Perspective as Symbolic Form

Erwin Panofsky

Translated by Christopher S. Wood

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Contents

Introduction 7
Section I 27
Section II 37
Section III 47
Section IV 57
Notes 78
Plates 355
Introduction

by Christopher S. Wood

Panofsky's early theoretical voice has proved both resonant and elusive. This capacious essay on perspective, in particular, enjoys a reputation well outside the professional territory of art history. Yet that reputation has often overwhelmed the finer modulations of Panofsky's argument and obscured its theoretical provenance. To listen to the voice of the perspective essay again, to attend to its undertones, is a project of more than merely biographical interest. Panofsky, who was born in 1892, belonged already to a second generation of German critics of positivist historical scholarship. These critics generally shared a vision of a more comprehensive science of culture, a scholarly practice that would seek to understand and not simply to accumulate data. Panofsky also belonged to a subset of critics sensitive to the inevitable deficiency of cultural history, namely the underestimation or neglect of a dimension of meaning proper to certain kinds of objects (texts, images), a dimension intractable to historical explanation. Artistic products, Panofsky wrote in 1930, "are not statements by subjects, but formulations of material, not events but results." Any historical treatment would have to acknowledge the autonomy of such an object, the impossibility of deriving the object from its phenomenal circumstances. This was the necessary first stage of any nonmaterialist cultural history.

This preliminary isolation of the work of art resembles the maneuver of Russian Formalism and New Criticism. For both these parallel refinements of reading practice served, in different ways, the long-term
purpose of sharpening our sensitivity to the social character of the linguistic sign, and ultimately to the inextricability of the text from the world. The strategy was to isolate the work temporarily in order to grasp more clearly its deep structural principles, and then ultimately to reinscribe the work into its primordial environment on more legitimate grounds. Indeed, Panofsky in "Perspective as Symbolic Form" was working within a methodological framework built by the early art historical Formalists: Heinrich Wölfflin and, above all, Alois Riegl. This is not an altogether obvious point. For it was not least Panofsky's own (later) scholarly achievements that finally discredited art historical Formalism, indeed helped turn virtually the entire profession against it.

In his essay on Riegl’s term Kunstwollen, Panofsky condemned both the wild and irresponsible concession to the irrational power of the art object (the “Expressionist” art history of Wilhelm Worringen or Fritz Burger), and any resigned retreat into spectral historicism. Panofsky endorsed instead Riegl’s “more-than-phenomenal” treatment of artistic phenomena. In Riegl’s visionary synchronic Weltanschauungphilosophie, tempered by a certain deliberate philosophical myopia, Panofsky saw the germ of a new art history, a reconciliation of materialist and idealist histories he called it a “serious Kunstphilosophie.”

Riegl had commenced his cultural history by introducing a new repertoire of formal categories. Haptic and optic, internal and external unity, coordination and subordination—like Wölfflin’s famous “principles”—were deep structural attributes of the work. Analysis of structure at this level transcended not only history, but also questions of function or value, beauty or meaning. Structural analysis revealed a pattern behind the temporal sequence of works of art, an internal tele or motivation, which Riegl personified as Kunstwollen or “artistic will.” Cultural history, then, would proceed by coordinating that will with something called the general Wollen of the epoch. Riegl said in the closing pages of Spätbarocke Kunstwollen that the Kunstwollen of an epoch, the prevailing structural principles of its artistic phenomena, “is plainly identical to the other main forms of expression of the human Wollen in the same epoch.” There is no doubt what to call that general Wollen: man is an active and sensory being disposed to interpreting the world in the way most open and accommodating to his needs (which vary among peoples, places, and times). The character of this Wollen is embraced by that which we call the respective Weltanschauung.”

In the view, however, Riegl declined to answer the last synchronic questions about artistic phenomena. This reluctance to interpret has usually been condemned as an aesthetically oriented view of the art object from life. Riegl’s immediate purpose, clearly stated in the introduction to Spätbarocke Kunstwollen, was indeed to undermine the materialist art history exemplified by the work of Gottfried Semper. Riegl dismissed function, materials and technology as merely negative restraints on form, mere “frictional coefficients,” and instead asserted the autonomy of formal development. Riegl scrupulously avoided confusing form not only with the functions that the physical work might have once served, or still serves, in the world, but also with the possible meanings that those references to the world made by form, and the possible meanings that those references might have generated or still generate. This is why the Kunstwollen has been called a Husserlian “bracketing device.”

The art historian’s disengagement of objects from the world may very well stand as a correlate to various, more general convictions about the superiority of spirit to matter, or imagination to reason; about the detachment of the artist from society; about the inescapably self-reflexive and circular nature of interpretation; about artistic tradition carrying more weight than individual gestures of innovation. Early art historical Formalism was associated with versions of all of these.

“The effect of picture on picture as a factor in style,” Wölfflin said, “is much more important than what comes directly from the imitation of nature.” Wölfflin’s aphorisms are the most often remembered, although others said similar things. But this does not mean (except in some extremely general and meaningless sense) that these methods were allied with aestheticism. On the contrary, the Formalities generally thought of themselves as emancipated from aesthetics: these were antiaesthetic, yet positivist historians, sciences of the spirit. This is a paradox, for clearly the attribution of dependence or independence is related to the initial criterion of selection of the objects. It is generally easier or more natural to attribute independence to a sequence of objects selected by
an aesthetic criterion, for the work of art since Kant is normally defined as discontinuous with the very conditions that made it possible (the "world"), and underviable from those conditions. An authentically "aesthetic" history of art would altogether detach certain formal qualities from the work and hypostatize them as "style"; the history then becomes a pure morphology, a study of changes in form that are only incidentally played out in material works. Riegl, on the contrary, was hostile to any absolute or supra-historical aesthetic category at any rate he would not incorporate such a category into his historical project. "Works of art" for him were simply man-made objects with some high level of artificial formal organization. He wrote about applied art or even entirely ordinary objects because, like works of art, they are subject to independent formal logic. For Riegl the primary level of facts was not style itself (the morphology), nor even the sequence of objects, but the Kunstwollen of an epoch, just as for Wolfflin it was the form of seeing.6

It would be a mistake to dismiss Riegl, and for that matter Wolfflin, as doctrinaire formalists who underestimated the fullness of the relationship between the work of art and the world. Riegl was not blind to those grand images of cultural totality sketched by Burckhardt or Dilthey, and which would later animate Aby Warburg. Rather, the operation of filling in that image was simply too delicate and hazardous for his temperament. He was too scrupulous a philologist, too much a nominalist at heart, to complete his own project. Riegl truncated his Weltanschauungphilosophie almost as a matter of conscience. Perhaps he was postponing the fulfillment of those ambitions to an old age which he never had; or perhaps he was willing to leave the risks to his students.7

The most successful and at the same time most disastrous extensions of Riegl's Weltanschauungphilosophie were indeed carried out by his own immediate successors and students, including Max Dvorak, and above all Hans Sedlmayr, Guido von Machrinitz-Weinberg, and Otto Piicher, the core of the so-called Second Vienna School. They sought to drive Riegl's structural analysis further along its synchronic axis by refining and elaborating the categories of the initial pictorial analysis. Their ambitions were superbly acetic. The latent structural principles of the work would alone yield the insight into the world that produced that work.8

The flaws of Viennese Strukturanalyse were the flaws of any structuralism: it was driven by a certain sentimental faith in the organic integrity of culture, in the mysterious interconnectedness of events; and consequently it tended to leave the crucial link between work and world strangely unexamined. The bracketing device that cut all the ordinary ties between work and world was originally a way of hedging off crude propositions about the relationship between work and world; it set preliminary limits on what could be said about synchrony about context. But this was a calculated risk. The initial bracketing often made it more difficult, or even somehow unnecessary, to find a path back to the world of ordinary events. Here is where Sedlmayr went astray. He discovered in works of art an appealing parallel universe, a "Welt im Kleinen," almost a parody of Heidegger's radically autonomous Kunstwerk whose adequacy to the world was no longer at issue. Strukturanalyse degenerated into a kind of nostalgic aestheticism with theological and even theocratic (not to speak of Fascist) leanings.

Any successes or failures of this method, then, followed from the inability of its practitioners to resist a temptation presented by Riegl. It is not far-fetched to cast this in ethical terms, for it is in just such terms that the Second Vienna School was repudiated, in America already in the thirties,9 in the German-speaking countries after the war. Panofsky in the thirties and twenties was obviously exposed to the same temptation; what has been difficult to see is the extent to which he was vulnerable to that temptation. The distinction between aesthetic intuition and aesthetic bracketing was one that Panofsky appreciated. Moreover, he thought he could resolve those antagonisms between philosophy and philology that had paralysed Riegl.

Panofsky preserved Riegl's Kunstwollen only by fragmenting it. The concept survives in Panofsky only in shards, strung about his argument in the form of a "Stuffe," in the verb "wollen," in words like "arriving" and "ambition." He restated the Kunstwollen because there was something austere about it. Indeed, Riegl used it precisely because it was not clearly derivable from academic philosophy, which he mistrusted; it was a homemade concept, and so Riegl used it with a certain confidence, and little anxiety about its ultimate legitimacy. Panofsky actu-
Perspective as Symbolic Form

Panofsky makes the fundamental neo-Kantian point about the incommensurability of cognitive models:

In epistemology the presupposition of this "thing in itself" was profoundly shaken by Kant in art theory a similar view was proposed by Alois Riegl. We believe to have realized that artistic perception is no more faced with a "thing in itself" than is the process of cognition; that on the contrary the one as well as the other can be sure of the validity of its judgments precisely because it alone determines the rules of the world (i.e., it has no other objects other than those that are constituted within itself).

In a footnote, however, Panofsky admits a distinction between artistic perception and cognition in general:

The laws which the intellect "prescribes" to the perceivable world and by obeying which the perceivable world becomes "nature," are universal; the laws which the artistic consciousness "prescribes" to the perceivable world and by obeying which the perceivable world becomes "figuration" must be considered to be individual - or... "idiomatic."

To some extent the perspective essay collapses this distinction. It does this by taking perspective as its subject in the first place. Perspective made a promising case study not because it described the world correctly, but because it described the world according to a rational and repeatable procedure. Perspective overrode the distinctions of the idiomatic. This is what Panofsky means when he calls perspective the "objectification of the subjective" (p. 65, below), or the "carrying over of artistic objectivity into the domain of the phenomenal" (p. 72). Perspective encourages a strange kind of identification of the art-object and the world-object. It is perspective, after all, that makes possible the metaphor of a Weltanschauung, a worldview, in the first place.

Naturally Panofsky was self-conscious about his project to write the history of Western art as a history of perspective. In the second section, after the hypothesis about Vitruvius and curved perspective, he offers an initial justification of his topic:

The philosophy of the "symbolic form." In effect Panofsky was trying to buttress Riegl with neo-Kantianism. He reinterpreted the Kunstwollen as the immanent Sinn or meaning of a sequence of artistic phenomena, and then insisted that this Sinn was accessible only through analysis of those phenomena according to a priori formal categories. This would be Riegl with philosophical substance.

This adaptation often resembles the Vienna School adaptations of Riegl. Panofsky's rhetoric was less bombastic and aggressive, and needless to say free of nationalist or racist undertones. Panofsky was more attentive to philological matters and had more historical scruples; he also relied more heavily, almost instinctively, on texts. Panofsky's structuralism is hard to recognize because it is obscured and dissipated by his philological habits (a resistance to systems, a tendency to wander away from argument, a natural sobriety of tone). But his aims and even his actual practice overlapped with those of the Strukturforscher. The affinity between them now looks more important than the breach - along the Kantian-Hegelian fault - described by Sohlmayr in 1929. The image of the American Panofsky choosing history over philosophy is thus rather misleading. In fact, he had made the essential move toward a reconciliation of philology and philosophy well before emigration.

Panofsky's adaptation and extension of Riegl was more or less rounded out by the mid-twenties, in the book on German medieval sculpture and above all in the essay on perspective. And it is not obvious that that move was reversible, that the philosophy could be disentangled from the philology.

The precondition for the move from the level of "form" to the level of "structure" was the disengagement of the work from the category of the aesthetic. Riegl managed this quietly, in part by simple abandonment of conventional terminology, in part by refusing to draw distinctions between works of art and other artifacts. Panofsky, again, wanted more substantial philosophical justification. He decided to consider artistic perception as a special case of cognition. On the last page of Idee (1934),
PERCEPTION AS SYMBOLIC FORM

Granted, this looks more like a mathematical than an artistic matter, for one
might with justice point out that the relative imperfection, indeed even the
total absence, of a perspectival construction has nothing to do with artistic
value (just as, conversely, the strict observance of perspectival laws need in
no wise encroach upon artistic "freedom"). But if perspectival is not a fac-
tor of value, it is surely a factor of style. Indeed, it may even be character-
ized as (to extend Ernst Cassirer's felicitous term to the history of art) one
of those "symbolic forms" in which "spiritual meaning is attached to a
concrete, material sign and intrinsically given to this sign."

This is not simply a plurality of possible meanings but a hierarchy. The
first is the ästhetisch or artistic, which is made equivalent here to the
aesthetic. Panofsky implicitly disparages "value" as a merely local and
self-serving category. In the same stroke he grants artists their "freedom"
and then dismisses their decisions as arbitrary or idiomatic. The sec-
level of meaning is style as it was isolated and concretized by early
Formalism, by Wickhoff, Riegl, Wolfflin, perspective is at least this kind
of meaning, and therefore a legitimate object of a scientific art history.
But the most profound level is the "symbolic form." This is the struc-
tural level so deep that the ordinary functions of form are suspended
and excluded from the historical analysis. The essence of Cassirer's the-
yory of symbolic form (as Panofsky read it) was the notion of a core sym-
bolizing activity. The different spheres of human creativity were the
"forms" produced by this activity. We recall that for Riegl, art had been
merely one among various expressions of a central human Weltan,
or a drive toward a "satisfying shaping of a relationship to the world." Thus
the symbolic form provided a philosophical vindication and completion
of Riegl's incipient Weltanschauungphilosophie.

But how sharp was the resolution of Panofsky's image of Cassirer?
The proposed "application" of the symbolic form is never theoretically
justified beyond the initial statement in the second part of the essay.
This is somewhat discouraging. The practice or tactic of the essay is to
juxtapose an art-historical narrative and a characterization of a Weltan-
schauung (which is often achieved by a narrative about intellectual his-
tory), and then marry them in a brief and dramatic ceremony. This

 Junction does not necessarily bear up under close scrutiny. In the first
section, for instance, after showing how difficult it has been since the
Renaissance to overcome the habit of seeing in linear perspective,
Panofsky makes the point that this habit was no mere arbitrary imposi-
tion upon the public eye: for the linear perspective employed by the
painters is "comprehensible only for a quite specific, indeed specifically
modern, sense of space, or if you will, sense of the world" (p. 34). What
does it mean to slide from Raumgefühl to Weltgefühl only by way of an
informed "weiss man so wohl?" Welt carries a heavy burden here: it is more
than the physical universe, it is shorthand for experience in general. Does
this mean that the experience of space is somehow central to or gener-
ative of other experience?

This association of experience in general with the experience of
space is the first of two successive links that together connect world-
view to paintings (and to other concrete formulations of thought). The
second link in the chain is the relationship between the experience of
space and the construction of paintings. In the sentence immediately
following the remark just quoted about Weltgefühl and Raumgefühl,
modernity is characterized as "an epoch whose perception was governed by
a conception of space [Raumvorstellung] expressed by strict linear per-
spective." This "expression" is evidently a simple and derivable rela-
relationship; it is a species of equivalency or mimetics. The expression of the
Raumvorstellung in the picture entails no loss or transformation.

The same double linkage is proposed after the discussion of Greco-
Roman painting in the second section: "Antique perspective is thus
the expression [Ausdruck] of a specific and fundamentally unmodern
view of space [Raumanschauung]... [and] furthermore the expression
of an equally specific and equally unmodern conception of the world
[Weltanschauung]" (p. 43). Again there is an initial link between "space"
and "world," this time accomplished by a chiasmus that crosses the
familiar term Weltanschauung with the new term Raumvorstellung. But
what is the precise mechanism of the other link, the "expression" of
the view of space in the painting? Panofsky divulges this by reformulating
the famous question posed by Rodenwaldt about why Polygnotus did
not paint naturalistic landscapes, and then reformulating his own answer
to the question offered in the Kunstwollen essay. To ask whether the *antique* painter "could not" or "would not" paint a certain way, Panofsky argued then and now, is to pose a false question. The matter was in fact out of the painter's hands altogether, for the artistic "will" is properly an impersonal force. Panofsky speaks in Riegl's voice: antique painters did not overlook Euclid's Eighth Axiom and arrive at linear perspective "because that feeling for space which was seeking expression in the plastic arts simply did not demand a systematic space." It is the *Raumgefühl* that "seeks" and "demands"; the artist is an instrument of Kunstwollen, and the exponent of the "immanent meaning" of the period.

This is a complicated piece of conceptual machinery. It functions slightly differently every time it is set in motion. In the context of seventeenth-century perspective, Panofsky argues that

the arbitrariness of direction and distance within modern pictorial space [Bildraum] bespeaks and confirms the indifference to direction and distance of modern intellectual space [Denkraum]; and it perfectly corresponds [entspricht], both chronologically and technically, to that stage in the development of theoretical perspective, when, in the hands of Desargues, it became a general projective geometry. (p. 70)

Here the relationship between the Bildraum and its mathematical formulation is one of "correspondence"; elsewhere it is "expression": "Once again this perspectival achievement is nothing other than a concrete expression [Anspruch] of a contemporary advance in epistemology or natural philosophy" (p. 65). The most precise and complex statement of the various relationships is the final sentence of section II, after the discussion of antique philosophies of space:

And precisely here it becomes quite clear that "aesthetic space" and "theoretical space" recast perceptual space in the guise of one and the same sensation: in one case that sensation is visually symbolized, in the other it appears in logical form. (pp. 44-45)

Thus art and philosophy are parallel transformations of empirical reality, and both are in some sense controlled by an *Empfindung* which can only be the Weltanschauung. Only art, however, is a symbolic form: the relationship of philosophy to the Weltanschauung is logical and thus not problematic. This is why the diagnosis of art can refer interchangeably to the Weltanschauung and to the formulations of philosophy.

In a sense, it is unfair to extract Panofsky's propositions from their contexts, as if to suggest that his arguments consisted of nothing but a series of imprecise manipulations and recombinations of philosophical terminology. But then he does argue in a peculiar rhythmic fashion, in cycles of quite sober philosophical and pictorial analysis culminating in brief synthetic pronouncements, like the conclusion to section II just quoted. These are rhetorically ambitious moments: they thrive on parallelism and paradox; they claim a certain apocalyptic autonomy; in effect they offer closure and explanation in the form of linguistic, even grammatical, operations. This kind of writing certainly has its purpose; it can serve a cultural criticism, or a philosophical history. But Panofsky's cultural history also claims a certain historical verisimilitude. Panofsky's account of the morphology, the sequence of works of art, is understood as reliable; this is his *metier*, in a sense. But the verisimilitude of the entire cultural history is contingent upon the reliability of that double link between the history of art and the Weltanschauungen. If it is a function, it must be regular and intelligible; it must be capable of being both differentiated and integrated. Otherwise the linkage will have no diagnostic value.

This may look like an unreasonable demand. But most cultural histories, and certainly Panofsky's, do claim diagnostic power, that is, the ability to derive initial conditions from cultural products. Such histories are still operating within a framework established by the natural sciences. They survive on a postulated causal relationship between a primary layer of conditions or events and a secondary layer of symptoms or documents. The limits of the explanatory power of this diagnostic model—the limits of its scientific claims—are set by archaeology or some other philological procedure. As a general rule, close historical scrutiny will always disrupt and invalidate causal relationships. (Philologies are of course themselves methods subject to limits, and can...
claim no more objectivity than any given method of scientific observation. They are corrected by more exacting philologies, and these in turn by still more exacting disciplines and so on in an infinite regression, until some threshold of human sensitivity or tolerance is crossed, and the method is found persuasive.) For philology is always hostile to philosophical explanation, to determinations of meaning grounded in scientific principles of inquiry. In order to satisfy the exigencies of philology, Panofsky was in the end constrained to reduce the symbolic form to a species of merely adequate or mimetic representation.

This antagonism between the historicist scruple and the structuralist imagination is revealed most graphically in Panofsky's awkward chronologically coordinations of art history and intellectual history. Syncretism is never better than approximate. Modern projective geometry as worked out by Desargues corresponds to the directionless space of Descartes, but it also corresponds to Alberti's estrations legittimo and to Kantian epistemology. The conceptions of space of Descartes, Plato and Aristotle all correspond to Greco-Roman landscape painting. The Aristotelian revival of the twelfth and thirteenth centuries corresponds to High Gothic sculpture. These are great blind spots in Panofsky, spectacular moments of irresponsible synthesis, forged because they serve as mere rhetorical punctuation of lengthy and substantive arguments. But what do they reveal about those arguments? The two kinds of events, philosophical and artistic, run in parallel because they derive from a common Weltanschauung. Because their relationships to that Weltanschauung are different - one is logical, the other symbolic - the time scales may diverge. But once they are out of synchrony, we lose our grip on the Weltanschauung. We are reduced to coordinating entirely unrelated sequences of events without any sense of why they should be coordinated.

The Weltanschauung is stripped of its historical reality, exposed as the hypothetical least common denominator between art and philosophy.15 Philology is especially lethal to diachronic structures. This is why Riegl was so suspicious of teleologies. The only one he accepted was the one he built himself, upon synchronic foundations. Panofsky installed a new diachronic structure: the problem-solving model. Pictorial devices like perspective solve technical problems that arise when previous devices are no longer considered effective. The evolution of the representational devices is presented as a series of resolutions of conflict, of "conquests" (p. 55). This agnostic rhythm is mirrored on a greater temporal scale in Panofsky's dialectical model of historical change. Panofsky conceived of historical movement as a series of syntheses. This is still conspicuous in Early Netherlandish Painting (1939) and in Renaissance and Renaisance (1960). In the perspective essay it surfaced at the beginning of section III, in the theory of "reversals":

When work on certain artistic problem has advanced so far that further work in the same direction, proceeding from the same premises, appears unlikely to bear fruit, the result is often a great recoil, or perhaps better, a reversal of direction. Such reversals, which are often associated with a transfer of artistic "leadership" to a new country or a new genre, create the possibility of erecting a new edifice out of the rubble of the old; they do this precisely by abandoning what has already been achieved, that is, by turning back to apparently more "primitive" modes of representation. (p. 47)

It is hard to say whether the local problems and solutions are mere symptoms of the universal dialectic, or on the contrary the dialectic is composed of countless particular dialectics. At any rate, this is well beyond Riegl. The source is not hard to find; Panofsky elaborated in Die Deutsche Pflanze:

The Hegelian notion that the historical process unfolds in a sequence of thesis, antithesis and synthesis appears equally valid for the development of art. For all aesthetic "progress," that is, each discovery of new artistic values, must first be purchased with a partial abandonment of whatever has already been achieved: further development, then, constantly aims at taking up anew (and from new points of view) that which was rejected in the initial onslaught, and making it useful to the altered artistic purposes. (p. 218)

This places a special burden on the historian, needless to say: he or she will want to show that historical individuals conceived of these problems in this way. Philology will virtually always show that they did not.
Moreover, this abstract diachronic will is incompatible with the synchronic will, the will of the culture or the worldview to express itself in art. One of the two perpendicular wills must be dominant; they cannot both claim mimetic power, if the diachronic will is so strong as to be almost predictive – at one point Panofsky says: “we can almost predict where ‘modern’ perspective will unfold” (p. 54) – then the synchronic will is reduced to a simple, necessary copying function. One suspects the opposite to be true as well: if one has faith in synchronicity, then the destiny of the diachronic will is no longer a mystery. Antiquity, for example, recognized direction as an objective attribute of space “by intellectual-historical necessity” (p. 70).

It is telling that philology is somehow less disruptive in those passages in the perspective essay on medieval sculpture. Since here the topic is not really perspective at all, the analysis can proceed outside the dominion of the perspectival heuristic model. There are the most difficult passages in the essay, and the closest to Riegl. The analytical model is introduced already in section II, when anthropomorphic and corporeal (haptic) classical art is compared to painterly and spatially unified (optic) Hellenistic art.

Yet even the (Hellenistic) artistic imagination remained attached to individual objects, to such an extent that space was still perceived not as something that could embrace and dissolve the opposition between bodies and non-bodies, but only as that which remained, so to speak, between the bodies. Thus space was artistically manifested partly by simple superposition, partly by a still unsystematic overlapping. Even where Greco-Roman art advanced to the representation of real interiors or real landscape, this enriched and expanded world was still by no means a perfectly unified world, a world where bodies and the gaps between them were only differentiations or modifications of a continuum of a higher order. (p. 41)

The manipulation of a priori structural categories is abstract and flexible enough to permit a direct comparison with modern Impressionism, and later with Expressionism. Once the categories are established, Panofsky can stretch the horizons of his argument. Section III begins by pro-

longing this analysis into a general morphology of medieval art, a vast Hegelian schema of advances and reverses. This morphology is conducted in terms of framing devices, surface values, the binding power of the plane, coloristic unity, the homogeneity of space, the emancipation of bodies from mass. The morphology takes place in the historical present tense: it is an explanation rather than a narrative. These pages are indeed what Hubert Damisch calls Panofsky’s real contribution to the philosophy of symbolic forms, and not merely an application of that philosophy to art history. They are the true outline for a philosophical art history, not pre-positivist (Hegelian) but post-positivist.

The hostility of philology to explanation is more conspicuous in the relatively well-documented periods – antiquity and especially the Italian Renaissance. Panofsky’s own philological work contributes to the erosion of synchronic systems simply by interposing networks of biographical and circumstantial detail between theories and pictures. Moreover, since Panofsky has imbedded his analyses of antique and Quattrocento painterly perspective within a much vaster synopsis of Western representations of space, embracing even the relationship of sculpted figures to architecture, rationalized linear perspective comes to look merely like one of many available tactics for representing space, and not necessarily the central and most prestigious achievement of Renaissance painting. In some ways perspective was only a compositional device, or perhaps even a stylistic gesture. The finer the grain of historical detail, the harder it becomes to justify the power conceded to perspective within the Weltanschauungsphilosophie.

And yet painterly perspective remains the dominant motif of the essay. Indeed, in a footnote Panofsky says that the essential purpose of the essay is to differentiate antique and modern perspectival systems. This is in part because perspective remains an irresistible heuristic model, because it encourages the symbolic unions he proposes. Panofsky exploits perspective constantly in double entendres encapsulating the symbolic relationship between art and worldview. He concludes, for example, that the spatial system of Quattrocento painting was constructed out of “elements” already present in Byzantine painting (projecting cornices, coffered ceilings, tiled floors and so forth); “it merely required
the Gothic sense of space to join these \textit{objeta mentra} into unity\textsuperscript{7} (p. 55). The epistemological achievement of perspective is equally an art historical achievement: perspective brings space and architecture into coordination, just as Giotto and Duccio synthesized Byzantine and Gothic art. Not can Panofsky resist using an unhistorical but systematically expedient concept of a \textit{Sehfeld} or internal visual image (which is closely related to but evidently not quite identical to the retinal image). The fundamental distinction between Panofsky’s antique and Renaissance perspectives is this: the ancients produced superficially false pictures because they would not abandon what they knew about the truth of perception (p. 43). This assumes that the object of representation was not the thing itself but our mental image of it, our \textit{Sehfeld}. But surely it is far from obvious why anyone would want to reproduce the result of vision. (Indeed, Wittgenstein wondered how one ever could do so.\textsuperscript{31}) As Joel Snyder has pointed out, it is the modern perspectival picture that furnishes the idea of a \textit{Sehfeld} in the first place.\textsuperscript{32} Perhaps there was even something aberrant in Alberti’s and Leonardo’s desire to depict the way objects look, rather than to depict them the way they actually are and then simply to allow subjective vision to operate upon the depiction.\textsuperscript{33}

It is in the end this chimerical \textit{Sehfeld} that brings down one of the most sensational ambitions of the essay. Panofsky began with the promise of undermining the claims to legitimacy or naturalness of linear perspective. This project, born of an aesthetic relativism worthy of Riegl, has always been the basis of the perspective essay’s celebrity. It is this claim that has attracted the attention of philosophers and perceptual psychologists.\textsuperscript{34} Whether or not perspective is in fact an arbitrary convention is not the issue here. For Panofsky in any case fails to fulfill his own promise; indeed, he rather quickly backs off from extreme relativism. The \textit{Sehfeld}, or retinal image, becomes an objective criterion of realism. Antique perspective is more faithful to the truth of perception than Renaissance perspective because it attempts to reproduce the curvature of the retinal image; the truth of all perspectives would be a complete curvilinear construction.

