Hellenistic art, and it may be considered a direct application of optical principles identified by

Euclid.[9] I shall call this technique of foreshortening 'parallel oblique' perspective, as distinct from vanishing point perspective. Analysis of a couple of paintings will show how these diverse principles co-existed.

South Italian 'Spatial Boxes'

Most of the boards or beams that compose the ceiling of the palace of Hades on the *Underworld krater* (PLATE Ia) converge toward a single point at ground level; the effect is quite convincing as only a few lines are slightly off. The fanning effect of the orthogonals is slight compared with Renaissance practices and close inspection is needed before the convergence becomes evident. At first glance the boards rather appear to be painted with parallel lines in accordance with the standard 'parallel oblique' method used by Italiote vase-painters to render orthogonals in three-quarter view. Though erroneous, this impression is further reinforced by the conspicuous discrepancy between the orthogonals that follow the ceiling boards and those that follow the entablature, the support of the roof; the latter ones again appear to be parallel, only slanted at an angle that differs from that of the boards (compare PLATE I, a and b). The conventional interpretation would therefore be that the artist did not feel the need to—or did not care to—make the ceiling and the entablature match each other. Against this reading I will insist that the convergence of the ceiling boards is a deliberate and significant effect: fifteen to twenty lines upon a vase do not converge upon a single point by chance.[10]

This realization entails the question: why was the vanishing point method only used in the ceiling, not in the rest of the picture of the palace? The answer must be sought in the painter's historical situation that made it advisable to restrict the application of the new, more demanding system to a limited area and to render the encasing framework of the building by means of the less problematic 'parallel oblique' perspective.

The distinction between the two systems of design allows us to reconstruct the artist's working procedure. At the planning stage, the decison was made to single out the orthogonals of the ceiling boards as the ideal vehicles for exercising the still daring vanishing point perspective to good effect, and in spite of the hesitant application, the painting benefits noticeably from the dynamics of the spreading orthogonals. They successfully convey a feeling of depth that belies the fact that the interior space is almost paper-thin (actually, only one person deep). The structural frame of the building, on the other hand, was more comfortably rendered by softer 'parallel oblique' orthogonals that blend in with the surrounding figures and objects more smoothly than

---

[8] See *Birth and Rebirth* (n.6) 261; (n.1) 244.

[9] According to Euclid's *Optics*, items that are perpendicular to the viewer seem to slant toward the left if they are on the viewer's right-hand side, and *vice versa* (theorem 12). Correspondingly, perpendiculars above eye-height seem to slant downwards and those above appear to slant upwards (theorem 13). These theorems do not describe the perpendiculars as parallel, but the fact that they are treated separately, right from left, horizontal from vertical, seems to imply that Euclid had four sets of non-converging lines in mind.

[10] To paraphrase John White (on the murals of the *House of the Labyrinth*). See *Birth and Rebirth* (n.6) 261.

would a full-blown centralized design with its inevitable extreme obliques and its more aggressive, 'zooming' sensation.

Our example represents a mature phase of Apulian vase-painting (c. 330 BC) and suggests that the centralized system at that stage of development increasingly imposed on the 'parallel oblique' one. We notice this tendency in the artist's handling of the conflict between two methods that arise where the focused ceiling meets the less obtrusive entablature. In order to deflect the confrontation, the lintel on the left (of which only the underside is visible) is lined up with the ceiling boards at the far left side of the ceiling as a mediating manoeuvre that extends even to the capitals of the two columns on the left (cf. the dotted line, PLATE 12b). On the right side of the building the clash is consequently stark—more so than it would have been if a choice had been made to spread the different degrees of obliqueness proportionately between the two sides. In order to circumvent this problem the artist instead employed a common technique for masking inherent discords, namely the use of the capital of the foremost column (front right) to hide those ceiling boards that are farthest to the right, precisely at the point where the contrast would otherwise be too obvious.[11]

In sum, the palace of Hades was painted by an artist who was able to use vanishing point perspective effectively in a distinct portion of the picture and was in command of adequate techniques for correlating localized centralization, used as a special effect, with non-centralized sections of the image.