This is not to say that the \textit{Sehfeld} has the last word. Renaissance perspective, although unfaithful to perception, nevertheless had in Panofsky’s eyes the virtue of instituting a perfect equilibrium between the claims of the subject and the object. Panofsky was always drawn to tripartite schemas, to the reconciliation of opposites. Linear perspective, like Kantian epistemology, involves a necessary abstraction from empiricism. In the end, Panofsky makes the literalism of Greco-Roman perspective look as pedantic and pointless as Hume’s skepticism. Linear perspective may be vulnerable to attacks from positions of extreme subjectivism or extreme objectivism. But its occupancy of the moderate center is perfectly secure. Panofsky grants it the same universality that he grants Kant’s reconciliation of rationalism and empiricism, which he calls “critical philosophy.” He found in the a priori categories an absolute standpoint. He saw no way out of the problem that Kant had framed, and no reason to seek a way out.

That way out, paradoxically, might equally have been generated by perspective. “Perspectivism” since the Renaissance also means relativism: it suggests that a problem is always framed from a particular point of view, and that no point of view is intrinsically superior or more reliable than any other. In granting Renaissance linear perspective special status, Panofsky moved away from Riegl. The extension of Riegl’s project in the opposite direction, toward an absolute historical relativism, was never carried out, except insofar as it has been proposed by the philosopher of science Paul Feyerabend. Feyerabend radicalizes Thomas Kuhn’s model of the history of science as a sequence of incommensurable paradigms by arguing that paradigms do not change for any rational or even intelligible reasons. Here Feyerabend actually invokes the art history of Riegl. Moreover, his prime object-lesson is fifteenth-century perspective. For even here, where painting is sometimes indistinguishable from science, there is simply no stable criterion by which the accuracy of the representational model can be evaluated. Linear perspective is just another artistic (and scientific) “style.”\textsuperscript{72}

Panofsky said as much; but then he went on to say, in effect, that perspective was more than a style. He was unprepared to accept, as Feyerabend would, the arbitrariness of the history of culture, of history itself. Feyerabend ridicules the Hegelian assumption “that the change of an idea must be reasonable in the sense that there exists a link between
the fact of change and the content of the idea changing. This is a plausible assumption as long as one is dealing with reasonable people." \[15\] 

Feyerabend's position is the natural extension of a rigorous and anti-contextual philology. At the moment when Panofsky invoked these two volitional mechanisms, the problem-solving model and contextualization (the symbolic form), he moved beyond philology.

And yet it would be a mistake to interpret Panofsky's iconology as a retreat to philology, as is so often done. Although Panofsky in America abandoned entirely the rhetoric of will, the essential diachronic and synchronic structures of the perspective essay remained intact. And once these structures had been installed, any further philological work was destined only to expose and perpetuate their inadequacies. Iconology, in the end, has not proved an especially useful hermeneutic of culture.

What it tells us about a culture is usually tautological (something like: this was the kind of culture that could have produced this work). For Damiš, Panofsky departed essentially from Cassirer when he accepted the totalizing metaphor of the Weltanschauung. \[24\] Panofsky was unwilling to perceive a divergence of symbolic systems, to suffer a culture with "faults." Philology would have corroborated exactly such a divergence.
"In Latin Perspectiva is a Latin word which means 'seeing through.' ". This is how Dürer sought to explain the concept of perspective. And although this Latin word was used already by Boethius, and did not originally bear so precise a meaning, we shall nevertheless adopt in essence Dürer's definition. We shall speak of a fully 'perspectival' view of space not when mere isolated objects, such as houses or furniture, are represented in 'foreshortening,' but rather only when the entire picture has been transformed — to cite another Renaissance theoretician — into a "window," and when we are meant to believe we are looking through this window into a space. The material surface upon which the individual figures or objects are drawn or painted or carved is thus negated, and instead reinterpreted as a mere "picture plane." Upon this picture plane is projected the spatial continuum which is seen through it and which is understood to contain all the various individual objects.

So far it does not matter whether this projection is determined by an immediate sensory impression or by a more or less "correct" geometrical construction. This correct construction was in fact invented in the Renaissance, and although later subjected to
various technical improvements and simplifications, it nevertheless remained in its premises and goals unchanged to the time of Desargues. It is most simply explained as follows: I imagine the picture — in accord with the “window” definition — as a planar cross section through the so-called visual pyramid; the apex of this pyramid is the eye, which is then connected with individual points within the space to be represented. Because the relative position of these “visual rays” determines the apparent position of the corresponding points in the visual image, I need only draw the entire system in plan and elevation in order to determine the figure appearing on the intersecting surface. The plan yields the width, the elevation yields the height; and if I combine these values on a third drawing, I will obtain the desired perspectival projection (Figure 1).

In a picture constructed this way — that is, by means of what Dürer called a “planar, transparent intersection of all those rays that fall from the eye onto the object it sees” — the following laws are valid. First, all perpendiculars or “orthogonals” meet at the so-called central vanishing point, which is determined by the perpendicular drawn from the eye to the picture plane. Second, all parallels, in whatever direction they lie, have a common vanishing point. If they lie in a horizontal plane, then their vanishing point lies always on the so-called horizon, that is, on the horizontal line through the central vanishing point. If, moreover, they happen to form a 45-degree angle with the picture plane, then the distance between their vanishing point and the central vanishing point is equal to the distance between the eye and the picture plane. Finally, equal dimensions diminish progressively as they recede in space, so that any portion of the picture — assuming that the location of the eye is known — is calculable from the preceding or following portion (see Figure 7).

In order to guarantee a fully rational — that is, infinite, unchanged and homogeneous — space, this “central perspective” makes two tacit but essential assumptions: first, that we see with a single and immobile eye, and second, that the planar cross section of the visual pyramid can pass for an adequate reproduction of our optical image. In fact these two premises are rather bold abstractions from reality, if by “reality” we mean the actual subjective optical impression. For the structure of an infinite, unchanging and homogeneous space — in short, a purely mathematical
space is quite unlike the structure of psychophysical space. Perception does not know the concept of infinity; from the very outset it is confined within certain spatial limits imposed by our faculty of perception. And in connection with perceptual space we can no more speak of homogeneity than of infinity. The ultimate basis of the homogeneity of geometric space is that all its elements, the 'points' which are joined in it, are mere determinations of position, possessing no independent content of their own outside of this relation, this position which they occupy in relation to each other. Their reality is exhausted in their reciprocal relation; it is a purely functional and not a substantial reality. Because fundamentally these points are devoid of all content, because they have become mere expressions of ideal relations, they can raise no question of a diversity in content. Their homogeneity signifies nothing other than this similarity of structure, grounded in their common logical function, their common ideal purpose and meaning. Hence homogeneous space is never given space, but space produced by construction; and indeed the geometrical concept of homogeneity can be expressed by the postulate that from every point in space it must be possible to draw similar figures in all directions and magnitudes. Nowhere in the space of immediate perception can this postulate be fulfilled. Here there is no strict homogeneity of position and direction; each place has its own mode and its own value. Visual space and tactical space [Tactum] are both anisotropic and unhomogeneous in contrast to the metric space of Euclidean geometry: the main directions of organization – before–behind, above–below, right–left – are dissimilar in both physiological spaces.”

Exact perspectival construction is a systematic abstraction from the structure of this psychophysical space. For it is not only the effect of perspectival construction, but indeed its intended purpose, to realize in the representation of space precisely that homogeneity and boundlessness foreign to the direct experience of that space. In a sense, perspective transforms psychophysical space into mathematical space. It negates the differences between front and back, between right and left, between bodies and intervening space (“empty” space), so that the sum of all the parts of space and all its contents are absorbed into a single “quantum continuum.” It forgets that we see not with a single fixed eye but with two constantly moving eyes, resulting in a spheroidal field of vision. It takes no account of the enormous difference between the psychologically conditioned “visual image” through which the visible world is brought to our consciousness, and the mechanically conditioned “retinal image” which paints itself upon our physical eye. For a peculiar stabilizing tendency within our consciousness – promoted by the cooperation of vision with the tactile sense – ascribes to perceived objects a definite and proper size and form, and thus tends not to take notice, at least not full notice, of the distortions which these sizes and forms suffer on the retina. Finally, perspectival construction ignores the crucial circumstance that this retinal image entirely apart from its subsequent psychological “interpretation,” and even apart from the fact that the eyes move – is a projection not on a flat but on a concave surface. Thus already on this lowest, still prepsychological level of facts there is a fundamental discrepancy between “reality” and its construction. This is also true, of course, for the entirely analogous operation of the camera.

If, to choose a very simple example, a line is divided so that its three sections a, b, and c subtend equal angles, these objectively unequal sections will be represented on a concave surface (like the retina) as approximately equal lengths; whereas if projected on a flat surface they will appear, as before, as unequal lengths (Figure 2). This is the source of those marginal distortions.
which are most familiar to us from photography, but which also distinguish the perspective-constructed image from the retinal image. These distortions can be mathematically expressed as the discrepancy between, on the one hand, the ratio of the visual angles and, on the other hand, the ratio of the linear sections produced by projection upon a flat surface. The wider the total or composite visual angle—that is, the smaller the ratio between the distance from eye to image and the size of the image—the more pronounced the distortion. But alongside this purely quantitative discrepancy between retinal image and perspectival representation, which was recognized already in the early Renaissance, there is as well a formal discrepancy. This latter follows, in the first place, from the movement of the gaze, and in the second place, once again, from the curvature of the retina: for while perspective projects straight lines as straight lines, our eye perceives them (from the center of projection) as convex curves. A normal checkerboard pattern appears at close range to swell out in the form of a shield; an objectively curved checkerboard, by the same token, will straighten itself out. The orthogonals of a building, which in normal perspectival construction appear straight, would, if they were to correspond to the factual retinal image, have to be drawn as curves. Strictly speaking, even the verticals would have to submit to some bending (pace Guido Hauck, whose drawing is reproduced as Figure 3).

This curvature of the optical image has been observed twice in modern times: by the great psychologists and physicists at the end of the last century; but also (and this has apparently not been remarked upon until now) by the great astronomers and mathematicians at the beginning of the seventeenth century. We should recall above all the words of the remarkable Wilhelm Schickhardt, a cousin of the Wurttemberg architect and Italian traveler, Heinrich Schickhardt: "I say that all lines, even the straightest, which do not stand directe centro pupillum [directly in front of the eye]...necessarily appear somewhat bent. Never-
theless, no painter believes this: this is why they paint the straight sides of a building with straight lines, even though according to the true art of perspective this is incorrect . . . Crack that nut, you artists!"10 This was endorsed by none other than Kepler, at least insofar as he admitted the possibility that the objectively straight tail of a comet or the objectively straight trajectory of a meteor is subjectively perceived as a curve. What is most interesting is that Kepler fully recognized that he had originally overlooked or even denied these illusory curves only because he had been schooled in linear perspective. He had been led by the rules of painterly perspective to believe that straight is always seen as straight, without stopping to consider that the eye in fact projects not onto a plana tabella but onto the inner surface of a sphere.11 And indeed, if even today only a very few of us have perceived these curvatures, that too is surely in part due to our habituation—further reinforced by looking at photographs—to linear perspectival construction: a construction that is itself comprehensible only for a quite specific, indeed specifically modern, sense of space, or if you will, sense of the world.

Thus in an epoch whose perception was governed by a conception of space expressed by strict linear perspective, the curvatures of our, so to speak, spheroidal optical world had to be rediscovered. However, in a time that was accustomed to seeing perspectively—but not in linear perspective—these curvatures were simply taken for granted: that is, in antiquity. In antique optics and art theory (as well as in philosophy, although here only in the form of analogies) we constantly encounter the observations that straight lines are seen as curved and curved lines as straight; that columns must be subjected to entasis (usually relatively weak, of course, in classical times) in order not to appear bent; that epistyle and stylobate must be built curved in order to avoid the impression of sagging. And, indeed, the familiar curvatures of the Doric temple attest to the practical consequences of such findings.12 Antique optics, which brought all these insights to fruition, was thus in its first principles quite antithetical to linear perspective. And if it did understand so clearly the spherical distortions of form, this only follows from (or at least corresponds to) its still more momentous recognition of the distortions of magnitude. For here, too, antique optics fit its theory more snugly to the factual structure of the subjective optical impression than did Renaissance perspective. Because it conceived of the field of vision as a sphere,13 antique optics maintained, always and without exception, that apparent magnitudes (that is, projections of objects onto that spherical field of vision) are determined not by the distances of the objects from the eye, but rather exclusively by the width of the angles of vision. Thus the relationship between the magnitudes of objects is, strictly speaking, expressible only in degrees of angle or arc, and not in simple measures of length.14 Indeed Euclid's Eighth Theorem explicitly preempts any opposing view. Euclid states that the apparent difference between two equal magnitudes perceived from unequal distances is determined not by the ratio of these distances, but rather by the far less discrepant ratio of the angles of vision (Figure 4).15 This is diametrically opposed to the doctrine behind modern perspectival construction, familiar in the formula of Jean Pelerin, known as Viator: "Les quantités et les distances Ont concordables différences" ("The quantities and the distances vary proportionally").16 And perhaps it is more than mere accident that in Renaissance paraphrases of Euclid, indeed even in translations, precisely this Eighth Theorem was either entirely suppressed or "emended" until it lost its original meaning.17 Evidently, the contradiction was felt between Euclid's perspectiva naturalis or communis, which sought simply to formulate mathematically the laws of natural vision (and so linked apparent size to the visual angle),
and the perspective artificialis developed in the meantime, which on the contrary tried to provide a serviceable method for constructing images on two-dimensional surfaces. Clearly, this contradiction could be resolved only by abandoning the angle axiom; to recognize the axiom is to expose the creation of a perspectival image as, strictly speaking, an impossible task, for a sphere obviously cannot be unrolled on a surface.

At this point we are bound to wonder whether and in what way antiquity itself might have developed a geometrical perspective. The ancients, as far as we know, never swerved from the principle that apparent magnitudes were determined not by distances but by angles. On the one hand, it is clear that as long as it respected this principle, antique painting cannot very well have contemplated a projection upon a surface, but rather would have had to adhere to a projection upon a spherical surface. On the other hand, there can be no doubt that antique painting was even less prepared than was the Renaissance to work in practice with "stereographic" projection, for example in Hipparchos's sense. We thus have to consider, at most, whether or not antiquity managed to work out an artistically serviceable approximation. We might imagine such a construction founded on the notion of a "sphere of projection"—or, in plan and elevation, a circle of projection— with, however, the arcs of the circle replaced by their chords. This would achieve a certain approximation of the depicted magnitudes to the widths of the angles, without posing any more technical problems than the modern procedure. And indeed it seems possible— we dare not claim this with any certainty—that antique painting, at least by late Hellen-
istic and Roman times, had just such a procedure at its disposal.

Vitruvius, in a much-discussed passage of the Ten Books on Architecture, offers the following remarkable definition: "Scenographia," that is, the perspectival representation of a three-dimensional structure on a surface, is based on an "omnium linearum ad circini centrum responsum." At first, of course, one had hoped to discover in this circini centrum the central vanishing point of modern perspective. But not a single surviving antique painting possesses such a unified vanishing point. More importantly, the words themselves appear to rule out this interpretation, for circini centrum properly means "compass point," not "center of a circle": the central vanishing point of modern linear perspective, the mere convergence point of orthogonals, cannot possibly be construed as the fixed point of a compass. If, however, Vitruvius is speaking about an exact perspectival construction at all (which the mention of the circini still implies), there is at least a possibility that Vitruvius meant by centrum not a vanishing point within the picture, but rather a "center of projection" standing for the eye of the beholder. That center (and this would conform entirely to the antique angle axiom) would then in preparatory drawings be the center of a circle intersecting the visual rays, just as the straight line representing the picture plane intersects the visual rays in modern perspectival construction. In any event, if one now constructs with the help of such a "circle of projection" (whereby, as said before, the arcs of the circle are replaced by the corresponding chords), the result does conform to the surviving monuments in a crucial respect: the extensions of the orthogonals do not merge at a single point, but rather only weakly converge, and thus meet in pairs at several points along a common axis. For when the circle is rolled out, the arcs break apart, so to speak, at the tips. This creates a "fishbone" effect (Figure 5).

![Figure 5](image)

Figure 5. Antique "angle-perspectival" construction of a rectangular interior space ("space box"). Left above: plan. Left below: elevation. Right: perspectival image arrived at by combining the segments marked off on the "projection circle."

It is not clear that such an interpretation of the Vitruvius passage can be sustained; it can hardly be proved, since the surviving pictures almost without exception are not rigorously constructed. At any rate, this fishbone or, more formally put, vanishing-axis principle was, at least as far as we can monitor it, crucial in antique spatial representation. Sometimes we find it in the form of a partial convergence, as just described and in accord with our hypothetical circle-construction (Plate 1); sometimes in the
more schematic, but more practicable, form of a more or less pure parallelism of oblique orthogonal forms. The latter version is attested already on southern Italian vases of the fourth century B.C. (Plates 2 and 3). 20

But this mode of representing space suffers, in comparison to the modern mode, from a peculiar instability and internal inconsistency. For the modern vanishing-point construction distorts all widths, depths and heights in constant proportion, and thus defines unequivocally the apparent size of any object, the size corresponding to its actual magnitude and its position with respect to the eye. That is precisely the enormous advantage of the modern method, precisely why it was so passionately pursued. A constant distortion is impossible under the vanishing-axis principle because the arrangement of the axes has no validity. This is strikingly illustrated by the inability of the vanishing-axis principle to foreshorten correctly a checkerboard pattern: the squares in the middle are either too large or too small. Already in antiquity, but then above all in the late Middle Ages, when this construction was revived in many parts of Europe, such awkward discrepancies were concealed by an escutcheon, a festoon, a bit of drapery or some other perspectival fig leaf. 21 Moreover, the diagonals of a checkerboard constructed in this way will only run straight if the depth intervals in the rear half of the board appear to grow, instead of diminishing as they should; and conversely if the intervals do diminish, then the diagonals will appear broken.

Granted, this looks more like a mathematical than an artistic matter, for one might with justice point out that the relative imperfection, indeed even the total absence, of a perspectival construction has nothing to do with artistic value (just as, conversely, the strict observance of perspectival laws need in no wise encroach upon artistic "freedom"). But if perspective is not a factor of value, it is surely a factor of style. Indeed, it may even be characterized as (to extend Ernst Cassirer's felicitous term to the history of art) one of those "symbolic forms" in which "spiritual meaning is attached to a concrete, material sign and intrinsically given to this sign." This is why it is essential to ask of artistic periods and regions not only whether they have perspective, but also which perspective they have.

The art of classical antiquity was a purely corporeal art; it recognized as artistic reality only what was tangible as well as visible. Its objects were material and three-dimensional, with clearly defined functions and proportions, and thus were always to a certain extent anthropomorphized. These objects were not merged in painterly fashion into spatial unity, but rather were affixed to each other in a kind of rectonic or plastic cluster. Hellenistic art, to be sure, began to affirm not only the value of the internally motivated body, but also the charms of its outer surface. It also began to perceive as worthy of depiction (and this is closely related) not only animate but also inanimate nature, not only the plastic and beautiful but also the painterly and ugly, or common, not only solid bodies but also the surrounding and unifying space. Yet even the Hellenistic artistic imagination remained attached to individual objects, to such an extent that space was still perceived not as something that could embrace and dissolve the opposition between bodies and nonbodies, but only as that which remains, so to speak, between the bodies. Thus space was artistically manifested partly by simple superposition, partly by a still-unsystematic overlapping. Even when Greco-Roman art advanced to the representation of real interiors or real landscapes, this unenriched and expanded world was still by no means a perfectly unified world, a world where bodies and the gaps between them were only differentiations or modifications of a continuum of a higher order. Depth intervals have become palpable, but cannot be expressed in terms of a fixed "module." The
foreshortened orthogonals converge, but they never converge toward a single horizon, not to speak of a single center (even if in representations of architecture, as a rule, the rising of the base lines and the fall of the roof lines are observed). Magnitudes generally diminish as they recede, but this diminution is by no means constant, indeed it is always being interrupted by mal-proportioned figures, figures "not to scale." The transformations effected by distance and the intervening medium upon the form and color of bodies are represented with such bold virtuosity that the style of these paintings has been held up as a precursor of, or even a parallel to, modern Impressionism; and yet they never achieve unified "lighting." Even when the notion of perspective as "seeing through" is taken seriously -- for example, when we are meant to believe that we are looking through a row of columns onto a continuous landscape (see Plate 4) -- the represented space remains an aggregate space; it never becomes that which modernity demands and realizes, a systematic space. Precisely here it becomes clear that antique "impressionism" was only a quasi impressionism. For the modern movement to which we give that name always presupposes that higher unity, order and above empty space and bodies; as a result its observations automatically acquire direction and unity. This is how Impressionism can so persistently devalue and dissolve solid forms without ever jeopardizing the stability of the space and the solidity of the individual objects; on the contrary, it conceals that stability and solidity. Antiquity, on the other hand, lacking that dominating unity, must, so to speak, purchase every spatial gain with a loss of corporeality, so that space really seems to consume objects. This explains the almost paradoxical phenomenon that so long as antique art makes no attempt to represent the space between bodies, its world seems more solid and harmonious than the world represented by modern art; but as soon as space is included in the representation, above all in landscape painting, that world becomes curiously unreal and inconsistent, like a dream or a mirage.

Antique perspective is thus the expression of a specific and fundamentally unmodern view of space (although it is certainly a genuinely spatial view, Spengler notwithstanding). Antique perspective is furthermore the expression of an equally specific and equally unmodern conception of the world. And only now can we understand how the antique world was able to satisfy itself with what Goethe called "such a precocious, even false" rendition of the impression of space. Why did the ancients fail to take the apparently small step of intersecting the visual pyramid with a plane and thus proceed to a truly exact and systematic construction of space? To be sure, that could not happen as long as the angle axiom of the theoreticians prevailed. But why did they not simply disregard the axiom, as would happen a millennium and a half later? They did not do it because that feeling for space which was seeking expression in the plastic arts simply did not demand a systematic space. Systematic space was as unthinkable for antique philosophers as it was unimaginable for antique artists. Thus it would be methodologically quite unsound to equate the question "Did antiquity have perspective?" with the question "Did antiquity have our perspective?" as was done in the days of Perrault and Sallier, Lessing and Kantzen.

As various as antique theories of space were, none of them succeeded in defining space as a system of simple relationships between height, width and depth. In that case, in the guise of a "coordinate system," the difference between "front" and "back," "here" and "there," "body" and "nobody" would have resolved into the higher and more abstract concept of three-dimensional extension, or even, as Arnold Gericke puts it, the concept of a "corpus generaliter sumptum" ("body taken in a gen-
eral sense”). Rather, the totality of the world always remained something radically discontinuous. Democritus, for example, constructed a purely corporeal world out of indivisible elements, and then, only in order to secure for those elements the possibility of movement, postulated further the infinite void as a non-being (even if, as a correlate to the on or being, this is something of a necessity). Plato let space stand in opposition to the world of elements reducible to geometrically formed bodies, as their formless hyperoché or receptacle (indeed it is even hostile to form). Aristotle, finally, with a basically quite unmathematical transfer of qualitative categories to the realm of the quantitative, attributed six dimensions (diastota, diotomata) to sapos koinon or general space (up and down, front and back, right and left), even though individual bodies were sufficiently defined by three dimensions (height, width, depth). Moreover, Aristotle conceived this “general space” in turn as merely the farthest frontier of an absolutely large body, namely the outermost celestial sphere — just as the specific location of individual things (topos idion) is for him the frontier where the One meets the Other.28 Perhaps this Aristotelian doctrine of space illustrates with special clarity the inability of antique thought to bring the concrete empirical “attributes” of space, and in particular the distinction between “body” and “nonbody,” to a common denominator of a substance étendue: bodies are not absorbed into a homogeneous and infinite system of dimensional relationships, but rather are the juxtaposed contents of a finite vessel. For, just as for Aristotle there is no “quantum continuum” in which the quiddity of individual things would be dissolved, so there is for him also no energoia apoteo (actual infinite) which would extend beyond the Dases of individual objects (for, in modern terms, even the sphere of fixed stars would be an “individual object”).29 And precisely here it becomes quite clear that “aesthetic space” and “theoretical space” recast perceptual space in the guise of one and the same sensation: in one case that sensation is visually symbolized, in the other it appears in logical form.
When work on certain artistic problems has advanced so far that further work in the same direction, proceeding from the same premises, appears unlikely to bear fruit, the result is often a great recoil, or perhaps better, a reversal of direction. Such reversals, which are often associated with a transfer of artistic "leadership" to a new country or a new genre, create the possibility of erecting a new edifice out of the rubble of the old; they do this precisely by abandoning what has already been achieved, that is, by turning back to apparently more "primitive" modes of representation. These reversals lay the groundwork for a creative reengagement with older problems, precisely by establishing a distance from those problems. Thus we see Donatello grow not out of the pallid classicism of the epigones of Arnolfo, but out of a decidedly Gothic tendency. Likewise, the powerful figures of Konrad Witz had to be supplanted by the more elegant creatures of Wolgemut and Schongauer before Dürer's Four Apostles became possible. And between antiquity and modern times stands the Middle Ages, the "greatest of those "recoils." The art historical mission of the Middle Ages was to blend what was once a multiplicity of individual objects (no matter how ingeniously linked to one another) into a true unity. This new unity -- and this is only apparently a para-
“looking through” begins to close up. At the same time it can be seen how precisely here the individual pictorial elements, which had almost completely lost their gestural and corporeal dynamic relationship and their perspectival spatial relationship, could be joined in a new and, in a certain sense, more intimate relationship: in an immaterial but unbroken tissue, as it were, within which the rhythmic exchange of color and gold or, in relief sculpture, of light and dark, restores a kind of unity, even if only a coloristic or luminous unity. The particular form of this unity once again finds its theoretical analogue in the view of space of contemporary philosophy: in the metaphysics of light of pagan and Christian neoplatonism. “Space is nothing other than the finest light,” according to Proclus; here, just as in art, the world is conceived for the first time as a continuum. It is also robbed of its solidity and rationality: space has been transformed into a homogeneous and, so to speak, homogenizing fluid, immeasurable and indeed dimensionless.

Thus the very next step on the path toward modern “systematic space” had to be the refashioning of the world — now unified but still luminously fluctuating — into a substantial and measurable world; substantial and measurable, of course, not in any antique sense, but indeed rather in a medieval sense. Already in Byzantine art, even if much impeded and even here and there repulsed by a constantly reemerging partiality for antique illusionism, a tendency to follow through with the reduction of space to surface declares itself (“follow through,” because the world of early Christian and late antique art is not yet a purely linear and two-dimensional world, but rather still a world of space and bodies, even if everything is oriented to the surface). Byzantine art, moreover, tended to exalt that element which within this new two-dimensionality could alone provide stability and system: line. But even Byzantine art, which in the end
never really severed itself from the antique tradition, failed to carry this development through to a fundamental break with the principles of late antiquity (just as, conversely, it never actually arrived at a "Renaissance"). Byzantine art could not decide, as it were, to form the world in a completely linear rather than a painterly fashion; thus its adherence to mosaic, whose nature it is to hide the inexorably two-dimensional structure of the bare wall by spreading a shimmering coat over it. The paths of light and shadows of shadow of antique and late antique illusionism are indeed hardened into line-like forms; but the original painterly meaning of these forms is never so completely forgotten that they become mere lines. Likewise where perspective is concerned: Byzantine art may have ended up treating landscape motifs and architectural forms as mere stage scenery before a neutral background; but these motifs and forms never ceased somehow to suggest space, even if they no longer encompassed space. Thus Byzantine art — and for our purposes this is especially important — managed, for all the disorganization of the whole, nevertheless to preserve the individual components of antique perspectival space, and so to hold them in readiness for the Western Renaissance.13

The art of northwest Europe, whose frontier in the Middle Ages was not so much the Alps as the Apennines, transformed the late antique tradition far more radically than did southeast European Byzantium. After the comparatively retrospective and for that very reason preliminary epochs of the Carolingian and Ottonian "renaissances," emerged that style which we usually call "Romanesque." The Romanesque, fully mature by the middle of the twelfth century, completed the renunciation of antiquity which Byzantine art never quite carried out. Now line is merely line, that is, a graphic means of expression sui generis which finds its meaning in the delimitation and ornamentation of surfaces. Surface, meanwhile, is now merely surface, that is, no longer even the vague suggestion of an immaterial space, but rather the unconditionally two-dimensional surface of a material picture support. This style was then extended along the same lines, that is, made still more systematic and tectonic, by the succeeding epoch. How the Romanesque destroyed the last remnants of the antique perspectival view may be clarified by the well-known example (one among countless) of the metamorphosis of the perspectively foreshortened River Jordan, in representations of the Baptist, into a "water mountain."14 In Byzantine and Byzantining painting, as a rule, the form of the river bank converging into depth and the shimmering transparency of the water are still clearly recognizable. Pure Romanesque (the transition declares itself already around the year 1000) reshapes with ever-greater resolve the painterly waves into a plastic and solid mountain of water, and the space-defining convergence into an "ornamental" surface form. The horizontally foreshortened river which permits the body of Christ to shimmer forth becomes a perpendicularly rising coulisse behind which he disappears (or on occasion even a mandorla which in a sense frames him). The flat bank which carried the Baptist, meanwhile, becomes a staircase which he must climb.

With this radical transformation, so it would appear, all spatial illusionism was abandoned, once and for all. And yet this transformation was precisely the precondition for the emergence of the truly modern view of space. For if Romanesque painting reduced bodies and space to surface, in the same way and with the same decisiveness, by these very means it also managed for the first time to confirm and establish the homogeneity of bodies and space. It did this by transforming their loose, optical unity into a solid and substantial unity. From now on, bodies and space are bound to each other, for better or for worse. Subsequently, if
a body is to liberate itself from its attachment to the surface, it cannot grow unless space grows with it at the same rate.

This process, however, is carried out most vigorously and with the most enduring effects in high medieval sculpture. For sculpture undergoes the same process of revaluation and consolidation that painting does; sculpture, too, sheds all vestiges of antique illusionism and transforms a painterly and agitated surface, a surface broken up by light and shadow, into a stereometrically condensed surface, a surface articulated by linear contours. Sculpture, too, creates an indissoluble unity between figures and their spatial environment, that is, the background surface, with the difference that this unity does not preclude a three-dimensional swelling forward of form. A relief figure is now no longer a body standing before a wall or in a niche; rather, figure and relief ground are manifestations of one and the same substance. Thus emerges for the first time in Europe an architectural sculpture which is not so much set in or on the building, like the antique metope relief or the caryatid, as it is a direct "formation" or development out of the building material itself. The Romanesque portal statute is a plastically developed doorpost, the Romanesque relief figure a plastically developed wall. Thus the style of pure surface which painting had worked out found its sculptural counterpart in the style of pure mass. Sculpture again possesses three-dimensionality and substantiality: but not, as in antique sculpture, the three-dimensionality and substantiality of "bodies," whose coherence (if we may repeat our own words) is guaranteed for the purposes of artistic effect by an association of indistinguishable parts with individually defined extension, form and function (that is, "organs"). This is rather the three-dimensionality and substantiality of a homogeneous substance, whose coherence is guaranteed for the purposes of artistic effect by an association of indistinguishable parts, with uniform (or infinitely small) extension, form and function (that is, "particles").

Now, the art of the high Gothic again differentiates this "mass" into quasi-corporeal forms; it permits the statue to reemerge out of the wall as an independently developed structure and the relief figure to resolve out of the ground almost like freestanding sculpture. Certainly this renaissance of a feeling for the body can be interpreted as a kind of rapprochement with antiquity; indeed, in many places it was actually accompanied by a newly profound desire for an artistic reception of antiquity. For this was the same high Gothic which through Vitellio, Peckham and Roger Bacon revived ancient optics, and through Thomas Aquinas (even if with significant alterations) revived Aristotle's doctrine of space. But the end result was not a return to antiquity but rather the breakthrough to the "modern." For the architectural elements of the Gothic cathedral, conceived once again as bodies, together with its statues and relief figures unfolded back into plasticity, nevertheless remained components of that homogeneous whole whose unity and indivisibility was secured once and for all by the Romanesque. Thus alongside the emancipation of plastic bodies is achieved — one would like to say automatically — the emancipation of a spatial sphere comprehending these bodies. An expressive symbol of this is the high Gothic statue, which cannot live without its baldachin; for the baldachin not only connects the statue to the mass of the building, but also delimits and assigns to it a particular chunk of empty space. Another is the relief which retains its deeply overshadowing arch-covering; here, too, the cover serves the purpose of securing a specific spatial zone for the now plastically emancipated figures, and making their field of activity into a veritable stage (Plate 6). This stage is still limited, just as the high Gothic church is decidedly a spatial construction and yet is still fragmented into a quantity of clearly
divided individual bays, which only in late Gothic architecture will flow into one another. Yet the stage is already a fragment of a world that, even if still built out of limited and individually added cells of space, nevertheless already seems innately capable of an unlimited extension; and within this world bodies and empty space are already considered equivalent forms for expressing a homogeneous and indivisible unity. In the same way, Aristotle’s doctrine of space, enthusiastically taken up by Scholastic philosophy, was fundamentally reinterpreted, in that the premise of the finiteness of the empirical cosmos was replaced by the premise of the infinity of divine existence and influence. To be sure, this infinity — in contrast to the modern view, which begins to assert itself from around c.1350 — is not yet thought of as something realized in nature. On the other hand, it does probably already represent in contrast to the genuine Aristotelian version) a true energeia aiphas (actual infinite), which at first, to be sure, remains confined to a supernatural sphere, but which could in principle take effect in the natural sphere.56

At this point we can almost predict where “modern” perspective will unfold: namely, where the northern Gothic feeling for space, strengthened in architecture and especially sculpture,17 seizes upon the architectural and landscape forms preserved in fragments in Byzantine painting, and welds them into a new unity. And in fact the founders of the modern perspectival view of space were the two great painters whose styles, in other ways as well, completed the grand synthesis of Gothic and Byzantine: Giotto and Duccio. Closed interior spaces reappear for the first time in their works. These interiors can in the final analysis only be understood as painterly projections of those “space boxes” which the northern Gothic had produced as plastic forms and yet they are composed of elements that were present already in Byzantine art.38 In fact, these elements — though this has been much disputed in the literature — were available in the products of the monasteries greco. A mosaic from the Baptistry in Florence (Plate 7) displays in a fictional projecting cornice the familiar vanishing-axis principle; indeed, it even has a perspectively rendered coffered ceiling, although information about the floor and a clear indication of the side walls are missing.39 A mosaic at Monreale (Plate 8), conversely, shows the side walls foreshortened into depth, but again without a floor and this time without any account of a ceiling, so that the Last Supper — if we are to interpret it realistically — appears to have been staged in an open courtyard. In a second scene from the same series (Plate 9), the floor already has a foreshortened pattern of tiles whose orthogonal converges almost “correctly” even toward two different vanishing points. But then this tile pattern stands in no relationship to all the other architectural components; indeed it ends, significantly, almost exactly where the figural composition begins, so that the represented objects appear to stand, for the most part, more above than on the floor.40 Thus the spatial system of mature Trecento art (for what is true for interiors is, mutatis mutandis, also true for landscapes) was constructed retroactively, as it were, out of its elements; it merely required the Gothic sense of space to join these disposita membros into unity.

The conquest over the medieval representational principle begins with this achievement of Duccio and Giotto. For the representation of a closed interior space, clearly felt as a hollow body, signifies more than a consolidation of objects. It signifies a revolution in the formal assessment of the representational surface. This surface is now no longer the wall or the panel bearing the forms of individual things and figures, but rather is once again that transparent plane through which we are meant to believe that we are looking into a space, even if that space is still bounded on all sides. We may already define this surface as a "picture
plane,” in the precise sense of the term. The view that had been blocked since antiquity, the vista or “looking through,” has begun to open again; and we sense the possibility that the painted picture will once again become a section cut from an infinite space, only a more solid and more integrally organized space than the antique version.

To be sure, there remained a quantity of work to be done, hardly imaginable to us today, before this goal could be reached. For Duccio’s space (Plate 10) is not only a bounded space, in that it is closed in front by the “picture plane,” behind by the rear wall of the room and on the sides by the orthogonal walls. It is also an inconsistent space, in that objects — for example, in our panel the table of the Last Supper — appear to stand in front of the “space box” rather than in it; and in that the orthogonal in objects viewed asymmetrically (for example, buildings or pieces of furniture standing off to the sides) still run approximately parallel, whereas in symmetrical view (that is, when the central axis of the picture coincides with the central axis of the represented object) the orthogonal are already approximately oriented toward a vanishing point or, within vertical planes, at least toward a horizon. But even within such a symmetrical view, when the ceiling is divided into several sections, the central section is distinguished from the adjacent parts; for only the orthogonal of the former converge toward that common vanishing region, while those of the latter deviate more or less sharply from it. At first, then, only a “partial plane” was perspectively unified, and not yet an entire plane, not to speak of the entire space.

Thus within the next generation of artists, at least so far as it took an interest in perspective at all, a curious division set in. Evidently, the need for a certain clarification and systematization of Duccio’s “perspective” was keenly felt; but it was arrived at by different routes. One group of painters — in a sense, the conserv-
much for those of the individual bodies as for those of the intervals. We can actually express both bodies and intervals—and thus the scope of every movement as well—numerically, as a number of floor squares. This is a pictorial motif that will henceforth be repeated and modified with a fanaticism only now entirely comprehensible. It is not too much to claim that a pattern of tiles used in this sense represents the first example of a coordinate system: for it illustrates the modern "systematic space" in an artistically concrete sphere, well before it had been postulated by abstract mathematical thought. And in fact the projective geometry of the seventeenth century would emerge out of perspectival endeavors; this, too, like so many subdisciplines of modern "science," is in the final analysis a product of the artist's workshop.

But even Lorenzetti's painting leaves open the question of whether already the entire ground plane was oriented toward a single vanishing point. For when the figures extend all the way to the edges and thus hide the lateral segments of space, as is the case in many other paintings, it cannot be determined whether those orthogonals that would begin outside the picture frame and run past the figures at the right and left would also converge in that single point. One would rather doubt it, for in another painting by the same artist which does leave open the view onto these lateral segments of space (Plate 12), the orthogonals at the edge clearly still evade the common vanishing point of the central orthogonals. Rigorous coherence is still limited to a "partial plane." And yet this very picture with its strong recession seems to prepare even more decisively the coming development. This discrepancy between the central and edge orthogonals can be illustrated with countless examples far into the fifteenth century. It shows, on the one hand, that the concept of infinity is still in the making, and, on the other hand (and this is its historical significance), that the linear disposition of the space—however much that space, together with its contents, was felt as a tangible unity, and for all the efforts to make it felt as a unity—was nevertheless still posterior to the linear disposition of the figure composition. Things are not yet at the point where, as Pomponius Gauricus would put it 160 years later, "the place exists prior to the bodies brought to the place and therefore must first be defined linearly."45

The conquest of this new and at last "modern" standpoint appears to have been carried out in the north and in the south in two fundamentally different ways. The north knew the vanishing-axis method already before the middle of the fourteenth century, and the vanishing-point method by the last third of the century; in both cases France was out ahead of the other countries. Master Bertram, for example, who was under Bohemian influence, constructs his tile floors entirely according to the vanishing-axis principle; he attempts to conceal the critical central section with a foot treading on it apparently by accident, or with a bit of drapery posed with comically transparent grace (Plate 13). The art of Master Francke, by contrast, can be derived directly from France; like Broederlam and other French and Franco-Flemish masters, he constructs according to the vanishing-point system of the Lorenzetti. Here, however, he is just as uncertain of the orthogonals at the edges (this is especially clear on the right side of the Martyrdom of St. Thomas) as were most of his contemporaries and predecessors. It is as if, at first, it actually went against the grain of the artists to turn the lateral orthogonals so far that they would aim at the same point at which the central orthogonals aim.30

The fully unified orientation of the entire plane—and now the vertical plane as well—seems to have been consciously realized only at about the stylistic level of the van Eycks (Plates 14, 15, 16, 17; Figure 6). Here, moreover, was attempted the bold
novelty of liberating three-dimensional space from its ties with
the front plane of the picture; this was an entirely personal exploit
of the great Jan van Eyck. Until now, even in the miniature shown
in Plate 14 (which may be considered an authentic early work of
Jan van Eyck), the represented space reached its forward termi-
nation at the picture plane, even if that space could be extended
ad libitum to the sides and often even back into depth. In Jan van
Eyck's Virgin in the Church (Plate 15), by contrast, the beginning
of the space no longer coincides with the border of the picture:
rather, the picture plane cuts through the middle of the space.
Space thus seems to extend forward across the picture plane;
indeed, because of the short perpendicular distance it appears to
include the beholder standing before the panel. The picture has
become a mere "slice" of reality, to the extent and in the sense

\[ \text{FIGURE 6. Perspective schema of the Madonna of Canon van der Paele of Jan van Eyck (Bruges, Musée municipal des Beaux-Arts; 1436). (With the aid of the diagram by G. Joseph Kern.)} \]

that imagined space now reaches out in all directions beyond
represented space, that precisely the finiteness of the picture makes
perceptible the infiniteness and continuity of the space.52

That said, the perspective of Eyckian pictures is, from a purely
mathematical point of view, still "incorrect"; for the orthogonals,
although they may converge to a single point within an entire
plane, do not so converge within the entire space (Figure 6). This
latter convergence seems rather to have been arrived at first by
Dirk Bouts (Figure 7), or at the very earliest by Petrus Christus.53
The achievement was at first neither lasting nor generally bind-
ing in the North. Even in the Netherlands there were great art-
ists, for example Roger van der Weyden, who took little interest

\[ \text{FIGURE 7. Perspective schema of the Last Supper of Dirk Bouts (Louvain, St.}
\text{Peter, 1464–1467). (After G. Doehlemann.)} \]
in the spatial problems under discussion here, and whose pictures are not unified by any vanishing point.\textsuperscript{34} And as for Germany, apart from the works of the half-Italian Michael Pacher, not a single correctly constructed picture appears to have been produced in the entire fifteenth century; that is, not until the adoption of the exact and mathematically grounded theory of the Italians, in particular through the agency of Albrecht Dürer.\textsuperscript{35}

The North, then, even if it started from the methods of the Italian Trecento, essentially arrived at "correct" construction by an empirical route. Italian perspectival practice, characteristically, appealed to mathematical theory. Trecento pictures after the Lorenzetti became, so to speak, progressively more false, until around 1420 when costruzione legittima was (we may as well say) invented. We do not know, although it is probable, whether Brunelleschi was really the first to have produced a mathematically exact linear perspectival procedure, and whether this procedure in fact consisted of the plan and elevation construction demonstrated in Figure 1. A construction was only attested in writing two generations later, in Piero della Francesca’s \textit{De perspective pingendi}.\textsuperscript{57} At any rate, Masaccio’s \textit{Trinity} fresco is already exactly and uniformly constructed;\textsuperscript{36} and a few years later we find the then-preferred procedure unequivocally described: a procedure that presents itself as a direct extension of what was already known in the Trecento, even if it does rest on an entirely novel principle. Already the Lorenzetti had respected the rigorous mathematical convergence of orthogonals; but there was still no method for measuring with comparable accuracy the depth intervals of the so-called transversals (in particular, the positions of those transversals contained within a “ground square” beginning with the front edge of the picture). If we can believe Alberti, the erroneous practice of mechanically diminishing each strip of the floor by one third still held sway in his day.\textsuperscript{59} Here Alberti proposes his own definition, which was to remain fundamental for all succeeding generations: “The picture is a planar section of the visual pyramid.” And because the perpendiculars of the final picture are already known, he needs to construct that “visual pyramid” only in side elevation, in order to make the desired depth intervals immediately legible along the vertical section, and to be able to insert them effortlessly into the existing system of receding orthogonals (Figure 8).\textsuperscript{60}

It is probable that this more convenient and practicable procedure of Alberti’s was derived from the complete plan and elevation procedure. For surely the idea of reforming normal Trecento practice by introducing the elevation of the visual pyramid was conceivable only after the systematic construction of the entire visual pyramid was understood. There is no cause for stripping Brunelleschi of the invention of this construction, the achievement of a true architect; and by the same token the fame for bringing an abstract and logical method into harmony with traditional usage, and thus facilitating its practical application, can safely be left to the dilettante painter Alberti. To an extent, of course, the two procedures coincide: since they both rest in the same way on the principle of the \textit{intersezione della piramide visiva}, they permit not only the construction of closed spaces, but also the development of free landscape scenery and finally the “correct” deployment and measurement of the individual objects found therein.\textsuperscript{61} In this way the Renaissance succeeded in mathematically fully rationalizing an image of space which had already earlier been aesthetically unified. This, as we have seen, involved extensive abstraction from the psychophysiological structure of space, and repudiation of the antique authorities. But, on the other hand, it was now possible to construct an unambiguous and consistent spatial structure of (within the limits of the “line of sight”) infinite extension,\textsuperscript{62} where bodies and the intervals of empty space...
between them were merged in a regular fashion into a corpus

generale tum pro. There was now a generally valid and mathe-
nomically justifiable rule to determine "how far two things ought
to stand from another, or how closely they ought to cohere,
in order that the intelligibility of the subject matter is neither con-
fused by crowding nor impaired by sparseness."

Thus the great evolution from aggregate space to systematic
space found its provisional conclusion. Once again this perspec-
tival achievement is nothing other than a concrete expression
of a contemporary advance in epistemology or natural philosophy.
The space of Giotto and Duccio corresponded to the transitional,
high Scholastic view of space; in the very years when their space
was gradually being superseded by true central perspective,
with its infinitely extended space centered in an arbitrarily assumed
vanishing point, abstract thought was decisively and overtly com-
pleting the break — always disguised until now — with the Ari-
totelian worldview. This entailed abandoning the idea of a cosmos
with the middle of the earth as its absolute center and with the
outermost celestial sphere as its absolute limit; the result was the
concept of an infinity, an infinity not only prefigured in God, but
indeed actually embodied in empirical reality (in a sense, the con-
cept of an *energetica opera* within nature). "Between these two
propositions: the infinitely powerful is not contradictory, and the
infinitely great can be realized in action, the logicians of the four-
teenth century — William of Ockham, Walter Burley, Albert of
Saxony, Jean Buridan — had erected a barrier which they thought
solid and impenetrable. We shall see this barrier collapse; it will
not, however, crash suddenly, but rather, secretly ruined and con-
sumed, will crumble little by little, in the time between 1350
and 1500."

Actual infinity, which was for Aristotle completely
inconceivable and for high Scholasticism only in the shape of
divine omnipotence, that is, in a *supernaturales tene* (place beyond
the heavens), has now become *natura naturata*. The vision of the
universe is, so to speak, de-theologized, and space, whose prior-
ity over individual objects was already so vividly expressed by
Gaucinus, now becomes a “continuous quantity, consisting of
three physical dimensions, existing by nature before all bodies and
beyond all bodies, indifferently receiving everything.” No won-
der that a man like Giordano Bruno now outfits this world of the
spatial and infinite, and thus of the thoroughly measurable, this
world which, so to speak, outgrew divine omnipotence, with an
almost religious sublimity of its own; he “invests it, along with
the infinite extension of the Democritan *kénos* (void), with the
infinite dynamic of the neoplatonic world-soul.” And yet this
view of space, even with its still-mystical coloring, is the same
view that will later be rationalized by Cartesianism and formal-
ized by Kantianism.

It may strike us today as somewhat strange to see a genius like
Leonardo describe perspective as the “eye and rudder of paint-
ing,” and to hear a powerfully imaginative artist like Paolo Uccello
answer his wife’s request that he finally come to bed with the
now-hackneyed phrase, “But how sweet perspective is!” All we
can do is try to imagine what this achievement meant then. For
not only did it elevate art to a “science” (and for the Renaissance
that was an elevation); the subjective visual impression was indeed
so far rationalized that this very impression could itself become
the foundation for a solidly grounded and yet, in an entirely mod-
ern sense, “infinite” experiential world. (One could even com-
pare the function of Renaissance perspective with that of critical
philosophy, and the function of Greco-Roman perspective with
that of skepticism.) The result was a translation of psychophys-
iological space into mathematical space; in other words, an objec-
tification of the subjective.

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This formula also suggests that as soon as perspective ceased to be
a technical and mathematical problem, it was bound to become all
that much more of an artistic problem. For perspective is by nature
a two-edged sword: it creates room for bodies to expand plasti-
cally and move gesturally, and yet at the same time it enables light
to spread out in space and in a painterly way dissolve the bodies.
Perspective creates distance between human beings and things
(“the first is the eye that sees, the second is the object seen, the
third is the distance between them,” says Dürer after Piero della
Francesca); but then in turn it abolishes this distance by, in a
sense, drawing this world of things, an autonomous world con-
fronting the individual, into the eye. Perspective subjects the artis-
tic phenomenon to stable and even mathematically exact rules,
but on the other hand, makes that phenomenon contingent upon
human beings, indeed upon the individual: for these rules refer
to the psychological and physical conditions of the visual impres-
sion, and the way they take effect is determined by the freely cho-
sen position of a subjective “point of view.” Thus the history of
perspective may be understood with equal justice as a triumph of
the distancing and objectifying sense of the real, and as a triumph
of the distance-denying human struggle for control; it is as much
a consolidation and systematization of the external world, as an extension of the domain of the self. Artistic thinking must have found itself constantly confronted with the problem of how to put this ambivalent method to use. It had to be asked (and indeed it was asked) whether the perspectival configuration of a painting was to be oriented toward the factual standpoint of the beholder (as in the quite special case of “illusionistic” ceiling painting, which goes about laying the picture plane horizontally, and then drawing all the consequences from this 90-degree rotation of the whole world); or whether conversely the beholder ought ideally to adapt himself to the perspectival configuration of the painting. In the latter case, it must further be asked where on the picture field is the central vanishing point best placed, how close or how far the perpendicular distance ought to be measured, and whether and to what extent an oblique view of the entire space seems admissible. In all of these questions, the “claim” of the object (to use a modern term) confronts the ambition of the subject. The object intends to remain distincted from the spectator (precisely as something “objective”); it wants to bring to bear, unimpeded, its own formal lawfulness (its symmetry, for example, or its frontalality). It does not want to be referred to an eccentric vanishing point, nor certainly, as in the oblique view, governed by a coordinate system whose axes no longer even appear objectively in the work, but rather exist only in the imagination of the beholder. Clearly, a decision can only be arrived at by involving those great antitheses that we usually call something like free will versus norm, individualism versus collectivism, the irrational versus the rational; and it was just these modern perspectival problems that provoked epochs, nations and individuals to take up especially emphatic and visible positions in such matters.

It thus stands to reason that the Renaissance would interpret the meaning of perspective entirely differently from the Baroque, and Italy entirely differently from the North: in the former cases, speaking quite generally, its objective significance was felt to be more essential, in the latter cases its subjective significance. Thus even Antonello da Messina, under such strong Netherlandish influence, constructs the study of St. Jerome with a long perpendicular distance, so that, like nearly all Italian interiors, it is basically an architectural exterior with the front surface removed. He also lets the space begin only at (or indeed behind) the picture plane and places the central vanishing point nearly exactly in the center (Plate 18). Dürrer by contrast, and he is by no means the first, shows St. Jerome in a real “cabinet” (Plate 19). We imagine that we ourselves have been admitted into it, because the floor appears to extend under our own feet, and because the perpendicular distance, expressed in real dimensions, would amount to no more than about one and a half meters. The entirely eccentric position of the central vanishing point reinforces the impression of a representation determined not by the objective lawfulness of the architecture, but rather by the subjective standpoint of a beholder who has just now appeared; a representation that owes its especially “intimate” effect in large part to this very perspectival disposition. In Italy, the rise of perspectival construction actually militated against the oblique view, which was still common in the Trecento, even if it did affect only individual architectural elements in the space and not the space as such. Yet someone like Altdorfer used just such a view to create, in the Munich Birth of the Virgin (Plate 20), an “absolute oblique space,” that is, a space in which there are no more frontals and orthogonal at all; he even reinforces the turning movement, optically and indeed superfluously, with a round dance of inspired angels. He thus anticipates a representational principle first fully exploited only by the great Dutchmen of the seventeenth century: Rembrandt, Jan Steen and, in particular, the Delf
architecture painters, above all De Witte. It is no accident that it was those very Dutchmen who pursued the problem of “near space” to its utmost consequences, whereas it remained for the Italians to create in their ceiling frescoes “high space.” In this triad of forms of representation – “high space,” “near space” and “oblique space” – is expressed the view that space in an artistic representation is determined by the subject; nevertheless, these very forms, as paradoxical as it may sound, belong to the moment when space as the image of a worldview is finally purified of all subjective admixtures, both by philosophy (Descartes) and by perspectival theory (Desargues). For when art won the right to determine for itself what “up” and “down,” “front” and “back,” “right” and “left” should be, it was essentially only giving back to the subject something that already belonged to it by rights, that antiquity had only unnaturally (although also by intellectual-historical necessity) claimed as objective attributes of space. The arbitrariness of direction and distance within modern pictorial space bespeaks and confirms the indifference to direction and distance of modern intellectual space; and it perfectly corresponds, both chronologically and technically, to that stage in the development of theorectical perspective when, in the hands of Desargues, it became a general projective geometry. This happened when perspective, replacing for the first time the simple Euclidean “visual cone” with the universal “geometrical beam,” abstracted itself completely from the line of sight and thus opened up all spatial directions equally.70 Once again, however, it is clear how much the artistic conquest of this not only infinite and “homogeneous,” but also “isotropic” systematic space (all the apparent modernity of Greco-Roman painting notwithstanding) presupposes the medieval development. For it was the medieval “massive style” that first created that homogeneity of the representational substratum without which not only the infinite-ness, but also the directional indifference of space, would have been inconceivable.71

It is now finally clear that the perspectival view of space (and not merely perspectival construction) could also be contested from two quite different sides: Plato condemned it already in its modest beginnings because it distorted the “true proportions” of things, and replaced reality and the nomos (law) with subjective appearance and arbitrariness;72 whereas the most modern aesthetic thinking accuses it, on the contrary, of being the tool of a limited and limiting rationalism.73 The ancient Near East, classical antiquity, the Middle Ages and indeed any archaizing art (for example, Botticelli74) all more or less completely rejected perspective, for it seemed to introduce an individualistic and accidental factor into an extra- or supersubjective world. Expressionism (for recently there has indeed been yet another shift in direction) avoided it, conversely, because it affirms and secures that remnant of objectivity which even Impressionism was still obliged to withhold from the individual “formative will” – namely, real three-dimensional space. But this polarity is really the double face of one and the same issue, and those objections are in fact aimed at one and the same point:75 the perspectival view, whether it is evaluated and interpreted more in the sense of rationality and the objective, or more in the sense of contingency and the subjective, rests on the will to construct pictorial space, in principle, out of the elements of, and according to the plan of, empirical visual space (although still abstracted considerably from the psychophysiological “given”). Perspective mathematicizes this visual space, and yet it is very much visual space that it mathematicizes; it is an ordering, but an ordering of the visual phenomenon. Whether one reproaches perspective for evaporating “true being” into a mere manifestation of seen things, or rather for anchoring the free and, as it were, spiritual idea of form to a manifestation
of mere seen things, is in the end little more than a question of emphasis. Through this peculiar carrying over of artistic objectivity into the domain of the phenomenal, perspective seals off religious art from the realm of the magical, where the work of art itself works the miracle, and from the realm of the dogmatic and symbolic, where the work bears witness to, or foretells, the miraculous. But then it opens it to something entirely new: the realm of the visionary, where the miraculous becomes a direct experience of the beholder, in that the supernatural events in a sense erupt into his own, apparently natural, visual space and so permit him really to "internalize" their supernaturalness. Perspective, finally, opens art to the realm of the psychological, in the highest sense, where the miraculous finds its last refuge in the soul of the human being represented in the work of art; not only the great phantasmagorias of the Baroque — which in the final analysis were prepared by Raphael's Sistine Madonna, Dürer's Apocalypse, Grünewald's Isenheim altar, indeed perhaps already Giotto's St. John on Patmos fresco in S. Croce — but also the late paintings of Rembrandt would not have been possible without the perspectival view of space. Perspective, by transforming the ausio (reality) into the phainomenon (appearance), seems to reduce the divine to a mere subject matter for human consciousness; but for that very reason, conversely, it expands human consciousness into a vessel for the divine. It is thus no accident if this perspectival view of space has already succeeded twice in the course of the evolution of art: the first time as the sign of an ending, when antique theocracy crumbled; the second time as the sign of a beginning, when modern "anthropocracy" first reared itself.