Theories of Interpretation

To realize fully the potential of these observations it is necessary to confront certain clichés regarding South Italian vase painting. One such prejudice is articulated in the following statement by J.J. Pollitt:

These extant monuments [of the fourth century], however, are without exception painted vases, mostly of the red-figure style, and since vase painting follows aesthetic standards which are in a large measure peculiar to itself, the evidence of the vases does not necessarily refute Vitruvius's date for the introduction of perspective ... Literary sources make it clear that painters who were famed as innovators and the formulators of important new movements were mural painters and panel painters, whose works were usually on a large scale and exhibited a much greater chromatic range than did painted vases. In the fifth and fourth centuries BC vase painting gives us only an echo of what the great painters were doing, and the later the date the weaker this echo becomes.[12]

Art historians generally underestimate the craftsmanship and sophistication of the large 'theatrical' vases of South Italy. The monumental decorated volute-kraters (many between 1 and 1½ metres tall) represented as much skill and effort as wall-sized panel paintings. In the words of A.D. Trendall,

The greater area which such vases place at the artists' disposal for purposes of decoration allowed them to indulge their taste for large-scale compositions, and led not only to the appearance of more elaborate settings and costumes, appropriate to the great figures of mythology or drama, but also to experiments in the use of perspective and in the rendering of spatial depth.[13]

Like any major art form, the vases of the fourth century do contain a fair amount of trivial decoration, and there is no denying that the portrayals of buildings mostly rely on the all-too-convenient 'parallel oblique' perspective. However, in our effort to trace the introduction of innovative techniques we should not be discouraged by the conservatism of the bulk of materials. Nor should we dismiss evidence simply because it seems less than ideal, as is admittedly the case of the above example (PLATE 12) where the ceiling boards remain too short and imprecise to prove definitively that a single point of convergence is present. As is often the case, the painting and the mathematical scheme are a less than perfect match, and we can only show that it is indeed feasible to establish a vanishing point without forcing the evidence.

Another potential problem—as mentioned by Pollitt—is that the curved surfaces of vases would interfere with ambitious perspectival designs. That objection is not truly pertinent since the buildings in question are the centrepieces of large vases and therefore occupy wide and even surface areas with minimal curvature. Consequently, the marginal distortions are all but negligeable.

Another stereotype maintains that decorators of pots intentionally avoided strong illusions of depth because the effect of space-penetration would counter the role of pots as containers. This line of thinking is contradicted by ornate vases showing architectural motifs that are entirely comparable with those found in mural paintings in Early Hellenistic tombs at Lefkadia in Macedonia. For example, ends of ceiling beams in rows, 'perspectival dentils', encircling the shoulders of pots[14] as well as the tops of walls: the painters made no distinction between perspective designs that were suitable for vases and such ones that pertained to walls. It could even be argued that the curved faces of pots sometimes offered a means to accentuate the effect of depth. An example is seen on the krater showing *The madness of Herakles*.[15] Here the

[11] It seems significant that an early Apulian vase, dated to the first decade of the fourth century, shows a temple in which the orthogonal ceiling boards clash disruptively with the lintels at *both* sides of the building. Apparently, techniques for mediating this disagreement were as yet undeveloped. A.D.Trendall and A. Cambitoglou, *The Red-figured Vases of Apulia* (Oxford 1978) pl. 12.

[12] See (n.1) 242 f.

[13] A.D. Trendall, *Red Figure Vases of South Italy and Sicily* (London 1989) 27.

[14] First identified by E. Panofsky, *Perspective as Symbolic Form*, translated by C.S. Wood (New York 1991) pl. 2. For another example see A.D. Trendall and A. Cambitoglou, *First Supplement to the Redfigured Vases of Apulia* (London 1983) pl. 37.

[15] See (n.13) pl. 355.

scene is set in a palatial structure that spreads across half of the circumference of the vase, and the ceiling beams of the hall, though actually drawn with parallel lines, appear to converge toward a centre due to the steady curvature of the surface. This illusionistic effect is a standard feature of decoration, albeit mostly in the form of abstracted patterns around the shoulders of vases.

The Pièce de Résistance

Probably later than the *Underworld krater*, the fragment of a decorated krater in PLATE 13 shows an unusually elaborate theatrical scene. It includes a projecting porch that constitutes part of the facade of a stately palace.[16] The ceiling is a prominent feature of the composition by virtue of the elaborate, finely detailed coffer lids (highlighted in golden colour). On closer inspection it becomes evident that the impressive three-dimensional effect is achieved by means of converging orthogonals, convincingly so, since only one out of a dozen lines resists alignment (cf. the dotted line in the bundle of orthogonals, PLATE 13).