Notes

Introduction


6. Wolfflin's most important early methodological propositions are found in his dissertation, Pragmata on eine Psychologie der Ästhetik (1886), reprinted...
in Kleine Schriften (Basel: Schwabe, 1946), pp. 13–47; and of course in the introduction and conclusion to the Grundbegriffe.

7. Wolflin's "structuralism" was less acerbic than Riegl's. Nevertheless he too stopped short of actually practicing the philosophical art history project within his formalism. Wolflin detached art from general history, but only to reattach it later. It is not entirely clear why Wolflin held back; doubtless the wilder experiments of the succeeding generation, which he lived to see, helped him rediscover the virtues of positivistic discretion. See for instance the "Revision" of the Grundbegriffe (1933), reprinted in Gedanken zur Kunstgeschichte (Basel: Schwabe, 1944), pp. 18–24.

8. The best treatment in English is Nodelman's essay cited in note 4, above. The maniflesse of the group was a pair of remarkable volumes edited by Päche, Kunstwissenschaftliche Forschungen 1/2 (1931/1933).


14. Pansofsky, "Der Begriff des Kunstvolkens," p. 32, also n. 11 on the "immanent meaning" of a period.

15. One is not necessarily more confident when the synchrony is exact: see for instance Pansofsky's comments on Cubism and Einstein's relativity in Early Netherlandish Painting (Cambridge: Harvard University Press, 1953), p. 5, n. 1.


20. This is one of the implications of Klein's thinking on perspective; see "Pomponius Gauricus on Perspective."

21. See the radical nominalist position of Nelson Goodman in Language of Art (Indianapolis: Hackett, 1976), pp. 10–19, especially p. 16 and n. 17, with references to various like-minded thinkers.


Perspective as Symbolic Form


2. Boethius, De ana. caus. Arist. In Arist. Interp. 1.7 and 1.10, in Opera (Basel, 1570), pp. 527 and 538; perspective is characterized in both passages as a subdiscipline of geometry.

3. The word ought to be derived not from perspicere meaning "to see through," but from perspicere meaning "to see clearly"; thus it amounts to a literal translation of the Greek term spýreō. Dürer's interpretation is based already on the modern definition and construction of the image as a cross section.
through the visual pyramid. Felix Witting, on the other hand, detected in the
transformation of the Italian prospettiva into prospettiva a kind of protest against
this understanding of the image ("the former is reminiscent of Brunnleschi's
punto d'osservazione fisibile", whereas the latter suggests only a seeing forward,"
1/ei Kunst und Christentum [Stuttgart, 1903], p. 106). This is more than doub-
tful, for it is precisely the most rigorous theoreticians of the cross-section
method, such as Pietro della Francesca, who use the term prospettiva. At least
we can grant that prospettiva implies more strongly the idea of the artistic
achievement (namely the conquest of spatial depth), while perspectiva evokes
rather the mathematical procedure. A purely phenomenological consideration must have
then favored the triumph of the term prospettiva, to wit, an aversion to the
sequence of consonants "rep."

4. Leon Battista Alberti, Della pittura, in Kleinere kunsthistorische Schriften.
Quellenschriften für Kunstgeschichte und Kunsttechnik des Mittelalters und
der Renaissance, no. 11, ed. Hubert Janitschek (Vienna, 1877), p. 79: "termo uno
quadraugolare... e qui volgo esame una figura opre se per dubbio si mui quella
quivi una dipinta" (On Painting, trans. John R. Spencer [New Haven: Yale
University Press, 1966], p. 56: "I inscrive a quadrangle... which is considered to be
an open window through which I see what I want to paint"). See also Leonardo
(Jean-Paul Richter, The Literary Works of Leonardo da Vinci [London, 1883],
no. 83), where the same analogy to a "pace di vetro," or pane of glass, is drawn.

5. Already Lessing, in the ninth of his Antigonean Briefe, distinguished
between a broader and a narrower meaning of perspective. In the broader sense
perspective is "the science of representing objects on a surface just as they would
appear to our eye at a certain distance.... Not to credit the ancients with
perspective in this sense would be rather foolish. For it would mean depriving them
not only of perspective but of the entire art of drawing, an art which they had
quite mastered. No one could maintain this. Rather, when one considers the
antique claim to perspective, it is in this narrower sense, the sense in which
artists take the word. For artists, perspective is the science of representing
a number of objects together with the space around them, just as these objects,
dispersed among various planes of the space, together with their space, would
appear to the eye from a single standpoint" (Schriften [Berlin, 1753-1755],
vol. 8, pp. 25-26).

Essentially, then, we are adopting Lessing's second definition, only that we
formulate it a little more liberally by dropping the condition of the rigidly
maintained single point of view. For unlike Lessing we accept late Hellenistic
and Greco-Roman paintings as already authentically "perspectival." For us
perspective is, precisely, the capacity to represent a number of objects
together with a part of the space around them in such a way that the concep-
tion of the material picture support is completely supplanted by the conception
of a transparent plane through which we believe we are looking into an image-
ary space. This space comprises the entirety of the objects in apparent reces-
sion into depth, and is not bounded by the edges of the picture, but rather
only cut off.

There are, of course, a multitude of transitional cases between mere "fore-
shortening" (which for its sake does represent the necessary first step and pre-
condition for the development of a true perspectival conception of space) and
something recognizable as perspective in this sense. An example of such a
transitional case are those well-known Southern Italian vases which show a figure
or even several figures assembled in a foreshortened attitude. This approxi-
mates true perspective insofar as a greater spatial construct already contains
within it a number of individual bodies; but this greater spatial construct is itself
still offered up as an isolated object, upon a picture support which retains
its materiality. Instead, the entire surface of the painting would have to be trans-
sformed into a projective plane for a perspectival illusion of the entire space.

6. Lange und Fichte, Drei philosophische Nachträge, p. 185, 1. 15: "Ein eine
durchnachtene Aenderung aller der Stammelgen, die aus dem Aug fallen auf die
Dinge, die es sieht."

7. Ernst Cassirer, Philosophy of the Symbolic Form, vol. 2: Das mythische
Denken (Berlin: B. Cassius, 1923), p. 107f. (Philosophy of Symbolic Form, vol. 2:
pp. 83-84. [In the last sentence of the passage Cassirer quotes Ernst
Mach. —TR]). For the psychophysical view of space, of course, the distinc-
tion between solid bodies and the medium of open space surrounding them is sharper than that between “front” and “back,” etc. For immediate and mathematically unratified perception, empty space is qualitatively altogether different from “objects.” On this subject, see E. R. Jaeschke, Über die Wahrnehmung des Raumes, Zeitschrift für Psychologie, supplement 6 (Leipzig: Barth, 1911), sec. 1, ch. 6: “Zur Phänomenologie des leeren Raumes.”

8. On the phenomenon of marginal distortions, see above all Guido Haack, Die subjektive Perspektive und die horizontalen Curvaturen des Deutschen Styl (Stuttgart, 1879), esp. p. 51ff., and “Die malerische Perspektive,” Wochenblatt für Architekten und Ingenieure 4 (1882). On the historical aspects, see Hans Schrötter, Die Perspektive in der Kunst Däners (Frankfurt: H. Keller, 1919), p. 11ff., among others. This problem was rather disconcerting for Renaissance theoreticians because marginal distortions expose an undeniable contradiction in the construction and the actual visual impression: indeed, under some circumstances the “foreshortened” dimensions can exceed the “unforeshortened.” The differences in opinion are nevertheless instructive. The rigorous Piero della Francesca, for one, decides the dispute between perspective and reality without hesitation in favor of the former (De prospectiva pingendi, ed. C. Winterberg [Strasbourg, 1899], p. 33). Piero recognizes the fact of marginal distortions and adds the example (used by Haack as well as by Leonardo, see Richter, Leonardo da Vinci, no. 544) of the exact perspectival construction of a frontal portico, or any comparable structure with a row of objectively equal elements, in which the breadth of the elements increases toward the edges (Figure 9). But so far from proposing a remedy, Piero proves rather that it must be so. One may marvel at this, he says, and yet “io intendo de dimostrare così ove è doveros fac.” Then follows the strictly geometrical proof (which is, of course, very easy, for precisely the premise upon which the proof rests, namely the plan section of the visual pyramid, necessarily entails marginal distortions) and, introduced here not unintentionally, a long esotericism of perspective. The conciliatory Ignazio Danti (in Jacopo Barozzi da Vignola, Le Due regole della perspettiva pratica, ed. with commentary by Danti [Rome, 1583]) denies marginal distortions altogether when they are less blatant (see, for example, p. 62); he then recon-

NOTES

![Diagram](image)

Figure 9. Marginal distortions in a linear perspectival construction of a row of equally thick columns $a = a' < b$, but $AB = EF > CD$. (After Leonardo.)

ments avoiding the most blatant distortions by establishing minimums for the perpendicular distance and for the height of the horizon (see p. 69ff., where it is asserted that if the central vanishing point is too close, the lines of the floor seem to rise and those of the ceiling to fall—“invariante,” a term which should be compared to Vasari’s statement cited below in note 68—and that in the most extreme cases the projection could exceed the real dimensions). Leonardo, finally, seeks to illuminate not only the cause but also the consequences of this curious phenomenon, that is, to define the practical boundaries between construction with a short perpendicular distance and construction with a longer distance. In Richter, no. 86 (see also nos. 544-46) he establishes the fact of marginal distortions and then recognizes, entirely in accord with the results of the most modern psychological research, that if the eye is fixed by special mechanical aids exactly at the center of projection, the distortions cancel each other out (on this so-called Veranli phenomenon, see Jaeschke, über die Wahrnehmung des Raumes, p. 151ff., as well as the excellent study by Rudolf Peter, “studien über die Struktur des Sehens,” PhD thesis, Hamburg, 1921). In a note in the Paris manuscripts (Charles Réaumur-Mollien, Les Manuscrits de Léonard de Vinci [Paris, 1884-1891], ms. A, fol. 40v, = Richter, no. 543])
Leonardo emphasizes, again anticipating the results of modern psychological research, the especially strong power of illusion of pictures with short perpendicular distances, which rests on the rapidity of the foreshortening and the concomitant expansion of the depth intervals (of course, with the restriction that the illusion is only effective if the eye of the beholder remains fixed exactly at the center of projection, for only then can the dispositions disappear). Thus the artist ought in general to avoid short perpendicular distances: "If you want to represent an object near to you which is to have the effect of nature, it is impossible that your perspective should not look wrong, with every false relation and disagreement of proportion that can be imagined in a wretched work, unless the spectator, when he looks at it, has his eye at the very distance and height and direction where the eye or the point of sight was placed in doing this perspective." (One must thus fix the eye of the beholder by means of a small peephole.) "If you do this, beyond all doubt your work, if it is correct as to light and shade, will have the effect of nature; nay you will hardly persuade yourself that those objects are painted; otherwise do not trouble yourself about it, unless indeed you make your view at least twenty times as far off as the greatest width or height of the objects represented, and this will satisfy any spectator placed anywhere opposite to the picture." And in Richter, nos. 107-109, occurs the exceedingly perspicuous justification for that apparent canceling out of the marginal dimensions when the eye is fixed at the center of projection (see, by contrast, Jaesch's quite unsatisfactory explanation of the phenomenon, in Über die Wahrnehmung des Raumes, p. 160): it consists in a collaboration between perspectiva naturalis - that is, the alteration that the dimensions of the panel or wall undergo when observed by the beholder - and perspectiva accidens - that is, the alteration that the dimensions of the natural object already suffered when the painter observed and reproduced it. These two perspectives work in exactly contrary senses, for perspectiva accidens, as a consequence of planar perspectival construction, broadens the objects off to the sides, whereas perspectiva naturalis, as a consequence of the diminution of the angle of vision toward the edges, narrows the margins of the panel or wall (see Figure 9). Thus the two perspectives cancel each other out when the eye is situated exactly in the center of projection, for then the edges of the panel recede with respect to the central part, by virtue of natural perspective, in exactly the same proportion that they expand by virtue of accidental perspective. Even in this discussion, however, Leonardo again and again recommends avoiding just such a perspectiva comparsa (the term is especially clearly developed in Richter, no. 90) resting on the mutual cancelation of the two perspectives, and instead making do with a perspectiva simplex, in which the perpendicular distance is set so large that the marginal distortions have no importance; such a perspective remains palatable regardless of where the beholder stands.

Jaesch seems to have overlooked all those observations of the Italian theoreticians, particularly those of Leonardo, for he claims (p. 159f.) that Dürer and the masters of the early Renaissance had "not noticed" marginal distortions (which Jaesch, moreover, by neglecting the curvature of the retina, derives exclusively from the discrepancy between the apparent sizes and the size of the retinal image; this is why he treats both the perspectively constructed image and the photograph as equivalent to the retinal image). According to Jaesch, because they ignored the distortions, they systematically demanded from their representations that powerful illusionistic effect generated precisely by the apparent deformations of the pictures with short perpendicular distances. Leonardo is for Jaesch a prime witness of this desire (in and of itself unrea
dible) for strong plastic illusion ("fiktiv"). And yet it was precisely Leonardo who most thoroughly investigated the phenomenon of marginal distortions, and who most decisively warned against constructions with short distances. The Italians, furthermore, for whom this issue was undoubtedly at least as desirable a goal as for the northerners, in general and on principle preferred greater distances to shorter distances, not only in theory but also in practice. It is no accident that Jaesch draws his concrete examples entirely from northern art (Dürer, Roger van der Weyden, Dirk Bouts). As a matter of fact, construction with a short perpendicular distance was employed not to realize general Renaissance ideals of strong plasticity, but rather to realize the peculiarly Northern ideal of an impression of a quite specifically interior space, that is, an impression of including the beholder within the represented space; see further, p. 69 and note 69, below.
Especially instructive is the counterproof, the so-called curved-path experiment. If a number of mobile individual points (small lights or the like) are ordered in two rows leading into depth in such a way that a subjective impression of parallel straight lines exists, then the objectively resulting form will be concave, trumpet-like (see Franz Hillebrand, "Theorie der scheinbaren Gréise bei binocularem Sehen," *Dokumente der Königlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse*, no. 72 [1902], pp. 255-307; the critiques of his arguments — see among others Walther Poppelreuter, "Beiträge zur Raumpsychologie," *Zeitschrift für Psychologie* 58 [1911], pp. 200-62 — do not impinge upon matters essential to us here).

10. Wilhelm Schickhardt, professor of oriental languages and of mathematics at Tübingen, as well as a dilettante woodcut artist and engraver, wrote a small work about a meteor observed on November 2, 1623, in various places in southern Germany. This work, composed very hastily to preserve its topicality, provoked a number of attacks. To refute these attacks, Schickhardt prepared in the following year a most interesting and in part quite spirited and humorous pamphlet, interesting, for example, for its position on the question whether and how far the prophetic meaning of such celestial phenomena could be clarified. The pamphlet was entitled "The Ball of Light, treating, as a proof of the miraculous light which recently appeared, not only that one in space but also similar meteors in general, that is, a kind of German Optics." In this book he found the following remarks as a proof that the trajectory ("bucket"") of the celestial body in question, even though it may appear subjectively to be curved, is in fact objectively nearly straight (p. 96 ff., Figure 10): "In any case, even if it was somewhat curved, it cannot have been so visible, but rather must have happened only apparent et optique and visio must have been deceived in the following two ways. First, I say that all lines, even the straightest, which do not stand direct contra papillae (directly in front of the eye), or go through its axis, necessarily appear somewhat bent. Nonetheless, no painter believes this; this is why they paint the straight sides of a building with straight lines, even though according to the true art of perspective this is incorrect. Furthermore, this will appear absurd even to the scholars of optics themselves, who believe that omnis perpendicularis apparent recta [all perpendiculars appear straight], which, strictly speaking, is not true — it is evident and undeniable that parallel lines appear to the eye to converge and ultimately meet at a single point. It can be observed, for instance, that although long rooms or columns may be of objectively equal breadth, they nevertheless appear progressively smaller and narrower. Let us now take an example of a square or a quadrilateral, BDKM with the eye in the middle, at G; the four edges, because they are all in front of the eye, must diminish as they approach the four external points A, E, I, and N. Or to put it more intelligibly: the nearer an object, the larger it appears, and conversely the further away it is, the smaller it appears; this can be shown with any finger, which close to the eye covers an entire village, further off hardly a single field. For, as in the figure above, the median lines CE and FH are the nearest to the eye (since they pass through it), they must appear larger; whereas the sides BD, DM, HK, KB are further from it, and so must appear smaller. Thus the sides
become narrower and necessarily curved; not like a roof, to be sure, so as to produce a sharp angle at the points C, F, H, I, but rather gently and gradually, indeed insensibly, something like a belly, as is appropriate for such an arc. Thus it is certainly not true to nature when the painter draws a straight wall on paper with straight lines. Crack that not, you artists!"  

Similar problems were addressed by, besides Kepler (see the following note),  
Franciscus Agulianus, Opticorum libri tres (Antwerp, 1613), 4, 4, p. 365, except that he addresses not so much the bending as the refraction of the lines: "his difficult pars occurratur heire plane ossentis omnium linears, quos horizonti aequilibus sunt, ubi illam, quae perire est cum hortentia altitudine, resum angari,  
cretus vero inflatus, set illas quidem, quae super horizontem eminet, ob ille punctum, in quod superius maxime dirigitur, utrinque pectore, quae autem infra horizontem procedunt, utrinque secundum aspectum solae, . . . venus et perpendiculares medium illam, in quam obturat directa medium, visum nostrum, visum autem superius utque inferior mediatur et copia extimis inflatus visit." ("This difficulty will be encountered in determining clearly which of all lines are horizontal; that one alone, which is equal in height to the horizontal, appears straight, but the others as inflated [which in the author's usage means "broken"], whereas those is rendered as "incusus"), and those lines moreover which rise out above the horizontal, from that point on which one’s eye is especially fixed, from either side fall forward; and again, the line at that middle point of the perpendicular, on which one’s eye is directly fixed, seems straight, whereas the others bend out above and below and in that way appear broken").  

11. Johannes Kepler, Appendices hyperaspiciarum, in Operaomnia, 8 vol., ed. Christian Friedrich (Frankfurt & Erlangen, 1856-1871), vol. 7, p. 279; on p. 292 of the same work he reproduces the passage from Schickhardt in the previous note, although not in its entirety: "Purpurinum, non omnium versum et, quod negari, ea quae sunt recte, non posse sitra refractionem in corlo representari cura, vel cum paralleli, vel eius sine ea. Cum hac negationem perseribus, videbaste in antino projectiones visibilium versum in plenum, et nonesse rem perspectiones graphicas suo perspectivo, quam quonenquam diversitatis graeciputarum terminorum  
dem pictura semper eis recte vestigio representatur aut super plano picturae in rectum italiam
delineatum. At vero visus nostrum planum pro tabella habere, in qua contemplatur picturae hemisphaericarum, sed factum illum est, superque visum coniunctum, imaginario sili sphaericam insinuavit naturalis resistent, in concavum vero sphaericum  
si projectur pictura verum recte linum extensum, eum vestigia non esse lineae rectae, sed subelevat curvam, circuli insinuam maxima sphareo, si visus in eum centro  
st, ut descripsi de projectione circularum in astrolabio" ("I confess that it is not entirely true, as I have decided, that those lines which are straight cannot appear from refraction be represented in the sky as curved, or similarly with parallel lines or other cases. Since I have retracted this denial, it used to be that projections of visible things were created in the mind as though projected on a plane surface, and perceptions were noted as graphic and perspectival which, according to the distance from terminal objects, order the represented traces as straight over the surface of the picture in a straight line. But our vision does not in fact have a plane surface like a tablet, on which it contemplates the painting of a hemisphere, but rather that image of the sky, against which it sees comes, it produces in itself as spherical by natural instinct of vision; and if the image of objects is projected into a concave sphere with straight lines of extension, the representations of those lines will be not straight, but in fact curved, just as in the circle, no doubt, of the greatest sphere, if it is seen from its center, so we teach about projection in circular astrolabes"). (See also Kepler’s Astronomiae in utratrum, 3, 2.7 [Opera, vol. 2, p. 167]): the spherical form of the eye corresponds to the spherical form of the visual image, and the estimation of size is carried out by comparing the entire surface of the sphere to the respective portion of it: "ut singulas viribus aspectusque et ipse concavus et convexos est, et quaedam de hemisphaericis a quo amplius insertum uno ab omnibus, id par est humin  
rectisatis. Convenisse nunc ignari est, proprietatem singularum versum ad totum hemisphaericum omnima e vice proportionali inget et hemisphaericum occult. Acque hic est velis dieus aequus angulares visus" ["This world is indeed visible and is itself concave and round, and whatever in the hemisphere we perceive as greater than it in a single glance, this is equal in its roundness, so that proportion of individual things to the entire hemisphere is estimated by vision in proportion to the image entering in upon the hemisphere of the eye.
And this is commonly called the angle of vision). This theory of the estimation of size is entirely in accord with Alhazen, Optica 2.37 and Vitello, Perspectiva communis 4.17; on the premise of the spherical field of vision, see note 13, below.) Thus because the bending of the optical image is for Kepler grounded only in, as it were, an erroneous localization of the visual impression, but not in its actual structure, he must necessarily reject Schickhardt’s view that even painters ought to represent all straight lines as bent: “Confundit Schickhardus separanda: occasus versus principium visionis in plano picture omnium rectarum realium, quae radii visusae paralelles exaeunt, vestigia in plano picture, vicinio curvatura non super plano picture, sed in imaginacione visus hemisphaerii omnium rectarum realium et incur se paralelles, et curvatura versus versus visusae latus rectum ex oculo in usus perpendicularius, cementum inquam neque realiter neque picto, sed apparetur aliam, id est videntur curvarum. Quod igitur quaedam, sumpta quid picto, quo exemplum in plano, reprehensio est apparetur hisus paralellemus? Ei, inquam, et non est. Nam quaternus considetarum lineas versus aramanque latus curvaris, aculi sidus cogitatae perpendiculariter factores incidere in medium paralellemus, aliud ipsum seu rectum collinacum extra paralellemus. Cuius ex vita picture in plano sit angusta pars hemisphaerii aspectabilis, etiam posent totam objectum perpendiculariter. Non vero in medio paralellemus, hoc picture in plano presentio est hemisphaerii genetico et proprius representationem. At neque tibi consensum est natura, ut picturar curvaris, quod sol. 98 destruerat spectum” (“Schickhardt confuses things that ought to be kept separate. All representations of straight lines in the plane of the picture that go out parallel to the angle of vision converge on a point of vision in the plane of the picture. Conversely, all straight lines parallel to themselves are curved out over the plane of the picture, but in the imagination of the visible hemisphere, and they are curved toward either side straight from the eye perpendicular to themselves, and thus they are curved neither in reality nor pictorially, but only seemingly; that is, they only appear to be curved. Why, therefore, do you ask why it is that, in those pictures which are executed in a plane, there is a representation of the appearance of these lines as parallel? There is, and there is not. For to the extent that we consider the lines to be curved toward each other, we cause the angle of the eye to fall in thought perpendicularly in the middle of the parallel lines, and we locate the eye itself apart outside the parallel lines. Moreover, since the entire picture in the plane is in the narrow part of the visible hemisphere, surely the plane projecting perpendicularly from the aforesaid angle of vision will embrace no part of the appearance of curved or parallel lines, especially since this appearance is received on either side and the end of the hemisphere of vision. Indeed when we direct the angle of vision in thought to any other point where the parallel lines apparently converge, in such a way that this angle of vision is in the middle as it were of the parallel lines, then the artificial pictures in the plane is a genuine and proper representation of this vision. But it is never consistent with nature to depict them as curved, as the author [Schickhardt] was desiring”).

12. That right angles appear round when seen from a distance (and that, by the same token, an arc becomes under certain conditions a straight line) was demonstrated by Euclid, Théorémzes 9 and 12 et 15; see Euclid, Optica, ed. I. L. Heiberg (1895), pp. 166 and 180 (pp. 16 and 12); subsequently Aristotle, Problèmes 5.6, and Diogene Laertius 9.8. This is applied more frequently to solid objects, for instance in the proposition that from a distance four-cornered towers appear cylindrical: “παραηγο... τῶν ἔγγραφον τινάς ἔγγραφον ἔγγραφον τινάς ἔγγραφον” (“The square shapes of towers appear cylindrical and falling forward when viewed from a distance”); “Ausläge aus Gemmena,” in Damian, Schrift über Optik, ed. Richard Schöne [Berlin, 1897], p. 22, along with numerous parallel passages from Lucretius, Plutarch, Petron, Sextus Empiricus, Terrellian and others). Later in the “Ausläge aus Gemmena” (p. 28) appears the following interesting perspectival explanation of illusion “nōn πάντως τῶν τῶν καθαρίσιν υπότως ἐπικαταλείποντος, ἐπὶ ταξινόμησι [which should of course be translated not as "broken" but as "weakened"] ἡ δὲ διήλθεν κατὰ πλεον ὠφη δὲ τινὲς τοιούτων ἐφόρεον κατὰ τάξιν ὄρθον (sc. ἐκ διάκρισιν)” (“Thus, since a cylindrical pillar as though weakened will appear more narrow at the middle,
the architect makes it wider at that point); see Vitruvius 3.5.13. Vitruvius, too, calls for a curving of the horizontal architectural elements — again by way of compensation — in those eternally discussed passages 3.4.5 and 3.5.8 (see the survey of earlier views in the commentary, in itself quite unreliable, of Jakob Prestel, Zehn Bücher über Architektur des M. Vitruvius Pollio [Strasbourg: Heitz, 1912-1914], vol. 1, p. 124). For the stylobate: "Stylobatum autem apartare, uti habent per medium ascensionem per summâ summa inspiciendi, si enim ad libellum dirigere, alatientur acus videlicet" ("It is best for the stylobate to be leveled, so that it has in its middle a projection through the use of leveling blocks of unequal heights. For it is constructed according to the book, it will seem hollowed-out to the eye"); and correspondingly for the epistyle and the capital: "Capitulis perfectis deside columnarum non ad libellum, sed ad aquosum medium collocatis, ut quasi adiecto in stylobatis facto farcit, in superiores membris respondat, epistylarum ratio sic est invenenda, ut... " ("Next, after the capitals of the columns have been constructed not according to the book, but built on an equal level, so that the same projection that will have been made in the stylobate has a corresponding projection in the members above, the proportion in the epistyles is to be similarly made so that... "). The apparently correct reading of the first passage, that of Émile Burkouf ("Explication des ouvrages dans les édifices doriques grecs," Revue générale de l'architecture 12 [1875], cols. 445-53; adopted by William H. Goodyear, Greek Refinements [New Haven: Yale University Press, 1912], p. 114) seems to have been unfairly disregarded by German scholars; the summâ (literally, "little stools") are not supports for the columns — this would produce not a swelling of the stylobate, but rather only a swelling of the succession of bases — but rather leveling blocks (intelleses) which had been placed on the cut stones to facilitate gauging. If these leveling blocks are "unequal," that is, if they diminish in size toward the middle, this will in fact produce the convexly curved stylobate described by Vitruvius (Figure 11).

All these remarks show that the ancients were familiar with visual curvatures, and that they were able to explain certain architectural motifs to themselves only as efforts to optically neutralize these curvatures. And if this explanation, considered purely from the viewpoint of art history, seems inconclusive or at any rate one-sided, then it is all the more striking how important these curvatures were to antique artistic theory. There is, however, a curious problem: the architectural curvatures that Vitruvius speaks of behave exactly oppositely to what one would expect in light of their documented purpose, namely to counteract the visual curvature. Moreover, when these curvatures can actually be verified (the most important case is the Parthenon), Vitruvius's claims are usually borne out. Whereas one might suppose that the convexity of the visual curves would be canceled out by a concavity of the architectural curves, the raising of the middle of the stylobate and epistyle produces exactly, on the contrary, a bulging upward of the horizontal (the same effect can also be obtained through a convex arching of the facade in the ground plan, as at Nîmes and Pausanias). Gaudio Häckel's explanation of this phenomenon by the so-called corner-triglyph conflict, or rather by the diminishing of the spaces between the lateral columns which were supposed to alleviate the corner-triglyph conflict (Die subjektive Perspektive, p. 93ff.), has been invalidated by the discovery of curvatures even on non-Doric temples, where naturally such a corner-triglyph conflict cannot take place. G. Giovannetti attempted to replace this refuted explanation in "La Curvatura delle linee nel Tempio di Ercole a Corio," Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung
It is most interesting that antique theory, when it asserts that an angle appears rounded when seen from afar, finds itself in accord with the most recent psychological research. H. Werner has proven that the less one conceives of an angular structure as "articulated," that is, the more one perceives the "angle" as the mere interruption of a single form and not as the encounter of two forms, the more the structure undergoes a kind of polishing off or rounding ("Studien Über Strukturentsetzter," Zeitschrift für Psychologie 94 [1924], p. 248ff.). This phenomenon appears, for example, when a broken line is drawn over and over again by an experimental subject instructed to maintain an "integral" perception; but also when unclear vision—especially for example at a great distance—hinders the "articulated" and favors the "integral" perception. If, on the contrary, the subject is held to the "articulated" perception, then there emerges an increasing tendency toward a concave sharpening of the corner. This would be the case at Segesta, where the tapering off of the facade preserves the clear "articulation" of the building from the rounding off that would otherwise threaten when seen from a distance.

This also sheds light on a curious phenomenon in medieval miniatures (the best-known examples are the Fleischer manuscripts in Munich, Bayerische Staatsbibliothek, Clm. 57, 58, 59, published by Georg Leidinger in the series Miniaturs aus Handschriften der Kgl. Hof- und Staatsbibliothek in München), namely, when the prismatic crib in which the Christ child lies (or other objects) is represented in the form of Figure 12A. This peculiar rounding off of the rear corner is evidently explained by the failure of the medieval artists to understand the perspectively foreshortened forms of their presumably early Christian models. In this case the psychological obscuring of the conception of form favors the suppression of the "articulated" interpretation, just as did the physical obscuring of the perception of form when it was seen from a great distance. The acute angles of the original form (Figure 12B) were naturally preserved from the rounding off, but also the obtuse angle at the front (b) was, in a sense, spared by the vertical joining it. Thus the rounding off would be limited to the rear angle (a), unless the prismatic object is covered by a cloth concealing its lower corner: for in that case this corner too can be
affected by the rounding off (see, e.g., Cim. 57 [= cod. lat. 4452], pl. 28).

13. See Damian, Schrif ten über Optik, p. 2, art. 11: "dlo καὶ τοῖς ἕξας καὶ τοῖς ἕξας

παρθενοῖς ἐκείνου τῆς ἐνθείης καὶ τήν ἄξονα τῆς ἑπίπτωσιν ἑκατέρας..." ("The pole of the cone

of vision is within the pupil and it is the point of a sphere...") (see also p. 8f).

From this it becomes immediately evident that it is one and the same form of

thought — or better, form of seeing — which, on the one hand, makes the visual

magnitudes so strictly dependent on the angles, and on the other hand, empha-

sizes so strongly the apparent curvature of the straight lines.

14. Euclid, Definition (hornes) 3-6, Optica, p. 154 (p. 2).

15. Euclid, Theorem Eight, Optica, p. 164 (p. 14): "τὰ ἐν τῇ μεγίθῳ βίονοι
dιαμετροὺς δια αὐτῶν ὀφθαλμὸς τῆς διαπέρας ἑπίπτωσιν" ("Two objects of equal mag-

titude placed at unequal distances are not seen according to the ratio of their dis-

tances"). The proposition is proven by showing that the difference between

the distances is greater than that between the angles, and that only the latter

(according to the axioms named in the previous note) determine the visual magnitudes.

16. Jean Pictet (Vitruv), De arithmetik persp ectiva (Toul, 1605), facsimile

ed., by A. de Montaignon (Paris, 1869), fol. C8r. The corresponding illustration,

which is of course dependent on Dürer’s Harpy of the Ten Thousand, first

appears in the edition of 1525. (For the explanation, see Figure 4.)

It is very instructive that Leonardo, with respect to the diminishment of
distances, arrived "per interpretatio" at the very result to which linear perspec-
tival construction leads; namely, to the notion that the apparent magnitudes of equal

sections are inversely proportional to their distances from the eye (Das Buch

von der Malerei, Quellenschriften für Kunstgeschichte und Kunsttechnik des

Mittelalters und der Renaissance, nos. 15-17, 3 vols., in 2, ed. Heinrich Ludwig

[Vienna, 1881], art. 461; see also Richter, Leonardo da Vinci, nos. 99, 100, 223).

Here, evidently, linear perspectival thinking showed the way for concrete

observation, and in fact Leonardo speaks even here, where he formulates an

"empirically" discovered law of perspective naturalis, of a "picture surface"

("pictura"). No matter whether he mentally projected objects onto this picture

surface, or whether (and this seems more probable) he in fact made observations with

the help of that apparatus with the pane of glass which he knew so well,

and which he recommends also for the corresponding observations of color

(attention of local color in objects at distances of 100, 200, 300 brocchi, etc.);

see Das Buch von der Malerei, art. 261 and Richter, no. 294. Thus the estab-

lishment of this law in no way constitutes "progress" beyond geometrical perspec-
tival construction (as Heinrich Brockhaus claims in his worthy edition of

Pomponius Gauricus, De sculptura [Leipzig, 1880], p. 47ff.), but rather only an

unconscious application of its results to the direct observation of objects in a

sense, a repercussion of perspective artificios upon perspective naturalis.

In other situations, however, for example with natural objects (that is, where

there is no question of a planar projection), antique angular perspective reassures

even the Renaissance. Dürer, for example, in order that lines of script

written on a wall all appear to be of the same height, recommends enlarging

them as they rise, such that the respective visual angles are all equal (Figure 13;

a appears to equal b which appears to equal c, if a = b = c; Unterweisung des

Meister [1525], fol. k10). This is in keeping with Euclid’s Theorem Seven and

with the often-attested practice of antique sculptors of permitting the propor-
tions of a figure in a high place to increase toward the top in order to counteract
the contraction brought about by the diminishment of the visual angle. See
Daniello Barlaeio, La Pratica della prospettiva (Venice, 1569), p. 9 (with explicit
reference to Dürer); Athanasius Kircher, De magnâ luci et umbrae (Rome, 1646),
p. 187f. (with the example of Trajan’s column and a citation from Vitruvius,
6.2.6ff., where the same "delatorirum et obliqutatem" are discussed); or Sandrit in
his Teutsche Academie (Nuremberg, 1675), I.3.15, p. 98. Even Leonardo, in his
document (mentioned in note 8, above) of the "natural" foreshortenings that the
margin of any picture undergo, tacitly presupposes the angle axiom. Indeed, per-
spectiva naturalis in general is almost entirely governed by the angle axiom, even
when it serves as an introduction to treatises on artificial perspective (as in the
case with Betti, Vignola-Chenti, Pietro Catanes, Agostinian co etc.).
It was, however, customary to ignore Euclid’s light theorem, or to dis-
arm it by enunciating the text for an account of its reference to the diminishment
of magnitudes into depth, it stood too unequivocally in contradiction to the
rules of perspectiva artificialis (see the following note). Indeed, it can even be
stated that the Renaissance, at least as far as perspective naturalis is concerned,
was almost more rigorously Euclidean than the Middle Ages, which knew Euclid
only from the Arab tradition, already somewhat modified, Roger Bacon, for
example (Prospectiva 2.2.5; p. 116ff. in the Frankfurt edition of 1641), precisely
following Albuin (Optica 2.36ff.; p. 50ff. in Ritter’s Basel edition of 1557).
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example (Prospectiva 2.2.5; p. 116ff. in the Frankfurt edition of 1641), precisely
following Albuin (Optica 2.36ff.; p. 50ff. in Ritter’s Basel edition of 1557).

17. The metamorphosis of Euclid’s light theorem (at least when it is not
simply dropped, as it is in most writings on artificial perspective) can be followed
almost step by step. The first complete published translation, that of Zamberto
(Venice, 1503), still renders it literally, even if a little misleadingly by virtue of
placing “intervallù” before “proportionaliter.” “Ex aequalibus magnitudinis
aequalitatem extensam intervallorum proportionaliter minima spectatur” (“Equal
dimensions set unequally at distances appear least proportionately”) (fol. A.4.6 v.). Dürer, or
the Latinist he relied upon, immediately fell victim to the ambiguity of this
translation, in that he referred “proportionaliter” to “exspectatio” instead of to
“spectosum,” and “minima” to “spectatorium” instead of to “proportionalitas,” thus
rendering the sentence perfectly unintelligible: “Gleich Gestalt ungleich gestalt
mit proportionalen Unterschieden bilden mit gesehen werden” (“Equal dimensions
set unequally with proportional differences cannot be seen”), Longe and Fuchs,
Dürer’s Werckbibliographie, p. 322, 3.23 (indeed, the whole passage from Longe
and Fuchs, p. 319, 3.23 to p. 326, 3.19 is a translation from Euclid: see Pasolius,
Dürer Kunsthcrz [Berlin: Neistrm, 1915], p. 155f.). The standard translation for
the entire subsequent period, that of Johannes Pena (Paris, 1557, p. 10; 1604, p. 8) emends it thus: "aequalis magnitudinis minaquae ab oculis distantiae, non servavit tandem rationem angulorum quam distantiarum" ("Equal dimensions standing at unequal distances from the eye do not have the same ratio of angles as their distances"). Both the Italian translation of Ignazio Danti, La Perspettiva di Euclide (Florence, 1573), p. 37, and the French translation of Roland Fréart de Chastellou, La Perspective d’Euclide (Le Mans, 1663), p. 19, follow Pena exactly. Thus the premise that the angles are not proportional to the distances is made into the conclusion, whereas the actual conclusion, namely the proposition that the ratio of the apparent sizes is determined only by the ratio of the angles and not the distances, is simply omitted. Since Euclid’s proof is adopted unaltered, this is in fact a demonstratio per demonstrandum.

18. Vitruvius, in the passage in question (1.2.2; on its much-disputed significance for antique perspective construction, see the following note), takes the term scenographic in its narrower sense as the method of representing buildings perspective on a surface, whether for architectural or theoretical purposes: scenographic means the representation of the building in plan, orthographic means the elevation, and scenographic means a perspectival display that shows the sides as well as the facade ("frons et internum abscensiam adhominis"; see also the parallel passage, 7. Prooemium, cited in the following note). But the term scenographing also has a broader sense, for it denotes quite generally the application of optical laws to the visual arts and architecture in their entirety; that is, not only the rules for making flat pictures on flat surfaces, but also the rules of architectural and plastic construction, insofar as the latter are interested in counteracting the distortions ensnared in the process of seeing (see notes 12 and 16, above). This definition is most clear and complete in Geminos ("Auszüge aus Geminos," in Dionian, Schriften über Optik, p. 78):

7 εὐκοποιημένην ἡ τετοιοθέτημα μίας ὡς ἡ αὐτοτόχος γραμμή ὀδηγεῖ τὸν ἀνθρώπινον ἔναν τὸν ὄρον τετελεσμένον. Εἰς ὅτι πέρι ἡ αὐτοτοχὴν ὡς τὸ τέλος, τοῦτον καὶ φαίνεται,
What is Sceenography?

As a branch of optics, sceenography seeks how to properly draw images of buildings. Since it is not possible to reproduce them as they really are and such as they appear, they [i.e., the sceenographers] seek to represent not the actual proportions, but rather proportion according to visual impression. Then, since a cylindrical column as though weakened will appear more narrow at the middle, the architect makes it wider at that point. And when he draws a circle he draws it not as a circle but as an ellipse, and a square as a rectangle, and a group of columns differing in size he draws in different relationships of extent and size. Such also is the method of the monumental sculptor, who gives the proportions as will appear in the finished work, in order that it may be well-proportioned to vision and so that it may not in vain be fashioned to measure in its actual substance. Yet the products are not such as appear placed in many a construction.

According to this text, then, "sceenography" is (1) the method of the painter who wishes to represent buildings and must reproduce not their true but their apparent dimensions; (2) the method of the architect who may not apply proportions considered beautiful from the point of view of abstract mathematics, but rather, striving for "pros upán suhýmnia" ("proportion according to visual impression"), that is, fine form as a subjective impression; must work against the deceivers of the eyes — thus he thickens columns in the middle, shows circles as ellipses and squares as rectangles and arranges a group of columns of varying sizes in different relationships (that is, different from the abstractly required relationships; we should like to question the accuracy of Schüne's translation on this point); (3) the method of the monumental sculptor ("ποιοτικὸς ἐκ τοῦ λόγου καὶ τῆς κολωνας"...); Schüne leaves καὶ [and] untranslated and renders kolouniai too pedantically as "maker of a colossal work," for he seems not to realize that now, after architects, come the sculptors, who learn from sceenography about the future optical impression of his own work of art; the work is meant to appear euhymesic, rather than pointlessly symmetrical, satisfying, only the abstract and mathematical imagination (see the famous passage in the Sphenik, 235E-236A, where Plato protests precisely against this replacement of the "ouste summetria" ("actual symmetry") by the "dunnam einai kal" ("those appearing to be beautiful").

Whereas an author like Vitruvian or Polýbius singles out this complete survey of sceenography only the first point (that is, pictorial perspectival representation), the Platonist Proclus, conversely — and this is both understandable and characteristic — shifts the third point into the foreground, for him sceenography is exclusively the study of how to compensate, for the apparent distortions of works of art displayed in high places or meant to be seen at a distance: "ποιοτικὸς... δεντρήσεις τῆς περικράτους πρᾶξις ἡ ψυχέως, ἄνθρωπος ἡ δεδομένη ἡ κατὰ θέαν τῆς πωμάτου..." ("Sceenography is what shows how the things would appear not disproportionate or deformed through the distances and heights of the objects depicted"); Proclus, in primo Euchisae dea concept. commentarii, ed. Gottfried Friedrich [Leipzig, 1871], p. 40, l.12). It is probably not possible to relate the passage, as Richard Deletric
does ("Beiträge zur Kenntnis der Liniensbezüge in der griechischen Kunst," PHD thesis, Bonn, 1899, p. 42) to the rules of perspectival representation rather than to these; as it were, antiperspectival compensatory measures.

We have not been able to determine whether Erich Frank, Plate und die genannten Pythagorier (Tübingen: N. Niemeyer, 1923), is justified in claiming that the ancients defined scenography as "optics in a narrower sense." For Pliny, "optics in general" fall under three parts: first, on the same name, scenography and the idae kalomene optiké ("science commonly called optics"); which in the doctrine of the causes of optical illusions is not especially related to the arts, followed by the third part, the kongrak.

19. The pertinent passage in Vitruvius and its parallel passage from the Proemium are the only testimonies that permit us at all to suppose the existence of a mathematically constructed pictorial perspective in antiquity; for other testimonies, although they reveal that artists took the laws of vision into account, nevertheless do not reveal knowledge of a geometrical procedure which would have permitted the exact construction of perspectival representations. They read as follows: (1) "Scenographia est frontis et laterum abscntium aedificiorum ad circinque centrum omnium linearum recessus" (Vitruvius 1.2.2); (2) "Namque primum Agatharchus Athenis Achyla domo erecto erat oenocrateum centrum facie et de ea communicatum reliquit. Ex eo montis Demosthenis atque Anaxagoras de nodis se scripsisse, quoniam medium apud alium centrum omnium extantium coro loco centrum centris lineis rectae naturales respondere, ut de invenire se certum imaginem adhorcis in scenarum picturis edificiis spectat, et quae in directa planaque fontiatis sita figurae, nihil absenentiae allia proximitas esse reddat" (Vitruvius 7. Proemium). That is (1) "Scenography is the illusionistic reproduction [this is probably the best translation of abscntium, which is equivalent to abstrahitus; on the latter term, see Erwin Ribbeck, Material und Zeichnung der Griechen (Munich: Bruckmann, 1973), vol. 2, pp. 620 and 678, where he qualifies considerably his own earlier and somewhat extreme interpretation ("Apollodorus O ΣΧΕΣΙΑΙΠΟΙΟΣ, Jahrbuch des Deutschen Archäologischen Instituts 25 [1900], pp. 12-28) of the facade and the sides, and the correspondence of all lines with respect to the center of the circle [formerly the "compass point"]; (2) "Agatharchus was the first, at the time when Aeschylus staged his tragedies in Athens, to make [usually understood as "to paint," although even that is, strictly speaking, not in the text] a scene, and he left a treatise on the subject. Inspired by him, Demosthenes and Anaxagoras wrote on the same subject, namely on how lines, when the middle point is assumed at a particular place [or at any rate; "when the compass point is placed at a particular point," although Vitruvius in this case normally uses the words ponor or calkere]; must according to natural laws correspond to the location of the visual faculty and the rectilinear extension of the visual rays, in order that clear images of unclear objects ["unclear" because seen from a distance; on the term invenire, see the passage 3.5.9] can reproduce in stage-paintings the appearance of buildings, and that something represented on flat, frontal surfaces appears either to retreat or to project forward." There is no more mention here of a centrum cerro or a centrum cerro locus consistitum lying on the picture surface, thus there is of lines that converge or are drawn from a vanishing point on that surface (the translation offered by Frank, Plate und die genannten Pythagorier, p. 234, is almost as arbitrary as the downright wild version of Jakob Precht, Zehn Bücher über Architektur, p. 339, which renders centrum as "fixed picture surface," resumate naturale as "natural succession," and extensio naturae as "points of disappearance"). Already Meister, in his still-valuable treatise in the Noti communiarii societ. reg. Geising. no. 5 (1775), objected for very sound reasons to the reading of the passages in question from the standpoint of central perspective, a reading so natural to modern commentators since the days of Cesariano, Rivius and Barbaro (as did the ingenious Johann Heinrich Lamberti, Integre Perspectiva [Zürich, 1774], vol. 2, p. 88f., and more recently, although with less felicitous arguments, Felix Witting, Die Kunst und Christenthum, p. 99ff.). We must leave to experts the ultimate clarification of these difficult texts (the wording of the second passage is evidently dictated by the effort to separate as many axioms and artistic terms from Greek optics as possible into a single sentence). Yet this much can be said: even if they prove nothing conclusive about our tentative hypothesis of a circular construction, they nevertheless — contrary to the generally accepted view held by (in addition to the authors already named) Delbrück, "Beiträge zur Kenntnis der Linien-

The historical data in the second Vitruvius passage, meanwhile, are right
fully treated with much greater skepticism by the archaeologists than by exemp-
ple by Frank (see Früh, Malerei und Zeichnung des Grekischen, p. 666ff., and August Frickenhaus, Die altgriechische Bühne [Strassburg: Trübner, 1917], p. 76ff.) The perspec-
tival doctrines of Democritus and Anaxagoras were almost certainly not manuals of construction for painters, but treatises on optics along the lines of Euclid; this also better matches the surviving title of a lost work by Democritus, Akrografisthe (The Drawing of Rays).

20. On the antique technique of foreshortening or perspective, to the extent it can be verified in representations of buildings, see (as well as the cited works by Döblin and Hölder) especially Guido Haack, Die subjektive Perspektive, p. 54ff., whose division of the development into four “stages,” it must be granted, has more systematic than historical value. See also Heinrich Schäfer, Von ägyptischer Kunst (Leipzig: Hinrichs, 1919), vol. 1, p. 59ff., and especially Vladimir de Gueinstein, “La perspective dans l’art archéologique oriental et dans l’art du haut moyen âge,” in Mélanges archéologie et histoire de l’École française de Jumieges 31 (1911), pp. 394-434. The essay by J. S. LeP. “La perspective d’un jeu de balle,” Bulletin des correspondance hellénistique 47 (1923), pp. 107-14, has, on the other hand, nothing to do with the problems discussed here. On the entire development from antiquity to the beginnings of the modern era, see the instructive surveys by Richard Müller, “Über die Anfänge und über das Wesen der malerischen Perspektive,” Rektoratsschrift (Darmstadt, 1913), and Ludwig Burkert, Beiträge zur Münchner allgemeinen Zeitschrift, no. 6 (1906); but above all G. Joseph Kern, Die Grundlegung der Innen-perspektivischen Darstellung in der Kunst des mittelalterlichen Europa und ihre Schule (Leipzig: Trennmann, 1907), as well as his important essays “Die Anfänge der zentralperspektivischen Konstruktion in der italienischen Malerei des 14. Jahrhunderts,” Mitteilungen der Deutschen Kun

NOTES


22. According to Kern (especially in Die Grundlagen der perspektivischen Darstellung, p. 33ff. and in “Die Anfänge der zentralperspektivischen Konstruktion,” p. 62; G. Wolf cites him thoughtlessly in Mathematik und Malerei [1916], p. 49), there was a controversy in antiquity and particularly in the Middle Ages over whether “parallel lines running off into the distance appear to converge in a single point or not”; it seems that Vitruvius polemized against the vanishing-

point theory in the twenty-first theorem of the fourth book of his Perspectiva communis (p. 127). This opposition, however, appears to be a position derived from the modern evolution of perspective, inductively introduced into the deliberations of antique and high medieval optics. For that “vanishing point” against which Vitruvius allegedly “mocked all his eloquence” (in truth this elo-
quence was restricted to this single sentence: “lineae...videbantur quasi concave, non tamen videbantur quaeque concavae, quia angulus ab angulo quandam Videbantur” (“Although lines shall seem as if to converge, nevertheless they will never be seen to converge, because they will always be seen at some angle”)) is the point that represents the infinitely distant points of those parallels. It can therefore hardly be the case, from the point of view of empirical psychology, that an actual convergence of two parallels becomes visible (“our faculty of vision does not extend into infinite distances, and moreover in reality there are no infinitely extended lines...”). To express ourselves entirely correctly, we must say: parallel lines are represented in a picture thus that if we could extend them sufficiently, their extensions within the picture would intersect at one and the same point;” thus Guido Haack, quite correctly, in his Lehrbuch der malerischen Perspektive (Berlin: Springer, 1910), p. 24). Nor should we be sur-

102

hierarchiae faciunt in Florentia 2 (1917), p. 39ff., and “Perspektive und bildarchitek-
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p. 260, or in the Opuscula liber de Petrus Ramus, edited with commentary by Riter in 1660, 2.70), two parallel columns, which are necessarily of very limited extension, do not converge in a single point, but rather only tend toward the "ubercurn cent acanun" ("infinite apex of the cone"). Mathematically considered, the theory of the vanishing point is linked to the concept of a limit, that is, to the possibility of imagining that when parallels are infinitely extended, their finite distance from one another, and thus the visual angle subtended by their furthest points, approaches zero. And in fact the principle of the vanishing point as it appears already in Agripponian, although still in imperfect form, is mathematically justifiable only with the help of this concept of an infinite limit:

"Quoniam sinum longituine promovetur ad distasicae tenuissimae perfecte coae et inter se et statum optico videostrum. Quae punctum quod postulatur, est quadrura basis radii optici sive cum infinite, hoc est immensum intervallo ab octro dispointum."

("The parallels at length extended through infinity of distance seem to converge exactly both among themselves and at the central ray. Therefore that point is proposed as drawn infinitely on the central ray, and is disjoined from the eye at an immense distance"); Aquinsonian, Opuscula liber de Petrus, 4.43, p. 266).

A really adequate definition of the vanishing point (for this definition, see any handbook of descriptive geometry, for example, Karl Dohlemann, Grundzüge der Perspektive, Aus Natur und Geisteswelt, no. 510 [Leipzig & Berlin: Teubner, 1916], p. 204, as well as that of Guido Haack just mentioned) is first found in Desargues, in Burmeister, Befuge, p. 44, points out.

Thus if Vitellio states that two parallels, notwithstanding their constant striving toward each other, could never actually intersect each other, because two opposing points on the parallels will always subtend an angle, no matter how small ("Les deliques a la mathematique concept de un point," according to Korn), then he does impose upon the concept of the concurs a restriction: but from the standpoint of the mathematics of the day this restriction was simply necessary. He formulates the only possible position for an optics not yet furnished with the concept of a limit. He does not, however, polemicate against "opponent" who could not even exist, for that concept of a limit would have been as foreign to them as to Vitellio himself. That the extinction of two objectively no-longer parallel lines (and Vitellio is never talking about more than two) drawn on a surface must intersect is self-evident, and Vitellio would never have denied it. But he was concerned not with the laws of representation but with the laws of vision, and if from this standpoint he disputes the possibility of a true concurs, this proves nothing more than that the mathematical imagination of his epoch still had no place for the concept of infinity; that concept was in fact arrived at only in the immediately following period (see p. 65).


24. Unfortunately, we are very poorly informed about the development which preceded the true perspectival representations of the so-called second Pompeian style, and especially about the hardly inscrutable role (at least on the evidence of Erronomic arms and mirrors; for an example of the latter, see note 40, below) played by the native Italian element in this development. Given the incompleteness and imbalance of the surviving material, it is at best doubtful whether this darkness will ever be entirely illuminated. Insofar as an art historian without professional archaeological credentials can judge, the development seems to have unfolded roughly as follows:

i. An initial "archaic" epoch, which — with certain exceptions — encompasses the style of the ancient Near East and a large portion of black-figure vase painting, seeks to reduce corporeal objects to the purest possible ground plans and elevations. The spatial relationships of these objects to one another can thus be suggested either by a combination of these two formal types (as we in the well-known Egyptian representation of a garden which shows the surface of the water in plan but the surrounding trees in elevation, and thus diagonal trees in the four corners: Figure 16); or by juxtaposition or superposition of elevations. This last method is usually described as "lateral" or "vertical" staggering, and it should be pointed out (contrary to Schlüter, L'Égyptienne Kunst, p. 129) that this is not actually to be interpreted as an oblique view, in fact not as a "view" at all, but rather only as a row of outlines.

ii. The subsequent development, which we can follow from about the second quarter of the sixth century, is characterized by the transferential of the principle of "lateral staggering" to the individual body, and in particular, of course,
Perspective as Symbolic Form

Figure 16. Egyptian representation of a garden, New Kingdom. (After Schäfer.)

To those bodies naturally divisible into a forefoot and a rear elevation, this means above all the body of the horse, whose rear elevation is now placed alongside the front elevation, just as when entire figures are staggered. This is the source of the sharp foreshortening which characterizes an entire group of black-figure vases of this epoch (Plate 21), and which finds its perfect sculptural counterpart in the famous four-horse metopes of Temple C at Selinun. Soon chairs, rectilinear and the like will also be represented such that the back legs are staggered alongside the front legs (see, for example, Ernst Ruechel, Die griechischen Vasenmaler [Munich: Piper, 1913], ill. 141/2). Now, when the rear elevation shifts from its position beside the front elevation to a position somewhat above it (a combination, as it were, of vertical with lateral staggering), and when both elevations, for they do after all belong to the same object, are connected by lines, the result is the "parallel perspective" typical of this second period. Nevertheless, the supporting line remains a line. Circles are now, for the first time, represented as ellipses (see, for example, the form of the shield in ibid., ill. 103 with that in ill. 127); and figures display a three-quarter turning of the face and of the thorax as well as a differentiation of the legs into support leg and free leg (although because of the preservation of the supporting line, the latter does not yet retreat behind the former, but rather remains on the same horizontal). Thus even now the recession of several objects into depth cannot yet be suggested in any other way than by staggering; however, this is now no longer restricted to figures alone, but rather extends to the terrain or fragments of rock accompanying them (as on the "Ptolemaic" vases, indeed even on the Ficoroni cista). Ernst Pfohl, who earlier (like Hasper) attributed to Polyclitus a highly evolved faculty for spatial representation, has now retreated to a position almost resembling Lessing's (Malerei und Zeichnung der Griechen, vol. 2, p. 667: "primitive pseudo-perspective of the vertical staggering on the surface"); not even Apollodorus, in Pfohl's current view (ibid., p. 620f.), "even with imperfect yet tolerably convincing perspective," succeeded in "really representing the considerable spatial depth, suggested on the surface, of the great Polykleitan painting."