As in the *Underworld krater*, the artist had to reconcile two divergent systems both of which are manifestly present: the centralization of the coffered ceiling, and the parallelism of the entablature. Here too, the initial decision was to line up ceiling and architrave on the far side (to the left) in order to achieve a seamless transition where the effect of foreshortening is least disturbing. Again, we find that this decision to mediate between differently oriented lines at one side of the image by implication generated a noticeable conflict at the opposite side, but in this case the painter took yet another step towards integration of the two systems, or rather towards extending the operative range of the vanishing point to encompass part of the framework of the building. No longer relying on the tricky use of a column (front right) to mask the awkward transition, the artist adjusted the inclination of the right-hand architrave so that it approximates the orthogonals of the neighbouring rows of coffers (cf. the dotted lines in PLATE 13, at the top, to the right). The lintel was not forced into full convergence with the coffers and their vanishing point, since that would have generated more disagreements than it would have resolved; instead the artist compromised and left the bottom line of the lintel *nearly* parallel with the right-hand rows of coffers to the effect that it effectively blends in with them. This, in turn, implies that the framing members of the entablature (the lintels, right and left) now retain a mere semblance of the traditional parallelism. Still, residues of that tried old system remained, and the resulting problem was finally transferred to the very top of the right-hand entablature where the cornices eventually were reset in an effort to resuscitate 'parallel oblique' perspective. At this point there was a price to be paid for the ingenious sleight-of-hand performance. The endeavour to push the slack between the two methods all the way to the top of the right-hand entablature eventually left the artist with a

crunch of lines producing a rather disturbing impression of reversed, 'backwards', perspective. The irony of this apparent confusion is that it was precisely the skilful execution of an innovative concept that brought the artist to the point at which the supportive mechanism of the conventional system became a cumbersome remnant of the past.

To appreciate fully this achievement we must also consider the handling of the perceived diminution of the rows of coffers from the front towards the back. This involves the design of the transversals, the problem that Alberti by the middle of the fifteenth century resolved with his *costruzione legittima*. We can draw diagonal lines across the coffers (following the corners of the lids and the centres of the floral designs, see PLATE 13) and confirm that the chosen diminution is adequate. In itself, that is an amazing feat for its time considering that even Alberti avoided a discussion of the mathematical basis for his solution and merely recommended drawing a diagonal to test the correctness of a painted grid.[17] Prior to Alberti, artists applied a rule of thumb, reducing the depth of rows of coffers and tiles by one third from one row to the next one, moving inward. Our Hellenistic artist might have used a similar approximation, but the precision of a few of the diagonals (see PLATE 13) suggests that one of these served to mark off the transversals. Though the diagonals do not converge correctly across the field of the ceiling, it seems likely, judging by the carefully adjusted inclinations of the petals of the repeated flower design, that the artist had an idea of the geometrical configuration that makes diagonals converge if the orthogonals do.

This impression is reinforced by the artist's skilful handling of those diagonals that run crosswise, top-left to bottom-right (not included in PLATE 13). These would ideally converge at a point so far removed from the painted area that they could have been considered parallel for all practical purposes; even so, the artist did not conceive of them as such but provided a minute shift in the degree of inclination for each diagonal row, as reflected by the leaves of the rosette in the center of each coffer. Particularly strong evidence of the individual treatment of these diagonals is seen in the drastically slanted orientation of the ones in the innermost row, notably, the very last one in the row (in the bottom left corner of the field). We can imagine that this acute articulation would strike contemporaries as puzzling, even wrong-looking, yet unerringly right.

Perspective in Retrospect

The above discussion concerns the mere existence of vanishing point perspective in pre- or proto-Hellenistic art and leaves much unsaid regarding the varied appearances of that technique within the matrix of vase-painting. Applications range from barely perceptible, narrowly localized convergences, to near-consistent applications in a circumscribed section of a picture. The lack of unity

---

[16] Probably that of king Pelias. Though the play may be lost, the extant fragments suggest a scene in which the daughters of Pelias are eavesdropping on his conversation with Jason. See A.W. Pickard-Cambridge, *The Theatre of Dionysus in Athens* (Oxford 1973²) 170; E. Simon, *The Ancient Theatre* (London, 1982) 24.

[17] This solution was sound, but the mathematical proof eluded Renaissance theorists. Cf. (n.6) 122; J. Elkins, *The Poetics of Perspective* (Ithaca 1994). H.G. Beyen, *Die pompejanische Wanddekoration* (The Hague 1938) i 159, recognized in the Würzburg fragment an early use of diagonals predating examples at Pompeii.

may be disconcerting, but partial or idiosyncratic applications of linear perspective were to remain characteristics of advanced art until Giotto's era. The pluralism of approaches simply shows that centralized perspective was not born complete and clarified.

This is not to say that early applications of centralized perspective may be relegated to the nebulous sphere of the intuitive or fortuitous.[18] A certain level of consciousness must be assumed in order to account for the accomplished techniques described above. We may even have to assume a measure of theoretical speculation about the optical principles implied, such as is indicated by Vitruvius. Since we have ascertained the existence of vanishing point perspective in paintings that predate Vitruvius' *De architectura* by more than three hundred years, we can in good conscience eliminate John White's suspicion that Vitruvius' comment on Agatharchus merely served to lend authority to a more recent invention. I believe that we have, by the same token, confirmed Vitruvius' credibility on the subject of Agatharchus.