III. Only since the turn of the fourth century—inspired probably by stage painting—does the consolidation of space appear to get under way. We may infer it, above all, from Plato's (disparing) comments on landscape painting and the deceitful diachronia. Granted, we can gather from his remarks—and from the reports on the representation of shimmering through water or glass or on the reproduction of special light effects (the fire-blowing god of Antiphilos)—little more than that the experiences of scientific optics in the fourth century were already to a certain extent at the disposal of painters. For one must always remember that contemporary or near-contemporary reports can of course only measure the "naturalism" of an artistic representation against what has already been achieved, against what is conceivable (hieracics, for example, perceived Giotto's paintings, which for a later beholder are very much in a "style," as "deceptively true to life"). There is thus no contradiction if behind Plato's descriptions of contemporary "illusionistic painting" we immediately summate something like the Esquiline landscape, even though to the more exacting eye of Lucian the perspectival design of a painting by Zeuxis was so obscure that he could not tell whether a figure was standing merely to the rear or at the same time higher up (Lessing, Antiquarische Briefe, no. 9).

Two things are certain: first, the supporting line is gradually reinterpreted as a ground surface, at first by simply having the feet cross it (Metodores sele,
reproduced in Pfuhl, Malerei und Zeichnung der Griechen, ill. 746; Etruscan mirrors); second, the coffered ceilings of buildings are perspectively "deepened" to such an extent that objects and people appear really to stand "in" the architectural space (southern Italian vases). Of course, this deepening is accomplished primarily with the help of parallel perspective, and we can easily imagine how the representations of buildings in pure elevation from preclassical and classical vase painting (such as Buschor, Die griechischen Vasenmalerei, pls. 77 and 108; Pfuhl, Malerei und Zeichnung der Griechen, ill. 286; our own figure 17), by means of foreshortening the beam ends and the columns in parallel perspective, gradually transformed themselves into the antediluvian of the southern Italian vases. When these antediluvians happened to appear in symmetrical form, the result was of course that very vanishing-axis perspective which we discussed at length in the text (see Plate 1); for the conflict in the corner, in those cases where it had not rather been concealed, gradually brought about a relaxation of pure parallelism in favor of "convergence" (see Plate 1); still in the Trecento, as Guido Hauck has already pointed out, one finds a convergence of orthogonals in symmetrical views even as parallelism is maintained in "lateral" views. A further license is what we should like to call the "turning inward" of the marginal orthogonals, that is, a closer approximation of their slope to the perpendicular; no doubt the intention was to make it possible to broaden the side walls. But even in the southern Italian vases, the evolution of the supporting line into a supporting surface proceeded only hesitantly and inconsistently; even the style of Heliaos, supposedly painted between 280 and 270 B.C. (Rudolf Degensteker, Nekropolis [Leipzig, Giesche, 1919], p. 77), shows the ground perspectively raised, but does not actually dare to place the figures on it. The figures do not use the surface of the ground as a supporting plane, but rather—almost as on the northern Italian vases—use the rear edge of the ground as a supporting line, so that they appear less on than above the ground plane.

IV. The true "interior" and the true "landscape" seem to have emerged only in Hellenistic times, when it was finally understood how to arrange the individual pictorial elements actually "in" the foreshortened ground plane. And even in this epoch we must imagine a rather slow and cautiously experimental evolution in the space testimonies to a pre-Pompeian painting, space either extends only as deep as the layer of figures (for example, in the Battle of Alexander at the Dioecitius mosaic), or the extension into depth is indicated by a simple layering of several cointinues (for example the Niobe fresco, assuming that the architecture was not simply added by the copyist or the celebrated Hector stele from Pausali, second to first century B.C., in Pfuhl, Malerei und Zeichnung der Griechen, ill. 748, and elsewhere). In such a layering, the depth intervals are indeed suggested by overdrawings and size differences, but they are not legible through any clear relationship to a foreshortened horizontal plane. This is a rather high-handed and, as it were, purely negative method of spatial illusion, in which the individual depth layers appear to stand behind each other and next to each other at the same time: for as in most so-called Greco-Roman reliefs (whether they also use the overlapping layers or only vertical staggering), the depth intervals can be read as zero as easily as infinity, and the empty remainder of the painted surface may be interpreted either as the symbol of an ideal plane, or as the material picture support (on this see the instructive study by Arnold Schober, "Der landschaftliche Raum in hellenistischen Reliefbild," Wiener
Perspective as Symbolic Form

Jahrbuch für Kunsthistorie 2 (1923), p. 36ff., which came to our attention too late. As far as we can tell from the surviving material, depth intervals were in fact first made really verifiable on Roman soil; in this way, the conception of a material picture support was unequivocally replaced by the conception of an immaterial picture plane. Here, for the first time, the world of things confronting the spectator as something objective, transformed itself into a "pictorial." This is most clearly emphasized by an illusion of an apparently accidental view, especially when glimpsed through something else. Antiquity never developed a truly perspectival relief at all, of the sort we have since Donatello; although the materiality of the picture support was at least sublimated to the extent that the relief ground was no longer presented as the coherent surface of a physical plane, but rather only in small fragments, often covered in shadow and thus functioning more as suggestions of space. It is also significant that reliefs now appear more often in places where the sensibility of an earlier epoch would have demanded actual empty space: the reliefs of the Ara Pacis are on the upper part of the building, where the Pergamon altar had intercolumniations; and the reliefs of the Pergamon altar are found on the lower part, which is in the Ara Pacis is decked with ornamental plates.

This evolution of the painterly representation of space, admittedly only hypothetical, nevertheless gains a certain plausibility through an interesting parallelism with the evolution of the skene (stage set). In the fifth century the skene is an independent and solid building, and only its large central portal could contain interchangeable representations of cliffs, caves and the like. In the Hellenistic era it becomes a flat relief, structurally still separated from the space of the audience. Only in Roman times will the skene develop into a true hollow space and merge with the audience's space into a closed architectonic unity. It no longer confounds the spectator as an independent construct, but rather is integrated directly into his sphere of existence. The skene now presents itself as a genuine "tableau" corresponding to the creations of view-painting. Indeed, an analogous evolution can be traced even in the realm of literature, most clearly in the restricted — but for that reason all the more clearly illuminated by a distinguished study, that of Paul Friedländer — case of elegia, or the description of works of art. Moschus was the first to "link thematically" the scenes represented in the described works (which are ornamental, of course, fictional) "by choosing three moments of the same legend... And this will to unity extends further. Description, which in all earlier examples of epic was actually a kind of ornamental interlude, which could be altogether different and yet exercise the same effect, now for the first time enters into an intimate relationship with the surrounding poetry. It is not only a fragment of ancestral history which is unravelled for us here; rather, everything points toward the future. If the cow "walks over the stydy paths," then the bull Zeus will later "walk with unmolested hoofs over the vast waves;" moreover, let's take actually Herakles, like his forebear, too, will have to cross the sea, will have to suffer fear and need, but will also in the end find salvation" (Friedländer, Johannes von Guss und Paulus Silentiarius Kunstgeschichte monumentaler Zeiten [Leipzig and Berlin: Teubner, 1912], p. 15). And if the Hellenistic era, in painting just as in elegia, achieved a certain consolidation of isolated motifs in the domain of the object, then Virgil less the resulting tableau both impressionistic looseness and a firm reference to the objective sphere of the beholder: "The poet cannot and indeed will not give the entire; he extracts a handful of scenes only. Thus a formless element is introduced into our representation, out of which the individual images arise, and the mystery of the gods is pushed further away from the calculating mind and the suspicious eye... In the end, when one examines the link between the interlude and the entire epic, something new in Virgil emerges, perhaps again something not at all Greek. For the ancients and still in early Hellenistic times, the elegia was mere ornament; the later Hellenistic period brought it into a profounder association with the whole and related it to the context of that whole. In Virgil, the elegia refers beyond this context, to something external, just as his poetry in general takes into account a dimension outside itself, namely the present of the poet. The means, both in the case of Aeneas' shield and of the journey to the underworld, is the appropriation of historical material extending all the way to the luminous days of the most recent past. Here Virgil stands to his Greek models as the Ara Pacis stands to the Parthenon frieze, or the Column of Trajan to the Mausoleum" (ibid., p. 204).
25. The arguments in this essay overlap considerably, as far as more general questions are concerned, with arguments presented in the author's *Die deutsche Plastik des acht bis dreizehnsten Jahrhunderts* (Munich: Wolfl, 1924), except that they now seem to have found a certain justification in the more readily verifiable results of an investigation conducted specifically from the standpoint of the history of perspective. The following sentence appears in an ingenious work by Ernst Garger, *Die Reheilte an den Pitiasstatuen des Stefansbraum* (Vienna: Krystall, 1926), which unfortunately could not be used here any more extensively: "Antiquity had true space, almost like that of the Renaissance" (p. 35). In this "almost" lies the problem of the present essay.


27. See the arguments of Ernst Canstein added above, p. 30.


30. On the formal and structural principles of early Christian art see, as well as Alois Riegl's famous treatise on the late Roman art industry, more recently Hans Beral, *Das Komplexproblem in der christlichen Malerei* (Bern & Leipzig: Schroeder, 1930), and the superb study by Fritz Saxl, "Frühes Christentum und spätes Heidentum in ihren künstlerischen Ausdrucksformen," *Wiener Jahrbuch für Kunstgeschichte* 2 (1933), p. 63ff., where both the preparatory phenomena within the pagan Roman development and the Eastern influences are precisely defined.

This consistently antiperspectival Eastern influence appears especially strongly in, for example, the miniatures of Cosma Indicopleustes, where, as in the ancient Egyptian representation of a garden mentioned in note 24, above, the ground of the Tabernacle is shown in plan and the walls in elevation, so that the four corner posts must maintain a diagonal position (Le Ministrore della topografia cristiana di Cosma Indicopleustes, ed. Cosimo Stornaiolo [Milan: Hoepli, 1908], pls. 15 and 17). But even in the famous Vienna Genesis, by comparison such a strongly Hellenizing manuscript, one can follow the gradual disintegration of perspectival space (how the schematicizing reinterpretation of the foreshortened spatial form as an ornamental surface form makes itself felt in the domain of figure representations is shown, for example, by the "floating" position of the apparently backward-turned feet, which originally was the foreshortening of forward-pointing feet; or by the apparently high-shouldered or even hunched form of the "round back," which resulted when the three-quarter profile was adopted as a design but plastically developed). On plate VI of the edition of Wilhelm von Hartel and Franz Wickhoff (Vienna, 1895) is found the representation, which later disappears almost entirely, of a self-contained and covered interior space (our Plate 2). And yet the ceiling coffers are given in simple flat projection; the upper body of the man leaving through a door already appears outside the room — thus heralding the transformation of the pure interior into a combination of interior and exterior views — and finally, what is most important and what is also closely related to the last point: the interior space itself no longer fills the entire picture field, rather, what is beyond it remains neutral ground. Thus the perspective plane has already reverted to being the picture surface, and must await the reverse transformation completed only by Duccio and Giotto. In plate XXXV, Pharaoh sleeps, as the editor remarks, "before" a foreshortened colonnade in asymmetrical side view; in fact, he would be lying in it, were it not that the two front columns, in order to avoid overlapping the figure, are not extended all the way to the ground.

This fear of overlapping is almost natural to a two-dimensional way of thinking, which prefers to see the contours of the form in back (viewed spatially) led around the contours of the form in front, rather than see them interrelated. In this fear we may also find one of the reasons for the special popularity of so-called reverse perspective. Reverse perspective does occur frequently even earlier (for example, as the well-known Capitolino dove mosaic, indeed even in fragments such as the perspectival meander of Apaxa from the third century B.C., illustrated in M. 1, Rostovtsev, *Antichnos dekhastravno khragno mne toto Rosv* [St. Petersburg: Imp. Akademia Khudozhestv komitent, 1913-1914], pl. XVII), and often in the perspectival details of southern Italian vases; see our own Plate 2), yet it never achieved the fundamental and universal significance it had in early
Christian, Byzantine and medieval art. The emergence of this reverse perspective was certainly also favored by the degeneration of the Greco-Roman ground surface back toward the ancient Eastern ground line; this, as was emphasized by Grünentrop in "La Perspective dans l'art archaïque oriental et dans l'art du haut moyen âge," was due to Eastern influences. Thus when the entablatures retained their slant, the result was the appearance of a divergence (our own Plate 23); on occasion this authentically Eastern tendency went so far as to make the perpendiculars horizontal — that is, to abandon "foreshortening" — even on the upper or lower roof line, which usually in very peculiar distortions, see, for instance, the Vienna Geneset [pl. XLIV], our own Plate 24, or the miniature mentioned in note 33 of André Boillet, Le Miniature carolingienne [Paris: Picard, 1913], pl. CXXXIII). The opinion of Oskar Wulff in "Die umgekehrte Perspektive und Neoklassizism," Kunstwissenschaftliche Beiträge, Augsburger Schauausstellung (Leipzig: Hirschmann, 1907), p. 110, must be rejected on principle: namely, that "reverse perspective" is a true inversion of normal perspective; in that the image is referred to the point of view of a beholder standing inside the picture instead of outside it; in response see, among others, Karl Doehlmann, "Zur Frage der so genannten umgekehrten Perspektive," Repertorium für Kunstwissenschaft 33 (1910), p. 85ff.


32. On the representation of space in Byzantine art, which only very seldom extended beyond that nonspectacular mode which lays out buildings and landscape elements almost like moveable scenery against a neutral background, and then only in Italy, see, among others, Johann Vollmann, "Die Bildarchitekturen, vornehmlich in der italienischen Kunst," PhD thesis, Berlin, 1900; see especially Wolfgang Kallmey, "Die toskanische Landschaftsmaler der XIV. und XV. Jahrhunderts," Jahrbuch der Kunstsammlungen des italienischen Kaiserstaates 31 (1901), p. 110, and Oskar Wulff, "Zur Stilbildung der Trientromaner," Repertorium für Kunstwissenschaft 27 (1904), passim, but especially pp. 103ff., and 234ff. But see as well our own remarks on pp. 30 and 35, above, as well as notes 38ff., below.

NOTES

33. One often detects in Carolingian art in particular an effort to counteract the flattening tendency through a real revival of antique perspectival motifs, indeed in certain cases even to the point of reviving its own achievements. The fountain of the life image in the Godescalc Gospel of 781-783 (Boillet, Le Miniature carolingienne, pl. IVb, whence our own Plate 23) derives, according to Strzygowski, from a Syrian model along the lines of the Ichthysdrin Gospel (Plate 26), and even though it reintroduces the four rear columns of the fountain, it has in common with this latter the true Eastern horizontalism of the ground- and roof-lines (Strzygowski, Byzantinische Denkmäler, vol. 1 [1891], pl. 58ff.). A generation later, in the gospel of Sossinos (Boillet, Le Miniature carolingienne, pl. XVIIIb, whence our own Plate 27), this fountain has become so "plastic" that it looks rather like the antique Macellum (Plate 28) which this entire fountain type is modeled after. One sees how Carolingian painting, which initially sought its models among the strongly flattened representations of Syrian art, can now fall back upon the more plastic representations of the West. In our case we can even form a concrete idea of the character of the Western model: Mr. von Reybekiel, a doctoral candidate, has called our attention to the 14th-century cupola mosaic in the church of St. George at Salonika, which agrees with the miniature from the Sossinos gospel in precisely those motifs which were not present in the Ichthysdrin gospel (the niche architecture and especially the frieze of birds; see the illustration in Marguerite von Berchem and Etienne Clemen, Manuscrits orientaux du IXe au XIIe siècle [Geneva, 1924], nos. 72 and 78, our own figure 18). Further evidence for this "renaissance of perspective" are the buildings of the Utrecht Psalter, often brilliantly drawn (see, for example, Boillet, Le Miniature carolingienne, pl. LXXVIIIb); and in particular the interior space achieved with the vanishing-axis construction in the Alexine Bible in London (ibid., pl. CXLIV, and our own Plate 29), which Keen already singled out as one of the exceedingly rare medieval examples of a perspectival ceiling ("Die Anfänge der zerfalls perspektivischen Konstruktion," p. 56ff., and Fig. 15; but see also our remarks on p. 55, above, and notes 38ff., below). The proper significance and context of these perspectives, however, are by no means always fully understood in the Carolingian renaissance: that is
evident even from the last-mentioned interior, whose side walls by rights ought to lead into depth in orthogonal foreshortening, whereas in fact they appear to be treated as frontal surfaces, filled with unfractioned circles and curtains. In the same manuscript, moreover, is found an obliquely foreshortened building where the interference of two-dimensional thinking led to a most peculiar misunderstanding: the artist, no longer grasping the perspectival reasons for the apparent rising of the roof lines, figured that this rising ought to open up a view onto a corner of the interior ceiling, and consequently let this corner show forth under the (now really "rising") roof. Thus it is no wonder that this entire "re-an
cience" of perspective was quite ephemeral, and that already in the Fountain of Life of the Codex Aureus (Boinnet, La Miniature carolingienne, pl. CXVII) "back" and "front" are spread thoroughly confused (see our own Plate 30). In the subsequent period, then, the horizontalization of buildings formerly shown in oblique views is carried out with ever-greater resolve, to the point of banishing all foreshortening— which, however, in no way rules out that at the same time, indeed even in the same manuscript, one may encounter buildings still clearly in oblique view.

34. See Josef Strzygowski, Iconographie der Taufe Christi (Munich, 1885); for examples of Byzantine and Byzantinizing miniatures, pls. III/4 and IV/1-4 (especially instructive is Adolph Goldschmidt, Das Evangelier im Rathaus zu Gelná [Berlin: Habel, 1919], pl. 4) for examples of Ostian transitional cases, pls. IX/2-5: A beautiful example from Eastern art of the tenth century (fresco at Elmalı-Köşre) is found in Gabriel Millet, Recherches sur l'iconographie de l'évangeliste de Mosée, de la Macédoine et du Mont- Athos (Paris: Renoue and others, 1930, ill. 131). It is not uninteresting that ancient Egyptian art, when it wished to represent a boar or cow, arrived at a similar formation (Schafer, Ein ägyptischer Kunst, pls. 36/2 and 32, and p. 126). In that case, however, we are dealing with a combination of plan and elevation (the boar in plan, the main wall surface in elevation); our example is a recreation from a true perspectival foreshortening.

The combination of two nonperspectival flat images and the flattening of a perspectival spatial image led to results which looked very similar but which in meaning were fundamentally different.

A genuine analogy to the transformation of the foreshortened river into a "water mountain," or on the other hand, is a phenomenon which to our knowledge has not yet been remarked upon: namely, that the landscape prospect extended through several picture fields, as seen most beautifully in the Esqui
line Odyssey landscapes, survived into the Middle Ages, but only as an evidently purely ornamental band or strip. See for instance the frescoes at Pögg in Styria (Richard Beermann, Aufnahmen mittelalterlicher Wand- und Deckenmalereien in Deutschland [Berlin, 1897], pl. 17 and 18), whose continuous ground strip surely ought to be considered an ornamental remnant of antique representations of terrain (our own Plate 31). And just as the "water mountain" of the baptism is in the fifteenth century, with new means, converted back into the perspectively foreshortened river, so will the motif of the continuous landscape prospect enjoy its own magnificent resurrection in the Ghent altarpiece.

35. On Vitellius, whose Perpetua dates probably from around 1270, see the monograph of Clemens Bormeyer, Wirbel, Beiträge zur Geschichte der Philosophie des Mittelalters, vol. 3, no. 2 (Mainz: Aschendorff, 1908). On the
further evolution of the epistemological problem of space, see the following note and p. 65ff.

36. See again Dubrem, *Études sur l'oeuvres de Vinci*, p. 37ff. This is the point where further speculation can begin for whereas Aristēs had to reject from the start the possibility of * Ereignis aparei*, now just such an *Ereignis aparei* is recognized in the empirical world in the shape of divine omnipotence; what then presents us from supposing that it could not also concrete itself in the empirical world, expanding that world, as it were, into an infinite universe?

37. The impression that the vision of space in northern Gothic painting lags behind the vision of space in contemporary sculpture is only an illusion: they stand quite on the same level, except that the means of expression of painting had to remain primarily line and the areas of color bounded by line. For there is a stronger binding power inherent in the conception of a real drawing surface than in the conception of the plane of a block which is destroyed in the process of creation and thus remains only as an ideal. Yet it simply be noted that already Villard de Honnecourt, in diagrams of buildings, quite consistently indicates concavity by a downward bending or breaking of lines, and convexity, in contrast, by an upward bending or breaking of lines (see the official edition of the *Bibliothèque Nationale*, *Album de Villard de Honnecourt* [Paris: Berthaud, 1906]: representations of concavities, pls. XI and LX; convexities, pls. XII, XIX, LXII). Likewise, the apses of windows, when they are concave, bend away from the central axis of the sheet, and in the opposite case approach it (especially instructive in the comparison of pls. IX and LIXI, where the same chapel is represented in concave and convex form). On the other hand, we do find in Villard the apparently primitive mixture of plan and elevation (the semicircle in pl. XLIV is typical) – but always in conjunction with genuine foreshortenings.

38. See Wall, "Zur Stilbildung des Trecentosmalers"; further, Kern, "Die Anfänge der räumlnahen perspektivischen Konstruktion." It is significant that sculpture, which could not pick up the thread of the maniera greca, is familiar since Giovanni Pissolo with vertical staggerings, yet only arrives at "perspectival" relief on the strength of Brunelleschi’s and Alberti’s achievements.

NOTES

39. The dating of the individual vault monastics is not altogether simple; nevertheless, the image in question certainly dates from before 1300 (see Adolfo Venturi, *Storia dell'arte italiana*, vol. 5 [Milano: Hoeplì, 1907]). 218ff., and Raimond van Marle, *The Development of the Italian Schools of Painting*, vol. 1 (The Hague: Nijhoff, 1923), p. 267 ff.). There are other occasional instances of the vanishing-axis construction before Duccio and Giotto, in works of the maniera greca, for example in the remarkably confused ceiling on one of the fresco fragments at Fabriano, which likewise dates certainly not later than 1300 (indeed, according to a friendly communication from Dr. Curt W. Weigel, probably from around 1270; cf. van Marle, *Development of the Italian Schools of Painting*, vol. 1, ill. 235; further, Lionello Venturi, "A Travers le masque," *Arte* 18 [1915], p. 2). The perspectival string-course in St. Demetrius at Saloniki, probably belonging to the seventh-century reconstruction, represents perhaps an intermediary stage; Georg Dehio and G. von Bonsdorff, *Die kirchliche Baukunst des Abendlandes*, vol. 1 (Stuttgart, 1892), pl. 31, no. 9, and Charles Doukidis, Marcel Le Tourneau and Pierre Saladin, *Les Monuments chrétiens de Salonique* (Paris: Leroux, 1918). Beyond this, it must be conceded openly that our knowledge of the development before Duccio and Giotto is still very incomplete; especially deserving of closer study, for example, are the facade mosaics of S. Maria Maggiore in Rome, which in their architectural representations surpass the level of Cavallini, even if they do not arrive at the representation of a "closed" interior space (that is, a space filling the entire picture surface).

40. In antiquity, significantly, floor patterns are commonly represented only on Etruscan mirrors; but then these floors are composed, as a rule, of diagonally placed squares or even more often of triangles (so far was antiquity from exploiting the floor as an orthogonal coordinate system). Moreover – and to this extent they closely resemble the example from Messina – these floors did not extend completely under the feet of the figures, but rather terminated quite suddenly with a horizontal line. See, for example, Eduard Gerhard, *Etruskische Spiegel*, 5 vols. (Berlin, 1843-1857), vol. 5, nos. 27, 28, 32, 40, 57, 64, 67, 109, 139/1, etc. The specimen reproduced here is Figure 19 (Gerhard, vol. 5, no. 146) seems especially instructive; it is also distinguished by its unusually advanced
rendering of the interior space (although even here, of course, the peculiarities of a fundamentally still pre-perspectival view of space is revealed in the walls, which end at the right and the left, indeed they are even partially overlapped by the figures who ought to be inside it). The completely misunderstood vestiges of such a tile floor occasionally survived in Western painting of the high Middle Ages; see, for example, the miniature reproduced in Emile Maie, *L’Art religieux du X le siècle en France* (Paris: Armand Colin, 1922), fig. 12 (likewise with triangular floor tiles). The well-known mosaic icon in the Bagelly (twelfth century) represents in a scene the counterexample to the mosaic from Monreale: here the floor – this time a checkerboard pattern – does not terminate below the figures, and yet it is devoid of foreshortenings; thus it has the effect of a tapestry stretched at half height. If at Monreale the normal three-dimensional relationship between figures and floor is translated into a two-dimensional superposition, here it is translated into a no less two-dimensional overlapping.


NOTED

47. The orthogonal of the lateral sections of the ceiling at first run entirely parallel with the brackets dividing the ceiling (thus in a purely vanishing-axis construction), only to swing inward at the edges, when they encounter the side walls, in a way already familiar to us from antiquity (see note 24, above). In addition, it is hardly accidental if Duccio, in the three analogous interiors of the Maestà (The Washing of the Feet, The Sending Out of the Apostles, The Last Supper), called special attention to the vanishing point of the central orthogonal with a small lozenge (hidden in the Last Supper by the nimbus of Christ).

41. Kern’s view (“Die Anfänge der zentralperspektivischen Konstruktion,” p. 56) that the vanishing-axis construction was reintroduced only in the Trecento, after Duccio, through a new and, as it were, spontaneous reengagement with antiquity, conflicts first of all with the fact that such a construction — contrary to the claim that it is “unattested in any examples from the middle of the ninth to the thirteenth century” — appears already in the Digesto (the list of examples in note 39, above, would surely increase with broader knowledge of the material), and can with some probability be traced back to a Byzantine tradition. Second, it conflicts with the circumstance that Duccio himself, in the three interiors mentioned in note 47, above, treated the lateral sections of the ceiling (as well as the vertical walls) entirely according to that “antique” principle. Only in a comparatively narrow ceiling (Floors are never constructed in Duccio), subdivided by any architectonic articulation, as in Kern’s example of the Annunciation of the Annunciation, where the partz plane and the entire plane, to speak, coincides, is the vanishing-axis principle entirely excluded; not because it was still unknown to Duccio, but because in such special cases he could already completely overcome it.

44. *Ibid.*, fig. 6. It is interesting that the shadows in the ceiling coffers are no longer understood as such, but rather are used as a symmetrical pattern.

45. By the Lorenzetti themselves see, for example, the Madonna with Angels and Saints in the Pinacoteca in Siena (Plate 32) among Northern works see, for example, the well-known Persönlich in the Temple of Melchior Beederhem. 

46. To be exact, one may not with Kern ("Die Anfänge der zentralperspektivischen Konstruktion," p. 63) speak already of a conquest by the Lorenzetti
of an entire plane; for, considered purely perspectively, even here we are still dealing fundamentally with a mere partial plane which, if the lateral sections of the floor were not covered by the figures, would, in a sense, appear to be enclosed within two marginal planes still constructed according to the principle of the vanishing axis. The difference is that this partial plane is now oriented, with full consciousness and mathematical precision, toward a vanishing point instead of toward a larger vanishing region. The Lorenzetti also surpass Duccio in that their partial plane can occasionally exceed the bounds of the pictorial architecture; see Pietro’s Siennese Birth of the Virgin of 1342, where the main space extended over two picture fields is perspectively unified by a unified orientation of the floor (while the apostle represented in the third wing remains in an exceptional position). There is still no question of such a perspectival unification of several picture fields in Duccio; on the contrary, in those cases where two pictures represent two simultaneous events occurring in the same building (Christ before Pilate and the Detail of Peter), he restored to the curious expedient of connecting the two parts by a staircase; he then joined the spaces not perspectively but, as it were, architectonically and functionally.

42. This discrepancy is variously stressed by Kean, “Perspektive und Bildarchitekturen,” p. 38, reproducing a characteristic Cologne Annunciation, and Alfred Stange, Deutsche Kunst um 1420 (Munich: Piper, 1973), p. 96. Nevertheless it is always interpreted as an “imprecision” or a “misunderstanding”; it is not recognized that the unification of the partial plane, in Italy too, represents a necessary preliminary stage within the evolution toward the unification of the complete plane. This latter unification can only succeed after a homogeneous and unlimited extension becomes conceivable. What holds for the adjacent sections of a complete plane, also holds for the sections of a plane lying behind one another, that is, when the plane is divided crossways; again, each section has its own vanishing point (see, as one among many examples, a northern Italian miniature from between 1350 and 1378, reproduced by Georg Lüdding, Meisterwerke der Buchmalerei aus Handschriften der Bayerischen Staatsbibliothek in München [Munich: Schmidt, 1920], pl. 25a; or even Martin Schaffner’s votive image in the Hamburger Kunsthalle). Particularly noteworthy, however,

is the following phenomenon: when a carpet runs over the steps of a throne down onto the floor (for instance in Lorenzetti’s Siennese Madonna [Plate 17], or the Madonna in Altenburg, reproduced in Kunstgeschichtliche Geschicht der Photographie 1, no. 8), the orthogonal of the carpet, even where the carpet lies on the floor, that is, where it in fact forms a single plane with it, aim not at the vanishing point of the floor but rather at a vanishing point valid only for the orthogonal of the carpet. The integrity of the material concept “carpet” is still stronger than that of the formal concept “complete plane” (see note 51, below).