We may speculate that the two-to-three generations between Agatharchus' time and the flowering of Apulian art account for the dissemination of the new principle from the theatre of Athens to the vases of Magna Graecia. Although the paths of this diffusion are obscure, we cannot fail to notice that the tie between the theatre and vanishing point perspective remained a crucial feature of art history for many centuries. It is, perhaps, the one aspect that both recalls the origins of the technique and provides a clue to its perpetual fascination. Stage-painting and perspectival drawing were both designated by the term scenography (*skēnographia, scaenographia*) and this convention certainly acknowledged the priority of the stage in the invention of centralized perspective, but it probably also recognized the role of the theatre in the ensuing development of the technique. The importance of theatrical themes in many murals at Campanian/Roman sites is too well known to need elaboration here, though it bears repeating that bold and effective use of perspective—drastically plunging and zooming orthogonals—characterizes the most impressive 'theatrical' murals in the villas at Pompeii. Was the same association not operative fifteen hundred years later when Baldassare Peruzzi, praised for his mastery of illusionistic architectural murals, was instrumental in reviving the ancient art of stage decoration?

In the 'perspective box'-type buildings on the South Italian vases the view-point is consistently low, at floor-level, and again, this suggests the legacy of stage decoration: in theatrical sets the view-point is invariably low, the floor always negligeable.[19] While stage direct-

ions are scarce in Greek dramas, the meagre indications do seem to favour the tops of sets: the towers of city walls (*Seven against Thebes*), roofs of palaces (*Oresteia*), cornices, pediments with *acroteria*, triglyph friezes, columns (various places in Euripides).[20]

Whatever the origins of this convention, the low viewpoint directs our gaze to the upper parts of the painted buildings, and it is definitely in the treatment of ceilings that these structures excel. Their beams, boards and coffers provide the orthogonals and the checker-board patterns necessary to visualize the idea of lines that converge in depth. We may recall that in the process of continual development of single vanishing point perspective in late medieval Italy, the most advanced paintings (e.g. Giotto's murals) still achieved spatial depth largely by means of the orthogonal lines in ceilings. Only by the middle of the fourteenth century was a consequent step toward 'Renaissance perspective' taken with the shift of attention toward tiled floors that, finally, allowed for concise location of figures in space.

Addendum: Linear projection

Vanishing point perspective is a function of linear projection, and the apparent ignorance of the principle of projection in antique optical theory has been an argument against the feasibility of vanishing point perspective in contemporary art. Erwin Panofsky, notably, saw an obstacle in the ancients' concept of a spherical field of vision: they gauged spatial diminution by way of arcs of the circle (as specified in Euclid's eighth theorem), and this method seemed incompatible with the proportional diminution measured by linear projection.[21] Euclid's *Optics* was, however, not a theory of the arts, nor did it necessarily reflect advanced artistic explorations of visual effects.[22]

For sure, the projection of lines onto the plane of a picture was not unknown to Early Hellenistic painters, and occasionally their works reflect the awareness of the intellectual process implied. Consider, for example, the detail of a painting on a South Italian vase that is rendered in PLATE 14a. The scene shows mourners around a memorial monument in the form of a column set on a stepped plinth.[23] The shaft and base are decor

[18] G.M.A. Richter, *Perspective in Greek and Roman Art* (London 1970) 3, presumed that even the murals of the *Room of the masks* 'could have been produced by a careful observer' without a geometric model. This 'careful observer' is, of course, purely fictitious.

[19] We may still trace this disposition in Roman-Campanian murals (e.g. the stage designs of the *Room of the masks*) where the top and middle registers of paintings are in perfect agreement with a single vanishing point, while the bases invariably are off. C. Krause, 'Skenographie, Architektur und perspektivisches Sehen', *La prospettiva pittorica*, C. Krause, ed. (Rome 1985) 43-77.

[20] J.Six (n.2) 186; J.M. Walton, *The Greek Sense of Theatre* (London 1984) 50; A.W. Pickard-Cambridge (n.16) 122; J.T. Allen, *The Greek Theater of the Fifth Century* (New York 1966) 67. Most scenes in Greek tragedies are set in front of a palace or a temple.

[21] See (n.14) 38. Panofsky presents a scheme for spherical projection that matches the 'fishbone' perspective (what I call 'parallel obliques'), but he admits that it remains conjectural.