48. Pomponius Gauricus, De sculp tura, p. 192: “Omne corpus quocunque stat constitit, in aliquo quidem secessit et est loco. Ur. quomue sic, quod prius erat, prius quoque et hic tempus considerandum. Mox locum prior sit necesse est quam corpus locum. Iucum igitur primum designatur, id quod praem unquam” (“Every body exists in some state and it is necessary for it to exist in some place. That which exists first, which exists first, we must also consider to exist prior to this. And it is necessary for the place to exist prior to the object. Therefore the place must be in the first instance designated, and they call this a plane”). This priority of space to individual objects (manifested with exemplary clarity in Leonardo’s celebrated study for the background of the Florentine Adoration of the Magi) is ever more sharply stressed in the course of the sixteenth century, until the classical formulations of Telesio and Bruno (cited on p. 66, above; see further L. Olchicki, “Giordano Bruno,” Deutsche Verlagsanstalt für Literaturwissenschaft und Geistesgeschichte 2 [1924], pp. 1-79, esp. p. 36ff.).

49. It should be pointed out that the spatial achievements of Duccio and his successors were known in the workshop of Jean Pucelle, for we encounter thoroughly Italian “space boxes” already in the Belleville Stairway (before 1345); see also the brief indications in Georg Verchrom, Die Partie Manierismuset (Leipzig: Quelle and Meyer, 1907), p. 181. Indeed, the Annunciation of a Book of Hours preserved in the Rothschild Collection (Leopold Delhise, Les Heures dites de Jean Pucelle [Paris: Mornand, 1910], fol. 16) must derive directly from a model in the manner of Duccio’s Siennese Annunciation of the Death of the Virgin. Since Pucelle’s art is purely Parisian, it now becomes evident – especially
in regard to the completely nonspatial frescoes of the Tour de la Gardiole, which incidentally should be dated rather earlier than later — that we cannot overestimate the role played by Avignon in the reception of Italian art in the north. We are faced with a movement that is far too fundamental to be dependent on the sole fact of the papal exile; surely the development would not have been essentially different even if the popes had remained in Rome throughout the fourteenth century.

50. In Master Franck's Martyrdom of St. Thomas, the orthogonal at the left edge of the picture already converge somewhat with the central orthogonal, whereas those on the right swerve strongly aside. The principle of the "partial plane" is thus, as it were, halfway overcome. Otherwise the swerving of the outer orthogonal on both sides is so common that it hardly worthwhile to list examples (there are many in Camille Claudel, Album de portraits d'après les collections du département des manuscrits [Paris: Berthaud, 1910], pls. XX, XVI, XVII, etc.). The vanishing-axis principle, too, survives well into the fifteenth century (see, for example, the Golden Table of Lüneburg, reproduced in Carl Georg Heise, Norddeutsche Malerei [Leipzig: Holff, 1913], ill. 47). Indeed, the famous dedication miniature exceeding over two pages of the Brussels Hours of the Duc de Berry (good reproduction of the entire double sheet in Eugène Bache, Les Trés belles miniatures de la Bibliothèque royale de Belgique [Brussels: Orst, 1913], pl. VI, whence our own Plate 13) displays on the page with the patron a vanishing-point perspective (indeed, of course) in the manner of the Lorenzetti or Broederlam, and on the page with the Madonna, by contrast, pure vanishing-axis perspective in the manner of Lorenzo di Bicci or Ugolino di Siena; the two methods worked out by Duccio's followers collide in one and the same work.

An interesting special case arises when an artist feels obliged by a particular model to let the side walls of the "space box" (and with them the lateral boundaries of the ground square) converge quite sharply, yet does not term the adjacent orthogonal as sharply; the result is often that the lateral boundaries run through the floor tiles as diagonals (see, for example, Claudel, Album de portraits, pls. I X and I XXVI). These diagonals may initially have corresponded to an entirely logical and objective state of affairs; this in turn was rooted in a most important process, a process especially significant for the derivation of the modern view of space out of high Gothic sculpture. For the diagonals may be explained by a more or less conscious adherence to polygonal space as it emerged when the half-chim of the Gothic statue was translated into two dimensions. Monumental sculpture survived until the early thirteenth century for the most part on the transfer of small-scale sculpture and, above all, pictorial models into monumental format (numerous examples for the latter process in Mâle, L'Art religieux du XVe siècle, parr, for the former, see the adoption of a particular Christ type from a Carolingian ivory first into the Notre dame sculptor of the Hildesheim cathedral doors, then into the Assumption tympanum from Petershausen, now in the museum at Karlsruhe, even though the composition as a whole depends already on models from Burgundy and southwest France). But the development of Gothic sculpture brought about a radical reversal of this relationship; in the sense that from now on small-scale sculpture and even painting for the most part is off monumental sculpture. (For a master demonstration of this in an individual case — the representation of the crucifix — see Adolph Goldschmidt, "Das Neumünster Lettnerkreuz im Kaiser-Friedrich-Museum in Berlin," Jahrbuch der Königlich Preussischen Kunstsammlungen 36 [1915], p. 137ff.; but see as well the drawings of Villard de Honnecourt, or a figure such as the St. Helen in the hapsal chapel of St. Germain, reproduced in Paul Cloumen, Die romanische Monumentalaltäre in den Aachener Düsseldorfer Skizzen, 1916], pl. XXXVI, which derives unmistakably from a narrative type on the lines of the Magdeburg Madonna; see Goldschmidt, Gotische Madonnaen in Dernst (Augsburg: Fitts, 1933), ill. 17.) And in the course of this great process (which shifted again in the fifteenth century), the polygonal half-chim and a little later the polygonal platforms of the plastic figures were also translated into flat forms (readily accessible examples in Georg Dehio, Geschichte der deutschen Kunst [Berlin & Leipzig: De Gruyter, 1921], vol. 2, Ills. 404-405, still as simple flat projection; ill. 407 is already "perspective"). Thus emerges a polygonal space which appears to push forward halfway out of the picture surface, and whose oblique rear walls must, of course, intersect the floor diagonally. For further developments of this "half-chim space"
on a vast scale, indeed even on a monumental architectonic scale, see Adolfo Venturi, Storia dell'arte italiana, vol. 5, fig. 558 or 602, or even Bode's famous well-known Presentation in the Temple in the museum at Dijon.

Alongside these more or less progressive floor perspectives, one still encounters for a long time, and chiefly in the North, the completely primitive representation of the ground plane in simple geometrical outline, without any foreshortening at all.

51. On the perspective of the Eyck, see especially the works of Kem cited in note 20, above, as well as Döblermann. "Die Entwicklung der Perspektive in der Altindischen Kunst," Reparatorium für Kunstwissenschaft 34 (1911), pp. 392ff. and 500ff., and "Nachweis der Perspektive bei den Brüdern van Eyck," Reparatorium für Kunstwissenschaft 35 (1912), p. 262ff. Given that the true unification of the entire horizontal plane is first achieved at this stylistic level and not already in the Trecento, it is appropriate that the principle of the uniform vanishing point is now — and only now — carried over to the vertical plane, which until now was always managed entirely with parallel perspective or, in symmetrical views, with a more or less freely handled vanishing-axis construction. It is equally appropriate that the orthogonal of a carpet extending over several steps now — and only now — follow the orthogonal of the respective planes which the carpet belongs to, that is, of the steps or the floor as the case may be (see note 47, above). All of these are stages on the route toward the priority of infinite space over finite things, which, however, is only perfectly realized when the orthogonal of all planes vanish to a single point.

52. Perhaps it only now becomes probable that the Berlin Virgin in the Church (Plate 15) is indeed the work of Jan van Eyck alone, even when — or rather precisely when — one claims the much-disputed miniatures in the Turin-Milan Hours for Hubert van Eyck. Moreover, it can hardly date from before 1433-1434. The reason for the early dating of the Virgin in the Church and its attribution to Hubert (supposing he really was the author of the early miniatures) is above all its affinity with the Office of the Dead in the Turin-Milan Hours (Plate 14). No matter that in both cases a Gothic church is represented from a similar aspect, that is, with a central vanishing point strongly shifted to the side:

against this more analogy of objects, the trifling differences — particularly in regard to the perspectival view of space — only stand out in stronger relief. The Turin miniature does not yet dare to cut the space with the edge of the picture such that its objective beginning appears to lie on one side of the picture plane; rather, in a most significant compromise with the older mode of representation (which preserves the architecture as a plastically self-contained exterior body even though the interior space is visible), it introduces the curious fiction that the building is unfinished, and that its already constructed parts are all to be found on the other side of the picture plane. Thus the entire building fits into the picture space (the vanishing of the first bay is improved convincingly by accident). In the Virgin in the Church, by contrast, we no longer see an objectively interrupted space, but rather a subjective "slice" of space (and the old copies in the Palazzo Doria and the Antwerp museum show that this effect is not the result of, say, a later reduction of the Berlin picture). We see a space that reaches across the picture plane and is, in a sense, intersected by it; the space seems to include the beholder within it. The space grows in our imagination precisely because the picture shows us only a portion of it. This aligns the Virgin in the Church, as far as perspective is concerned, with the Arnolfini portrait of 1434 (Plate 17). For in its conception of space the Arnolfini portrait bears exactly the same relationship to the Birth of John the Baptist in the Turin-Milan Hours (Plate 16) that the Virgin in the Church bears to the Office of the Dead. Here it is the bourgeois domestic space, not the church space, which is represented such that the picture plane appears not to limit it but to intersect it (note in particular the several orthogonal beams of the ceiling). Less of this space is shown than is actually there. Now everything else falls into place: not only is the Child of the Virgin in the Church formerly related to the Child of the Lucca Madonna, but also the Virgin is a sister to the St. Catherine of the Dresden altarpiece and in particular, even to the draped figures, of Jeanne de Charny in the Arnolfini portraits. The problem faced by the mature Jan van Eyck was how to couple the illusion of an open space filled with light and shadow with a sculptural consolidation and plastic rounding of individual bodies (lenses, a slight stiffness and flattening would appear, as can be observed especially in the Antwerp Virgin at
the fountain with its angular drapery style, its Child twisted almost violently into the surface, and its almost arthritic remittance of the open view onto a landscape. In the Virgin in the Church we see this problem posed and solved in exactly the same sense as in the Arnolfini portrait and in the Lucca Madonna. In the Turin-Milan miniatures the figures are small and slender, almost incorporeal, and entirely subordinated to space. In the works of the middle thirteenth century, on the other end of the spectrum, a perfect equilibrium between space and figures is established: the forms are large, massive, surrounded by heavy drapery, reminiscent almost of the classic monumental sculpture of the thirteenth century. This very Virgin in the Church, for all her painterly refinement perceived as especially plastic, grows upward so violently that the artist, in order to avoid inconvenient overlapping, had to make space by raising the threshold of the choir. It is also no accident that the architectural style of the church interior of the Turin Office of the Dead differs from that of the Berlin picture in a curious and in what at first seems an almost paradoxical way. In the earlier work we find the fine-span and capital-less pillars of the late Gothic, in a sense entirely dissolved into narrow strips of light and shade, as belths the overall antiplastic and antistructural character; in the later work we find the plasticity developed and powerfully differentiated compound piers of the classic Gothic of Amiens and Reims, which express their static function with their capitals. Thus one may choose whether to see, in the Virgin in the Church, the overcoming of Hubert van Eyck's artistic vision by Jan, or rather — and following Friedländer, we should still consider this the more probable — the overcoming of the young Jan by the more mature Jan. In both cases, however, one must in our opinion attribute the work to the younger brother and date it roughly to the time of the Arnolfini portrait.

It is significant, incidentally, that the oldest of the many works that imitated the space of the Virgin in the Church seem to shrink from its brilliant audacity and indeed modify it back toward the very view of space which had been most decisively overcome. Both the silverpoint sheet in Wolfenbüttel published by Hildegard Zimmermann as an Eyckian drawing, "Eine Silbermattzeichnung Jan van Eycks aus dem Besitze Philipp Hausholters," Jahrbuch der Königlich Preussischen Kunstsammlungen 36 (1915), p. 215 and the church interior by the Hamburg Master of Heiligensthal (reproduced in Heine, Norddeutsche Malerei, III, 90, our own Plate 34) yield to the need to objectively close the pictorial architecture in front — Regnier's Chevet triptych and Cambrai altar do the same, although with more refined means — and to "complete" the pure interior view of the space with a fragment of exterior architecture. Indeed, the Master of Heiligensthal appended to the Eyckian interior an entire anteroom, with a floor passed over its own vanishing point.

§3. On this question, see the exchange between Kern and Doehlemann in Repertorium für Kunstwissenschaft 10 (1911) and 15 (1912). Kern seems to be right that Petrus Christus's Frankfort Madonna of 1437 is already constituted with a single vanishing point for the entire space. Yet it is at the very least risky then to trace this final perfecting of northern perspective back to Jan van Eyck simply because it ought to be entrusted to the great pioneers rather than to the comparatively insignificant epigones. Far, to cite Lessing once again, "perspective is not a matter for genius." One can very well believe that the rather sober mind of Petrus Christus tried to secure, by means of a thorough consolidation of linear perspective, that which Jan van Eyck managed to achieve even without a fully rationalized linear framework, by means of a "soumambulistic certainty in striking every moisture of color" (Friedländer). In the field of portraits, too, Petrus Christus took a step beyond his great predecessor: whereas Jan van Eyck was satisfied in all his half-length portraits with a simple dark background — although, again by virtue of that "soumambulistic certainty," it never has the effect of a dead monochrome surface — Petrus Christus creates the "corner-space" portrait (see the portrait of Sir Edward Grevestone from the collection of the Earl of Verulam, on loan to the National Gallery, London), which strains the Eyckian principle of the "slice" of space by trying to create a spatial sphere for the figure with rational means. Let it be noted parenthetically that for this reason we should like to regard the Frankfort silverpoint of a man with a falcon as a work by (or after?) Petrus Christus; although now often attributed to Jan, the sheet corresponds in its design almost word for word to the Grevestone portrait (see Max Friedländer, Die altdeutsche Malerei [Berlin: Cassierer, 1934-1937], vol. I, pl. XLVIII, p. 124).

54. Only the Sibyl wing of the Bladelin altar appears to possess a unified spatial vanishing point: it would lie in the lap of the Virgin and would thus coincide exactly with the thematic center of gravity of the composition. This would correspond entirely to Roger’s dramatic, centripetal and not at all relaxed artistic character.

55. On perspective in fifteenth-century German painting, and especially in Dürr, see Schütte, Die Perspektive in der Kunst Dürrs. On Dürr as a theoretician of perspective, see also Panofsky, Dürr’s Kunsttheorie, p. 140. The various mechanical expedients designed to replace the lengthy geometrical construction, and which Dürr especially troubled himself, are treated comprehensively in a small work by Daniel Hartnagel, Perspectiva mechanic a (Nuremberg, 1683).

56. One still reads in Cennino Cennini’s handbook (Das Buch von der Kunst, oder Tacht der Malerei, Quellenschriften für Kunstgeschichte und Kunsttechnik des Mittelalters und der Renaissance, no. 1, ed. Albert Iffig [Vicenza, 1871], chs. 85 and 87) that the distant parts of the landscape are to be represented darker than the nearer parts (a view which Leonardo, Das Buch von der Malerei, art. 234, had to combat expressly), and that in buildings the lines of the roof moldings are to fall, those of the base moldings to rise, and those of the moldings in the middle of the building are to run “evenly,” that is, horizontally.

57. See, among others, Schütte, Die Perspektive in der Kunst Dürrs, p. 661.


59. Alberti, Kleine Kunsttheoretische Schriften, p. 81.

60. There is surely now a consensus on Alberti’s perspectival procedure, which frequently used to be identified with the well-known “distance-point construction;” see Panofsky, "Die perspektivischen Verfahren Leonis Batsi Albertis," Kunstchronik NF 26 (1913), cols. 505-516; Kern, ""Grausame Aquädukt" oder 'Ostanaufkonstruktion' bei Alberti?" in ibid., cols. 515-516; and the recent synthesis by H. Wielandt, "Zur Erfindung der verschiedenen Ostanaufkonstruktionen in der malischen Perspektive," Repertorium für Kunstwissenschaft 42 (1920), p. 749ff.

In the North, before the exact perspectival method emerging directly out of the idea of the intersected visual pyramid became generally known, the accurate measurement of the depth intervals (that is, the exact amount at which) was achieved with diagonals laid down through the "ground square." In Italy these diagonals were avoided, for example by Alberti, only as a means of verifying the accuracy of a construction arrived at by another route. It was also possible, however, to use them as a direct means of construction, in that their points of intersection with the orthogonals readily provide the desired transversals. The persistence of this workshop practice in the North is revealed in the Perspectiva of Hieronymus Rosler, published in 1546 (in Frankfurt) and yet entirely unaffected by modern exact theory. Here the purely mechanical procedure is recorded explicitly: one should first extend the orthogonals to a vanishing point; then, in order to determine the depth intervals, "select a half-diagonal stroke, and carry that diagonal higher or lower, according to whether you will have the floor tiles broad or narrow. For the shorter the distance you travel upward with that half or whole diagonal, the broader the tiles, and the more disproportionately they become when the diagonal stroke or line reduces the tiles; for properly, the deeper they stand in the rooms, and the more distant they are, the more they should reduce or diminish" (ed. A. von H., and our own Figure 20). Perhaps the availability of such a method explains the curious circumstance that the so-called distance-point method (Figure 21), first taught in Italy only by Vignola-Danti in 1584 (Serlio paves on a superficially similar but in fact false procedure, and a perspectival drawing by Vincenzo Scamozzi in the Uffizi, cat. 94, no. 89), is still done according to Alberti’s method, in the North already by Jean Pélerin-Viator and some of his followers (Jean Cousin and Verelem de Vries). For the workshop practice handed down by
Figure 20. Perspective construction of the checkerboard type "ground square," according to Hieronymus Rodler (the forerunner of the "distance-point method"); the diagonal serves not as a mere control, but actually provides the depth intervals; yet its position is arbitrarily determined.

Figure 21. Perspective construction of the checkerboard type "ground square," according to the "distance-point method"; the depth intervals are provided by the diagonal, whose endpoint D is established on the horizon at the given "distance" (i.e., the distance of the eye from the picture plane) from the vanishing point A.

The theoretically quite innocent Hieronymus Rodler (he is not even afraid to recommend, in order to broaden the background, a construction with two central vanishing points) may actually be described as a distance-point method without a distance point. It agrees with it insofar as the diagonals directly indicate the depth intervals of the transversals, and one can well imagine that it would be easier to arrive at the true distance-point procedure from this position than it was in Italy itself. The eye alone taught, as Rodler expressly put it, that the foreshortening proceeds more rapidly the higher one "travels up" with the diagonal, and from here it was only a step to the recognition that the distance separating the intersection of this diagonal with the horizon from the vanishing point stands in a definite lawful relationship to the distance of the eye from the picture plane (for even Ptolomeo-Vitruv does not expressly state that this distance is exactly equal to the perpendicular distance of the eye to the center of the picture plane). Hence, he says only (fol. A.5r) that the "basis pungens" or "BASE point," that is, the "distance point," is farther from or closer to the vanishing point "adrem sedem ingenios et prausseum aut distans um visum" ("according to the location of the person indicating the position or distance of the object seen"). Thus the correct and thoroughly worked out distance-point procedure of Vignola-Danti, like Alberti's calibrations, is probably the theoretically purified and systematized form of older workshop routines; only that in Vignola-Danti's case we are dealing with a usage from the Northern drawing practice, and in Alberti's case with a legacy of the Italian Trecento tradition.

It is at best doubtful whether the distance-point procedure was known in Italy before Vignola-Danti. Wieland, too, cautiously states that Piero della Francesca did not know it (in a response to Pansky in Repertorium für Kunstwissenschaft 45 [1921], p. 86). As far as Leonardo is concerned, the drawing reproduced by Schultz, Die Perspektive in der Kunst Dützis, fig. 15 (Ravaisson-Muellel, Les Manuscrits de Léonard de Vinci, ms. A., fol. 41r) surely proves only awareness of the fact that the diagonals of the upper and lower surfaces of a cube converge to a single point; and the drawing reproduced by the same author as fig. 16 (ibid., ms. M, fol. 3v, our own Figure 23) may have nothing to do with perspective at all: for the most crucial line of all is missing, namely, the rear side of the ground.
square, whereas conversely the lines AC and BD would be perspective entirely superficial. It is possible that the drawing illustrates only the proposition that triangles with equal bases and equal heights are equal in area.

In this context we may briefly consider the perspectival procedure of Paolinius Giacumio. His account has been considered unintelligible since the reading proposed by Brockhaus (in his edition of De sculptura, p. 51) was with good reason rejected by Paul Kristeller (Andrea Montagna [Berlin: Cosimo, 1902]), p. 104f.) and yet never replaced (see also Schütte, Die Perspektive in der Kunst Dürers, p. 14). But if one reads the text quite literally, and recognizes that, with its incessant interventions of "hic" and "sic," the text is intended only as an accompaniment to a direct graphic demonstration and so appears somewhat erratic and incomplete, it ought to be possible to come up with a satisfactory reading. The text is as follows, with literal translation (De sculptura, p. 104f.):

Ad perpendicular medium lineam demittit. Ut hic ete semi-circulae circundantur, per eorum intersectionem liniam ipsum sequam remitit, Neque in se simul in colloquando utique perscrutici error, first appearance demonstrat hordeo modi, Esto in hac hordeo, summaeque positivam intr.

Drop a vertical in the middle [i.e., of the sheet of paper]; then from here draw semicircles. Through their points of intersection draw a horizontal. Now in order not to err in the distribution of the figures, one should proceed as follows, as was taught to us on this quadrangular panel, for this is indeed the sort we most commonly use, this line [i.e., the horizontal] should already be present. But how far should

mox, tabulis hic inquit brun, As quantum ab hae, planti definitas distare debebit? Aut ubi corporea collabebamus? Ques perspicat, ubi iam in pede depressus, perspicat ira, usque suadet minimum dimensione. Discover quaque quin valde posita linae hic, Men deinde hic longem ars ad uultum calcatur sin in humanum sternum Sic, Ex haeesse earum ipsius aetatis duration ad extremam sequentiam linae Sic, idem ad omne humanum posticum sternum Sic, ubi iugum a medio aequo perspectivario linae, cum eo que ob vertice ad extremum dextra faveat, se centrorit, plant finitris Liniae terminus hic est, aequali sic aequo ad hordeo finitris, ob hordeo ad teresiem, aequo aequo aequo aequo ad angulo, plane tabulis hae modo perscrutabatur linear, descriptum etiam collabandae personae locum ubicue, nam et cadere hordeo et distare ut apparecerat his ipsis delibera interim.

From this no doubt difficult and, as before, somewhat incomplete account, this much at least can be inferred with certainty: the location of the rear side of the ground square is transferred to a vertical line when one draws a visual

135

NOTES

the boundary of the ground plane [i.e., the rear side of the foreshortened ground square, the establishment of which is always the first task of a perspectival construction method, and not for example the horizon] be removed from it? And where will we place the bodies? Whence looks in front of him, unless he is looking directly at his own feet, will see at least as far forward as the length of his own body. Thus this line must be prolonged forward as many feet as you wish. Then a second line of the height of a man may be erected at some distance [not of some length!], thus. From its apex a line will be drawn to the beginning of the horizontal, thus; likewise to the terminus of all these parallel lengths, thus. Now the point where this central vertical intersects that line which was drawn from the apex [i.e., of the line of the height of a man] to the beginning of the horizontal should be the location of the boundary of the ground square. And now if you have drawn several lines from the horizontal to this boundary, from one side to the other, as I do now, and have connected the intersections, then you will have defined the place for the distribution of the figures for they will be appropriately related to and removed from one another at these very distances.
ray from the apex of a second vertical, of the height of a man, to the beginning of the horizontal line, with the base of this second vertical shifted sideward to a distance corresponding to the perpendicular distance of the eye. To this extent Gaustruc's instructions aim at nothing other than a side elevation of the visual pyramid, just as it is constructed in Alberti's auxiliary drawing (Figure 8, upper right). They also agree with Alberti's method in that the horizontal is to be divided into equal sections whose endpoints are likewise to be linked to the apex of the vertical with the height of a man. Thus it may be assumed, without further ado, that just as the rear side of the ground square is to be determined by the intersection of the uppermost visual ray with the "central vertical," so are the remaining transversals to be determined by the points of intersection of the other visual rays with this same vertical. The lines that are drawn "from the horizontal to the (rear) boundary of the ground square" are manifestly the orthogonals (except it is not expressly stated that they must converge in a central vanishing point at the same height as the apex of the vertical; but then that is one of those matters, of course, which the text, supplemented by direct demonstration, can omit). Finally, the lines drawn "ad equum spatium angulam ad angulam" ("connecting the intersections") are without any doubt those diagonals of the ground square that conclude and validate the entire construction.

In sum, then, the procedure of Pomponeus Gautrus is from beginning to end identical with that of Alberti, or, more obviously, with that method — taught by Dürer, Piero della Francesca and Leonardo — which Dürer described as the "shorter way," and which differs from Alberti's procedure only in that the entire construction is carried out on a single sheet, without a separate auxiliary drawing (this sheet must of course be larger than the picture field itself). Thus the instructions of Gautrus begin quite consistently with a halving of this large drawing sheet by a central vertical, so that the construction of the side elevation can unfold off to the side. Alberti, who assumes rather the viewpoint of the practicing painter, must build this side elevation to a separate drawing, since there is no room for it on the painter's panel (on this, see Passikoff, "Das perspektivische Verfahren Albertis," col. 513). In modern terminology, then, Gautrus' method would be described as follows (Figure 23): I divide the entire drawing surface by a central vertical line AB and establish on it, at point E, the horizontal CD. I divide this into equal sections with the points G, H, I, K, L, M, N, O, P, Q, R, S, and raise at point R the perpendicular RI. I connect I with G, G, H, I, K, L, M and E. The intersection of IC with AB gives me the location J of the rear boundary of the ground square; the intersections of IG, IH and so on with AB give me the locations of the transversals. Now I create the point U, whose distance from CD should equal RJ; but whose lateral position may be chosen freely, and connect it with G, G, H, I, K, L, M and E. This connecting line gives me the orthogonals of the ground square, within which I can now draw the diagonal lines by connecting these points where the orthogonals meet the already-established transversals (whereby, as in Alberti, the correctness of the construction is confirmed, for in an incorrectly foreshortened square the corner points of the various subsquares cannot be joined by a straight line).
This interpretation of the passage from Gaufricso may be considered fairly secure precisely because, without in the least forcing the text, it amounts to the very method long since familiar to all Italian perspectivists, the method which Gaufricso not only could have known, but which he in fact must have known. This, of course, renders Bocklins’s hypothesis of a separate “Parmesan school” of perspective untenable.

Supplement to note 60: Just as Hermann Rodler, in order to encompass more “material,” suggests putting two central vanishing points in the picture, so Lucas van Leyden, in order to permit a greater development into depth in his genre scenes, did not hesitate to give the ceiling twelve transverse rows of squares to match its eight orthogonal ranks, and thus to transform it into an oblong turned back into the picture. Naturally, he could have achieved the same effect as well by a rapid foreshortening of a normal ceiling, but – and this is the essential point for us – he was apparently less shy of a material inaccuracy (until now unmentioned) than of a formal infeasibility.

61. Alberti’s method, far less complicated than the plan and elevation procedures, has the sole disadvantage that it breaks down (like the distance-point construction, of course) with structures that cannot be divided (by division, multiplication, inscription or circumscriptio, or elevation) from the square. Yet this disadvantage is of practically no consequence, since in any case (all the efforts of Piero and Durer notwithstanding) the exact perspectival construction of completely irregular structures, above all the human or animal body, hardly ever entered into day-to-day practice.

62. See Alberti, Kleine kunsthistorische Schriften, p. 81: “quod sit lineae [i.e., the orthogonal] adeo diminuta in chaos, quod praeseit in infinito, ipsis inveniisse praemonit scriptor aut auctoris” (On Painting, trans. Spencer, p. 56: “These drawn lines, [extended] as if to infinity, demonstrate to me how each transverse quantity is altered visually”).

63. Pompeys, Gaufricso, De sculpture, p. 200: “Commers enim tuta hic in universal perspectivus dispositione, ut intelligamus quoniam non omnis spectare, quantum ab aliquo distare nor coherens debet, quod necessarium sit ad illum rem significatam personæ, ne aut uno confusandae, ne aut variante deficit.

64. See Diderot, Éloge de Léonard de Vinci, p. 45. The transition from the basic cosmological vision of the Middle Ages to that of modernity (and this was generously pointed out to us by Professor Cusari) is especially clearly seen in Niccolò Cusano, from whom the world was not yet truly “infinite” (infinitus), but nonetheless “unlimited” (infinitus), and who relativized its spatial center (its spiritual center lay, as before, in God) when he explained that any random point in space “may be considered” the center of the universe – just as perspectival construction can determine entirely freely the “vanishing point” in which the respective represented world appears to be “centered.”

64a. [Panofsky’s] original numbering of the notes, both here and at n. 70a, has been preserved in order to keep the English and German text uniform. – [n] Oelschli, “Gioranbro,” also Jonas Cohn, Geschichte des Unendlichkeitsproblems im abendländischen Denken bis Kant (Leipzig, 1896). It is especially interesting how Bruno, in order to establish his own concept of an infinite space against the Aristotelian and high Scholastic view, sets consciousness upon the pre-Socratic fragments, especially the teaching of Democritus. In a certain sense – and this is actually typical for the Renaissance – one antiquity is played off against another, and the result is in all cases a new, third antiquity: the specifically “modern.” A most striking contrast to Bruno’s beautifully formulated definition of space as a “continuitas continua, physis triplus dimensionis continet” (“a continuous mass existing in a three-fold physical dimension”) is the medieval representation (in the Baptistry of Parma) of the personification of four dimension, parallel to the four Evangelists, the four rivers of Paradise, the four elements, and so forth.

66. Lange and Fabio, Düret's schriftliche Nachlass, p. 319, 1,14, and Piero della Francesca, De perspectiva pingendi, p. 1. On the concurrence between the two, see Pansofkie, Düres Kunsttheorie, p. 43, and (apparently independently) Schurritz, Die Perspektive in der Kunst Düret's, p. 50.

67. Already in the fifteenth century, as we know, this alternative led to two completely different systems of ceiling painting on the one hand, to the "illusionism" of Mantegna and Melozzo, developed further especially by Correggio, which to a certain degree denies the existing ceiling architecture by a perspectival illusion of elevating or even breaking through the ceilings; and on the other hand, to the objectivism of all other artists, who, in a Renaissance continuation of the medieval principle of a simple division of surface, affirm the existing ceiling architecture by making its functionality visible. (The ceilings of Raphael, especially that of the Capella Chigi, represent a synthesis of these two possibilities, whereas Michelangelo followed an entirely individual path, not illusionistically broadening the space but illusionistically narrowing it by placing relief layers in front of it.) In the seventeenth century we still see Bernini, who in the question of theory assumed an almost academic standpoint, with Ulysses passion take up a position against the subjective, illusionistic system (see Pansofkie, "Die Scala Regia im Vatikan und die Kunstgeschichtener Bernini.", Jahrbuch der Preussischen Kunstsammlungen 40 [1919], p. 264ff.).

Even in the realm of true wall painting, the question of whether the picture ought to take into account the actual standpoint of the beholder, and so in a sense extend the room whose walls it adorns, has a certain importance (on this, see Karl Bisch-Lutschfeld, Die Lebre von der Malerei im Cinquecento [Leipzig, 1912], p. 68ff., where the arguments of Lorenzo in particular are discussed further, see the following note). The celebrated example is Leonardo's Last Supper; but already the Last Supper of Castagno in the refectorium of St. Apollonia is constructed such that for a beholder standing exactly in the middle of the room (the perpendicular distance comes to about fifteen meters, with an overall room length of about thirty meters) the architecture of the room appears to continue perspectively.

The question whether and to what extent the point actually perpendicular to the eye of the beholder ought to coincide with the perspectival center of the painting is investigated from the standpoint of modern psychology by von Östing, "Das Beunruhigen perspektivischer Abbildungen im Hinsicht auf den Standpunkt des Betrachters," Annalen für Psychologie 5 (1906), pp. 194–278.

68. Leonardo, Das Buch von der Welt, art. 416, for example, recommends assuming a central vanishing point at the height of an eye of medium height, but leaves the lateral position unspecified. Vignola-Dusi, Le Drei regole di perspettiva, p. 86, requires for ceiling painting, as a rule, a centrally placed vanishing point, unless special circumstances justify an exception, for example when the flow of traffic in passageways runs sideways. More recently on the question of "eccentric" or "centric" positioning of the vanishing point, see Ernst Sauerbeck, "Kathetische Perspektive," Zeitschrift für Entwurf und allgemeine Kunstwissenschaft 6 (1915), pp. 420–55, 346–59, and the schematically less limited but methodologically more objectionable — indeed often grossly mistaken — book by Theodor Wedepohl, Lehrbuch der Perspektive (Berlin: Wasmuth, 1939).

The most remarkable and interesting example of the seriousness with which the position of the vanishing point in the picture field and its relationship to the standpoint of the beholder were discussed in the Renaissance, is the pamphlet of Martinus Basi, Disputatio in materiae d'architectura et perspectiva con pareri di eccellenti et famosi architetti, che li rimasino (Brescia, 1572) — excerpts are reprinted in Giovanni Bottari and Serino Tucori, Raccolta di lettere sulla pittura, scultura ed architettura, vol. 1 (Milan, 1822), p. 483ff.; cf. Julius von Schlosser, Die Kunstliteratur (Vienna: Anton Schroll, 1924), pp. 368 and 376. The case which occasioned this pamphlet was as follows: there was in the cathedral of Milan a relief of the Annunciation, set at the height of seventeen braccia (one braccio equals approximately fifty-nine centimeters — 1m) above the ground in a perspectively represented square room with sides of eight braccia. The creator of this work had assumed a distance of nineteen braccia and ("per dati più o meno a certi suoi partimenti fatti in uno di esti lunghi") had given the vanishing point an asymmetrical position (Plate 35). Now, Pellegrino Tibaldi — reasoning that the vanishing point ought to lie at the eye level of the announcing angel — introduced a second vanishing point into this relief, in the center of the picture field.
and fifteen pollici [i.e., approximately thirty-three centimeters] higher than the first vanishing point; and on top of this he calculated the lines that converged toward that new vanishing point at a perpendicular distance of only four braccia (Plate 36). This provoked a violent uproar among the Milanese experts, with this very Mattino Bassi proclaiming himself their spokesman, followed by fruitless negotiations with the unperturbed offender, and finally a questionnaire put to Palladio, Vignon, Vasari and Giovanni Battista, the Mantuan architect and Vitruvian commentator. Bassi presented the matter to these authorities and at the same time proposed two emendations to which they were to respond: the vanishing point must in any case be modified, either if the vanishing point is assumed at the old height but on the new axis (Plate 37), or if the entire pictorial architecture is reconstructed from the real standpoint of the beholder, that is, at a prespective di sona in situ with a vanishing point lying seventeen braccia below the lower edge of the picture (Plate 38). That the present situation with two vanishing points was intolerable, was of course freely and immediately admitted by all parties. But as for the corrective measures to be adopted, it turned out that precisely in these perspectival questions the positions of contemporary artists could differ considerably, according to their particular concepts of art.

Palladio, thinking purely architecturally, objects already to the original condition with its unified but eccentric vanishing points, he asserts in a purely dogmatic fashion that "according to all perspectival rules the central vanishing point must lie in the middle," so that the representation possesses "sua et grandesse." Thus he would surely have approved Bassi’s first proposal (which in itself was certainly the most sympathetic to him), but that another consideration, less a matter of aesthetic than logical doctrine (namely, that it would conflict with reason and the nature of things to look upward at the floor of the represented room from such a deep standpoint), leads him to prefer the second proposal (that is, more prespectivo di sona in situ). "E per rispondervi con quella" ordine che noi avremmo, dico che non è dubbio alcuno, che la prima opinione, circa il piano di marmo del quale si tratta, non sia definitiva, poiché l’aristocrazia in uno dei loro del marmo, il quale, essendo per ogni regola di perspettica des' essere posto nel mezzo. Conclusivamente per dare maggior grandezza e maggior massità a quelle cose che agli occhi nostri si rappresentano, devono rappresentarsi in modo che dagli estremi al punto dell’aristocrazia stiano le linee uguali. Non può anche essere dubbio appresso di me, che la seconda opinione, la quale vuole che si facciano due orizzonti, non sia da essere lasciata, se per le regioni distintamente dette da noi, si anche perché, come ho detto, il proprio di tali opere è il pare il prespettivo nel mezzo; e così non deve essere osservato dal più eccellente uomo, dell’autorità de’ quali non mi parliamo ma delle opere, se una viva suggerisca non mi mostrasse che il partirsene fosse meglio. Per le cose fin qui dette poteste più comprendere che la terza opinione, la quale posse un solo orizzonte, sia indifferente più delle due passate, se in essa non si fate il piano dignitario, sopra il quale si pongono le figure. Perciò che ripugna alla ragione ed alla natura delle cose, che stendendo in terra, in un abitare di 31 braccia, si possa vedere tal piano, onde si anche nelle pitture in tinta ed in minor altezza si vede essere stato forse tutto che in esse si possa concepire alcun altro di più dignitoso che nelle opere di marmo, maravigliosamente devo esserli figura di tanto rilievo. Per la cosa... l’ultima resta opinione mi piace infiamente, conciossi che in ni si servono i proceri della perspettica, e non si partisere da quello che la natura c’ingaggia, la quale deve' essere da noi posta e da speriamo di far le opere natura che stiano bene e siano lodevole" ("And in order to answer you in the same order as you write to me, I say that the first opinion about the piece of marble that we are dealing with is undoubtedly not incorrect, for it places the vanishing point [aristocrazia] which in the older terminology always means "vanishing point"] among one of the sides of the marble. In fact, according to all perspectival rules, this vanishing point should lie in the middle; for, in order to provide the objects represented to our eyes with higher greatness and majesty, they should be represented so that the lines from the extremes to the vanishing point are equal. It is also beyond any doubt, as far as I am concerned, that the second opinion, according to which there should be two vanishing points, should be discarded. This is so both due to the reasons most learnedly pointed out by you and because, as I said, a vanishing point lying in the middle is the characteristic feature of such works. We see that this characteristic was observed by all the most excellent men, and I would never depart from their authority in my works, unless a strong reason..."
showed me that it is better to do so. Given what has been said hitherto, you can already understand that I would find the third opinion, according to which there is to be one vanishing point only, more satisfactory than the preceding two, were it not for the presence in it of the inclined plane upon which the figures are to be placed. In fact, it would conflict with reason and the nature of things that such a plane could be seen from the ground at a height of seventeen braccia. Therefore, this was avoided even in paintings at an equal or lesser height, although less accuracy may be conceded there than in marble works, especially in the ease of figures of considerable relief. Due to this I like your last opinion infinitely, since both the perspective principles are there observed and you do not depart from the teachings of nature, to which we must conform if we wish that our works will be correct and praiseworthy.

Vignola cannot assure us the initial condition either, but it is not nearly so intransigent as Palladio (he concedes that special conditions could justify an eccentric position of the central vanishing point). He, too, chooses the perspective di anto in si, although he recommends moderation; correctly requested lowering of the vanishing point to seventeen braccia below the picture would create a violent slanting of the lines; one should thus proceed with "discretion" and "sauce giudice," that is, not show the floor of the room from above, but nevertheless not permit the perspective di anto in si to take full effect. "E prima, sopra il vaso dell'Annunziata fatto in perspectiva, dico che si prato avviato avrebbe fatto meglio avendo meno il piano della volontà in mezzo, ma già non era necessario per qualche suo effetto fare in contorno. Del poro del secondo architetto, che reale fui due orienti, a me par tempo perduto o perdonato, perchè egli mostra non aver nemmeno alcuno di perspectiva. E per dire quello che mi pare di desso opera, si por lato il poro di V. S. del quarto diagno, volendo assister in tene regola di perspectiva, cioè mettere l'orizzonte al luogo suo, a alzare tanto basso, che non si regge il piano, e non piuttosto lasciato di far vedere il piano in tanta altezza, cosi fatissimo, come che avuti l'habboni uomo., ma in pittura si può meglio talvolta che in scultura. E la ragione è che altri si può coperire con dire fingere tal pitture essere un quadro dipinto attaccato al muro, come face l'insolente Baldassare Peruzzi senza nel tempio della Pace in Roma, il quale finito un talato de legnatiere essere attaccato e'
not dislike the fourth, given its variety; but, since it requires again that very low view, it falls so sharply that laymen would take offense; and although it may be all right, much grace is taken away"). Thus Vasari, alone among those polled, has no fundamental objection to the original solution with the central vanishing point set off to the side. But the present condition is of course unjustifiable; the first proposed emendation, although in its own right admirable, represents no essential improvement, for it does not "enrich" the picture; and the second proposed emendation, although praised with "per la sua variet。” with a really strictly carried view from below the lines would fall so sharply ("normale"; see the comment by Vignola-Daniei cited in note 8, above) that laymen would take offense.

Bertani, finally, does not in his highly personal contribution wish to deny that Betti's perspectival deliberations are correct, but rather is opposed to the perspectival relief as such. Here he appeals to the arch of Septimius Severus and other antique monuments which, despite their high placement, all reproduce the ground as seen from above. He conceives the problem of the perspectival relief very analogously as a mixture of fiction and reality, and picks up train of thoughts voiced by Leonardo in Das Buch von der Malerei, art. 37: "Vie, poi nel giudicato del signor Cesalpino, posta nell’alta nomina del Monte Carlo la statua di Molapo col Porco di Calabria, e molte altre figure van dardi, archi e lance, le quali unite intorno e dentro hanno le loro figure che ponevano sopra i suoi piatti naturali, e non sopra piani in perspectiva. Laude Tengo per ferma che dati antichi fuggiranno di far i piani in perspectiva, conoscendo essi che le figure di rilievo non vi possono posare sopra se non falsamente. Per la che a me parmi che non si venga la figura accompagnare colla verità, se non in caso di qualche guasto o capolino, o d’altre cose simili fette sopra i fondi delle storie. Tengo io la verità essere il rilievo naturale, e la perspectiva essere la figura e finzione, come co’ che V. S. suo maggiore di me. Ben è vero che Dostielllo e Caccio, sopra del vedico Bertani, attribuivano lavoro di fare i piani in perspectiva, facendosi sopra le figure di non più rilevo di un mene dita in geometria, e di alzette le dette figure da un bruco, come si vede a un quadro di una macina in cosa de’ Tronchinigli, per a Monte Carlo, scritto con tante arti, magisterio e scienza di perspectiva, che fanno spigolare tutti i velati uomini ed intendenti di tal arte che li
NOTEs

For more on the problem of construction with short perpendicular distances, see the brief but substantial essay by Hans Jauzen, "Die Raumdarstellung bei kleiner Ausdehnung," Zeitschrift für Architektur und allgemeine Kunstwissenschaft 6 (1911), pp. 119-23, and Das niederländische Architekturbild (Leipziger Künstlerzeitung and Biermann, 1910), p. 144, as well as Mennel, "Macari est et la théorie de la perspective." It need not only be added that Northern art already in the fifteenth and sixteenth centuries generally preferred a short perpendicular distance in representations of interiors. As with the Netherlandish painters of the seventeenth century, here, too, the will to subjectivism dominated, only that it did not yet to such an extent take advantage of the physiological conditions of vision (lack of clarity of the foreground, and so forth) and in both cases the distant space of landscape painting is the necessary correlative to the near space of interiors (see also Pasolsky, "Dürers Stellung zur Antike," Wiener Jahrbuch für Kunstgeschichte 1 [1922], p. 86ff.) The views of Wedepohl, Architekt der Perspektive, p. 46ff., are nearly as doctrinaire as those of Hans Conelius, who in his Elementarheiten der bildenden Kunst (Leipzig & Berlin: Teubner, 1908), p. 21ff., actually forbids construction with a short perpendicular distance and instead advises redrawing with a longer distance.

70. Karl Voll's satirical comparison of the two works, in Vergleichende Gemälde- und Bildnisstudien (1907), vol. 1, p. 127ff, makes remarkably little allowance for the antagonism between the two perspectives configurations. See, further, besides the censorious comments of Wedepohl, Architekt der Perspektive, p. 50, or of Fritz Burger, Die Deutsche Malerei, Handbuch der Kunstwissenschaft, 5 vols. (Berlin-Neubabelsberg: Athenaion, 1913-1919), vol. 1, p. 112ff.; the perspectival analysis and reconstruction of Düer's engraving in Schnitz, Die Perspektive in der
Kunst Hinters. p. 34; it is, however, to be objected that the large window should have not fine but only four lights, whereby the arguments against the "fidelity to nature" of the representation are further diminished.

70a. See Burmeister, Beilage, p. 45.

71. There has been considerable confusion regarding the evolution of the oblique view (see as well Kern in Saalabanger der Berliner Kunsthistorischen Gesellschaft [Oct. 1945]; Smeuf, Künstlerische Perspektive, pp. 60 ff.; and Wedepohl, Architektur der Perspektive, p. 98 ff.). In that oblique placement of the pictorial architecture in the space is not always clearly distinguished from a rotation of the space itself. The oblique view in the first sense is already common in the Trecento, especially in Giotto, who with his propensity for the plastic must have welcomed such motifs, creating depth with almost geometrical means (see, besides the Arena Chapel frescoes, the Baring of the Dead in S. Croce, with oblique placement of the entire stretch of wall closing the stage); and in his school (Taddeo Gaddi, Presentation of the Virgin in S. Croce). In the North, see alongside the Presentation of the Virgin in the Beba riches books at Chartes (which is, of course, copied from Gaddi), the Annunciation of Kevelaer, the interesting Passion series of a Lake Constance master in the Bayerische Nationalmuseum in Munich, or the Karlshuhe "H startsammlung." In all these cases, as already in the Temptation of Christ in Daedalus’s Maesta, even the floors of the obliquely rotated buildings are made visible. In the fifteenth century, however, as Kern in particular has correctly stressed (in Strengerehehe, p. 19), even this form of the oblique view becomes rare in Italy, so that a work like Masaccio’s Renewal of Judas (Catalogue des collections de Suisse, vol. 2 [Brussels, 1904], pl. XXVIII, no. 306; now in the Johnson Collection, Philadelphia), looked strange to Vasari’s connoisseurial eye (as Vasari, ed. Milanesi, vol. 2, p. 790). The North, on the other hand, kept the problem in mind all along, even — and this is typical — in the broader and genuinely subjective sense of the true rotated space. Already in the Boccaccio of Jean van Perck (ed. Henry Martin [Brussels: Oest, 1911], pl. 16, no. LXI, whence our own Plate 5) we encounter the attempt to represent an independent interior (the inside of the Temple of Jericho) in an oblique view, even though a lot of the normally viewed foreground remains visible and the transition of the oblique pictorial architecture into the frontal frame architecture creates a bizarre contradiction. And in the Book of Hours of Etienne Chevalier by Jean Fouquet we find both on the Madonna side of the dedication page and in the Annunciation of the Death of the Virgin similar attempts with similar (although not quite so striking) contradictions. The next step is taken in Gerard David’s Judgment of Cambyses, where the entire foreground together with its architecture is rotated, whereas in the background, as a kind of reassurance, the marketplace appears normally, with a different vanishing point and even a different horizon. Peltroto-Vian, finally, who on the strength of his familiarity with the distance-point method was able to master the problem of the oblique view perspectively and exactly, gives in his De arte fabularis perspective, os Iuf, lvx and lvx, two examples of the completely rotated total space, dispensing with all frontal and orthognathic (Figure 74). Already Altdorfer put this achievement to practical use in a number of cases (see, for example, the Munich Birth of the Virgin and its interesting preliminary drawing, our own Plate 20, published by Elfried Buck, "Eine Architekturrekonstruktion Altdorfers," Berichte der Berliner Museen 45 [1924], p. 12 ff., with a good analysis — in need of emendation only in detail — of the perspective; further, see, for instance, the Judgment of Plate of the St. Eustachius altarpiece, or the eighteenth and thirty-sixth images in Holbein’s Dance of Death). One may therefore stress, against Jantzen’s otherwise-repeated assertion (Das niederländische Architekturbild, p. 180, cf. also p. 95 ff.), that the completely diagonal positioning of the interior space (or, as the case may be, of the architectonically enclosed exterior space) had already been achieved in German and French art of the early sixteenth century, and that here, too, Netherlandish painting of around 1560 (especially Jan Steen and Cornelis de Vos, as well as the Delft architectural painters; see also Rembrandt’s etchings B.112 and B.285, although in his old age, and in keeping with the overall development of his style, Rembrandt retreats entirely from this way of forming space) finally resolved a problem which northern art had posed itself from the start, and which already a century and a half earlier had led to similar solutions.

It is no accident that the evolution of the oblique view played itself out prematurely in the North. Inmate to "most," that specifically Northern formal
substance, is a peculiar indifference to direction (on this, see Hermann Beurzen's review of Panofsky, *Die deutsche Plastik*, in *Zeitschrift für bildende Kunst*, Beiheft "Die Kunstliteratur" [1925], vol. 1, pp. 1–6); and as soon as the perspectival mode of representation had been adopted, that indifference would have been transferred at once to the "pictorial space." For one may say that the North, compared to Italy, felt even pictorial space as "mass," that is, as a homogeneous substance within which the space of light, was felt to be almost as dense and "material" as the individual bodies distributed in it. Conversely, it now becomes clear that the working out of geometrical perspectival methods was reserved for the Italians; for them, the conquest of space proceeded first

of all from the desire to provide freedom of movement and disposition for bodies, and was therefore more a stereometric than a painterly problem. The artistic incarnation of the homogeneous and infinite space could thus only be achieved by the collaboration of North and South, for the one was capable of grasping the problem sub specie qualis, and the other sub specie quantis.

Of course, even in the question of the oblique view the particular approaches of individual artists and schools played an important role. Whereas Altdorfer in some cases carried out the diagonal placement of an entire interior with a resolve almost worthy of de Witter, Dürer, as far as we can tell, avoided it altogether. And whereas Rogier van der Weyden understands, even if not rotated space, at least pictorial architecture rotated in space (middle panel of the Bodegondo altar), strict frontality prevails in the Master of Flemalle and in Jan van Eyck. Conversely, Italian art, which was by and large avowed to the oblique view and which generally avoided it even in the Baroque, nevertheless occasionally adopted the motif of rotated space already in the sixteenth century, even if usually with mitigating modifications, and (significantly) almost exclusively where a Northern element or at least a Northern influence is present; see, for example, Delacroix's *Adoration of the Child in Berlin*, or later, Santi di Tito's *Marriage at Cana* (Villa Borghese at Pistoia, reproduced in Hermann Voss, *Die Malerei der Spätrenaissance in Rom und Venedig* [Berlin: Gute, 1920], vol. 2, ill. 181), or the great *Handling over of the Keys of the City of Venice* of Jacopo Ligozzi (in other ways, too, strongly "suggestive of Northern art") in the Museo Civico in Verona (Voss, *Malerei der Spätrenaissance*, p. 414, ill. 160). The two latter cases are especially instructive in that Santi di Tito leaves open a reassuring vista through large arcades onto a landscape seen normally, whereas Ligozzi, despite the oblique placement of the stair of the senate, which occupies nearly the entire breadth of the picture, frontals in a quite inconsistent fashion the rear closing wall of the space (the situation is somewhat similar in Titian's *Last Supper* in Urbino).

72. For a good anthology of the relevant remarks, see Fischel, "Apollodoros O ΞΟΑΑΠΑΟΡΟΣ," p. 128.

73. Most instructive, although – or perhaps precisely because – disputa-
PERSPECTIVE AS SYMBOLIC FORM

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Plate 1. Fragment of a wall decoration in stucco and paint from Boscoreale, in the "fourth style," first century A.D. Naples, Museo Nazionali.
PLATE 2. Perspectival dentil, ornament from the neck of a southern Italian vase, end of the fourth century B.C. Hamburg, Museum für Kunst und Gewerbe. (See Plate 3 and note 30.)

PLATE 3. Architectural representation on a southern Italian vase, end of the fourth century B.C. Hamburg, Museum für Kunst und Gewerbe. (See Plate 2.)

Plate 5. *Abraham Receiving the Angel and The Sacrifice of Isaac*, mosaic, middle of the sixth century A.D. Ravenna, S. Vitale.


Plate 10. Duccio di Buoninsegna, Last Supper from the Maestà, 1301-1308.
Siena, Museo dell'Opera del Duomo.


PLATE 14: Jan van Eyck, *Office of the Dead*. Miniature from the Turin-Milan Hours, between 1415 and 1417. Turin, Museo Civico. (See note 52.)

PLATE 16. Jan van Eyck, *Birth of John the Baptist*. Miniature from the Turin-Milan Hours, between 1415 and 1417. Turin, Museo Civico. (See note 52.)


PLATE 21. Black-figure vase, second half of the sixth century B.C. Hamburg, Museum für Kunst und Gewerbe. (See note 24.)
PLATE 22. The Shrou of Noah, miniature from the Vienna Genesis; c. 500 A.D. (?) Vienna, Österreichische Nationalbibliothek. (See note 30.)

PLATE 23. Denial of Peter, mosaic, first quarter of the sixth century A.D. Ravenna, S. Apollinare Nuovo. (See note 30.)
PLATE 24. Joseph's Brothers before His Steward, miniature from the Vienna Genesis; c. 500 A.D. (3). Vienna, Österreichische Nationalbibliothek. (See note 30.)

PLATE 16. Fountain of Life (?), Syrian miniature of the sixth century A.D. (?). Echmiadzin, Monastery Library. (See note 30.)

PLATE 17. Fountain of Life, miniature from the Gospel of St. Médard in Soissons, supposedly completed around 827 (according to W. Köhler, already before 814). Paris, Bibliothèque Nationale, ms. lat. 8850. (See note 33.)
PLATE 28. Macellum, fresco in the "second style" from a villa at Boscoreale, first century A.D. New York, Metropolitan Museum. (See note 33.)

PLATE 29. Presentation of the Tables of the Law from the so-called London Alcuin Bible, second quarter of the ninth century. London, British Library, ms. Add. 10546. (See note 33.)
Plate 30. Canon page from the Codex Aureus from St. Emmeran, completed 870. Munich, Bayerische Staatsbibliothek, cod. lat. 14000. (See note 33.)

Plate 31. Frescoes from St. Johann in Pürgg (Steiermark), second half of the twelfth century. (After Bormann; see note 34.)
Plate 32. Ambrogio Lorenzetti, Madonna with Angels and Saints. Siena, Pinacoteca. (See note 47.)

Plate 33. André Beauneveu (?), Duke Jean de Berry with Saints Andrew and John Worshipping the Madonna, first dedication picture from the Brussels Hours of the Duc de Berry, c. 1395, no later than 1402. Brussels, Bibliothèque Royale Albert 1st, ms. 11060. The sheet was bound into a later codex executed in the workshop of Jacquemart de Hesdin. (See note 50.)
PLATE 34. Master of Helligenthal (Konrad von Vechta), St. Andrew Baptising, c. 1445. Lüneburg, St. Nicholas. (See note 52.)

PLATE 35. Annunciation relief before the alterations by Pellegrino Tibaldi. Milan, Cathedral. Etching from Martino Bassi, Dispareri in Materia d’Architettura et Prospettiva (Brescia, 1572). (For Plates 35–38, see note 68.)
PLATE 36. Annunciation relief after the alterations by Pellegrino Tibaldi.
Milan, Cathedral.

PLATE 37. Martino Bassi, first recommended improvement for the Milan Annunciation relief.
Plate 38. Martino Bassi, second recommended improvement for the Milan Annunciation relief.

Plate 39. Robbery of the Virgins of Lodi by the Tyrant Dionys of Syracuse, miniature from the Boccaccio of Jean sans Peur, between 1409 and 1419. Paris, Bibliothèque de l’Arsenal, ms. 5193. (See note 71.)
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37. Biblioteca Trivulziana, Milan.