[22] W.R. Knorr, 'On the principle of linear perspective in Euclid's *Optics*', *Centaurus* 34, 3 (1991) 193-210, refutes efforts to find applied projection in Euclid (sc. his tenth theorem), but recognizes evidence of an alternative tradition in the writings of Pappus of Alexandria. Knorr concludes: 'to whatever extent such techniques (sc. projective distension, vanishing point, etc.) arose among the ancients, they were only partial and dispersed among different fields (e.g. optics proper, scenography, etc.) and never integrated into a comprehensive system'.

[23] To judge from comparable scenes, the plinth is circular. However, my line of argument remains the same if a square base is presumed.

ated with fillets, and in the disposition of these ribbons (see PLATE 14b) the artist took on a challenge that he was able to meet only through stepwise registration of a sequential displacement that, in fact, constitutes projection. PLATE 14c illustrates the necessary and sufficient observations by which the artist traced the linear trajectory, both horizontally and vertically. Since the artistic/intellectual achievement is trivial to us, this analytic break-down may seem cumbersome, but we must bear in mind that the conscious realization of the process was new for its time. Still at an embryonic stage, this painstaking adventure went through the same motions that Alberti much later would prescribe under the term *costruzione legittima*: the vertical coordinates (the elevation, c 1) and the horizontal coordinates (the plan, c 2) are combined on the picture plane (c 3).

We recognize the same three steps in Vitruvius' description of the categories of architectural design, significantly cast in Greek terms: *iconographia* (ground plan), *orthographia* (elevation), and *scaenographia* (perspective rendition).[24] Although the concept was not without precedents (*cf.* innumerable vase-paintings showing undulating seams of draperies indicating layers in depth), the sharp, point-by-point reduction of the artistic process was new for its time.

The scene in PLATE 14 was painted by the so-called Iliupersis Painter, an inquisitive and inventive artist who contributed significantly to the break-down of such outdated perspectival conventions as the use of registers to indicate depth (low register meaning 'in front', high register meaning 'behind'). This standard device of Classical art (used in the lost murals by Polygnotos, and familiar from Greek vases) was still employed by the vase-painters of Apulia, but by the middle of the fourth century it was becoming obsolete, and vase-painters increasingly tried to correlate fictitious registers with actual points of view. Mostly inconsistent and often self-contradictory, these transitional works reveal the awareness of the surface of a picture as a projection plane.[25]

It seems relevant, at this point, to recall Anaxagoras and his lost treatise on the optical implications of vanishing point perspective, for his famous explanation of solar eclipses was, ultimately, projection applied on a cosmic scale: the projection of the moon's shape onto the surface of the earth.

JESPER CHRISTENSEN
University of Louisville

The Meaning of Arrian, *Anabasis* 7. 9. 5

This passage forms the climax of the first part of Alexander's speech at Opis in which he described the achievements of Philip. In the next sentence Alexander began to compare 'these achievements of my father' with his own services.

The first part is carefully structured. It begins with Philip's achievements in Upper Macedonia, which over many years had suffered from raids by its neighbours. It then proceeds to Thrace, Thessaly, Phocis, Athens-and-Thebes, and the Peloponnese. This sequence is not temporal, but geographical. Then comes the climax, the command against Persia which was entrusted to Philip. As the manuscript is without punctuation, I print our passage without punctuation:

πορίζεσθαι] ἐς Πελοπόννησον δὲ παρελθὼν τὰ ἐκεῖ αὖ ἐκόσμησε καὶ ἡγεμὼν αὐτοκράτωρ συμπάσης τῆς ἄλλης Ἑλλάδος ἀποδειχθεὶς τῆς ἐπὶ τὸν Πέρσην στρατιᾶς[1] οὐχ ἑαυτῶι μᾶλλόν τι τὴν δόξαν τήνδε ἢ τῶι κοινῶι τῶν Μακεδόνων προσέθηκεν.

'provide] and entering Peloponnese he organised things there in turn and being appointed commander with full powers of all the rest of Hellas he conferred this glory of the campaign against the Persian no more at all upon himself than upon the community of the Macedonians' (7.9.5).

I have translated αὖ as 'in turn' because it looks back and marks the conclusion of Philip's arrangements. It is made emphatic by the harsh hiatus ἐκεῖ αὖ. The word τήνδε, rather like our colloquial 'this here', brings the glory up to date.[2] It was appropriate because the army was now back in Persian territory. The lack of punctuation does not impair our understanding of the text. For each stage in the sequence from Thrace onwards is marked by a verb at the end of the clausula: παρέσχε, ἀπέφηνε, ἐποίησεν, ἐταπείνωσεν, ἐκόσμησε and προσέθηκεν. It is the same with the participial phrases; for the participle comes at the end of the phrase: καταλαβόμενος, ταπεινώσας, ξυμπονούντων, παρελθών, ἀποδειχθείς.

There are two editions of the Loeb text of Arrian, *Anabasis*. In 1933 E.I. Robson translated 7.9.5 as follows:

'Then he passed into the Peloponnese, and put all in due order there; and now being declared overlord of all the rest of Greece for the expedition against Persia, he won this new prestige not so much for himself as for all Macedonia'.

---

[24] Vitruvius i 2.2. D. Gioseffi, 'Continuità della prospettiva da Democrito a Brunelleschi', in C. Krause (n.19) 25-41, speculates that Brunelleschi's famous demonstration of exact perspective was fuelled by familiarity with Vitruvius.

[25] See Trendall (n.13) figs. 140 (by the Iliupersis Painter), 203, 204, 209 (a detail of which is my PLATE 12a), 229. Also, White, *Birth and rebirth* (n. 6) pl. 60 a and b.

Curious self-contradictions mark these early works, e.g., one by the Iliupersis Painter (Trendall fig. 138, the reverse of my PLATE 14a), in which a character in the upper register sits on a stool that is shown from *below*—evidently not because he was meant to be *above* the characters in the lower ('frontal') register, but because the artist no longer accepted the registral convention at face value.

[1] There is no need to emend στρατιά to στρατεία, as has been suggested. See LSJ s.v. στρατεία 5 and s.v. στρατιά II = στρατεία. Both forms of the word occur in Arrian's text, presumably because during the transmission of the text the scribes varied in their spelling.

[2] So also at Arr. 3.8.2 κατὰ τὴν στρατιὰν ταύτην. For the concept of δόξα we may compare Arr. 7.20.1 κατὰ δόξαν τῆς ἐς Ἰνδοὺς στρατιᾶς.

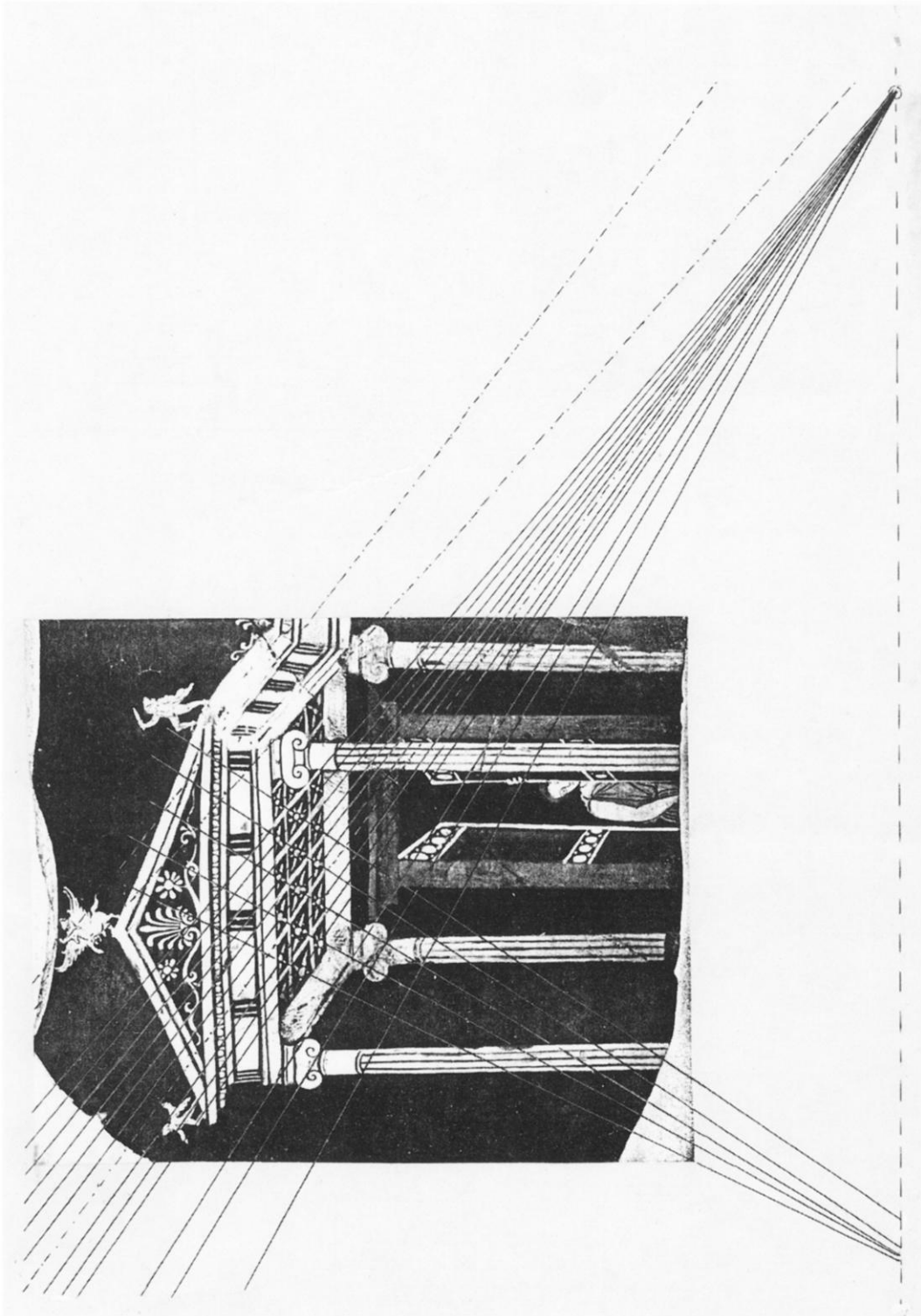PLATE 12 VITRUVIUS ON PERSPECTIVE *JHS* 119 (1999)
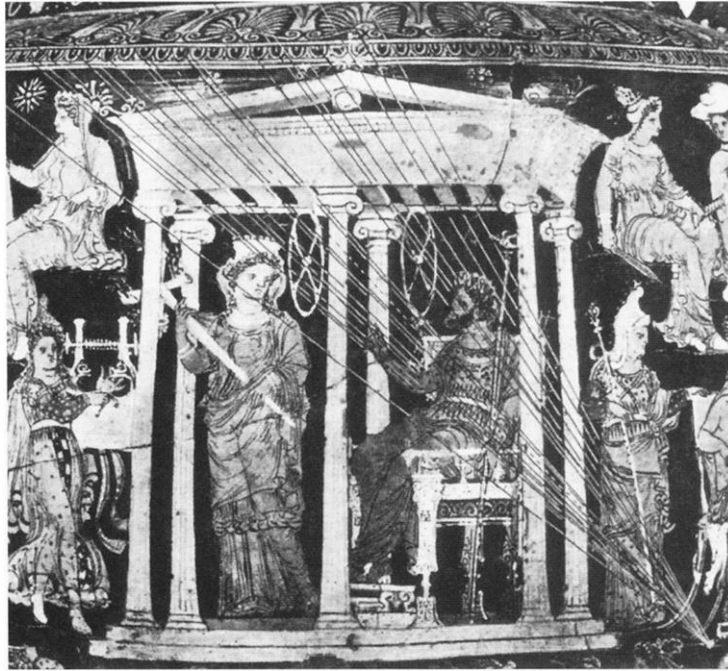
12a Volute krater (detail). Decorated by the Underworld Painter. Apulia, *c*. 330 BC.
Staatliche Antikensammlungen und Glyptothek, Munich. (Museum photo)
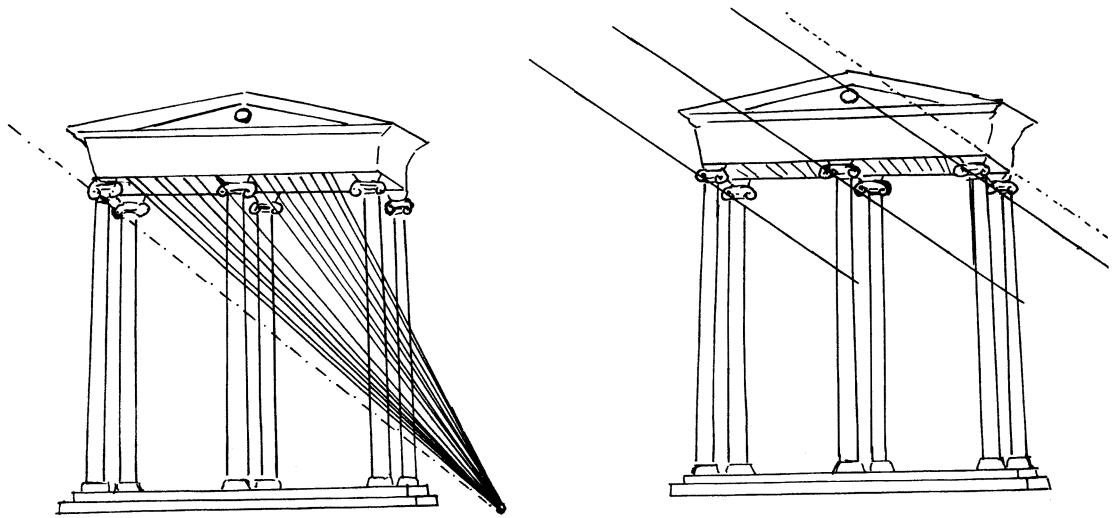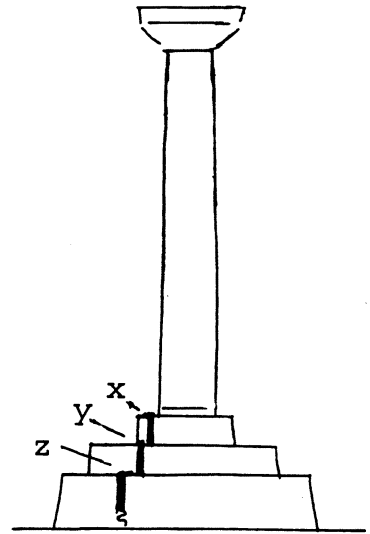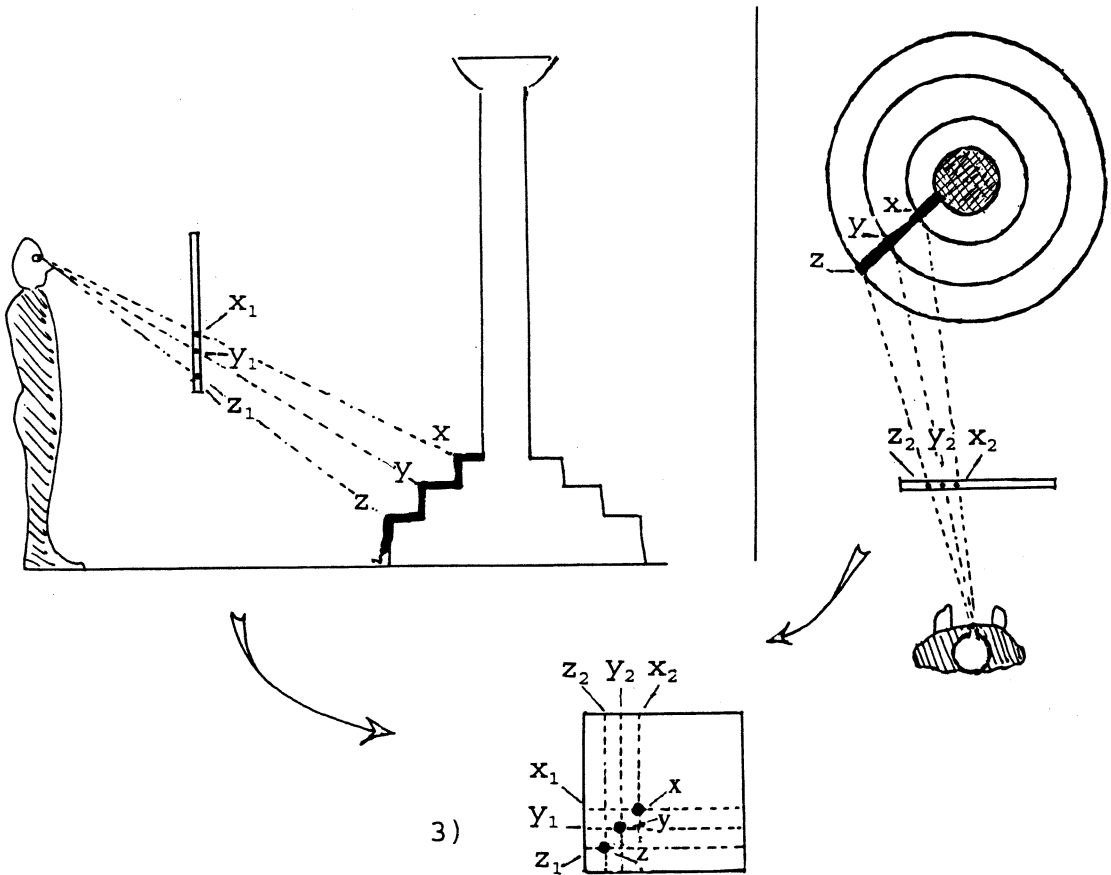

12b

12c

Diagrammatic renditions of 12a

PLATE 13

Calyx krater (fragment). Apulia, 4th century BC. Martin von Wagner Museum, Würzburg. (Photo: K. Oehrlein)

PLATE 14   VITRUVIUS ON PERSPECTIVE   *JHS* 119 (1999)

14a Volute krater (detail). Iliupersis Painter, Apulia
c. 375 BC (British Museum). After Trendall, *Red Figure Vases*, fig. 139.

14b Schematic rendition

14c Reconstruction of (a): linear projection in three steps.