

# Visual perception and theories of painting

## An uneasy complementarity

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### 0. Introduction

What can psychological theories of perception contribute to theories of painting?

In the world of art the pervasive opinion concerning this question is “few if anything at all” and the few which can be learned is confined to the aesthetics of reception. There are rare exceptions to be found; e.g. Gibson’s and Gombrich’s discourse in “Leonardo” 1978/9 might be regarded as the most prominent example of a fruitful exchange between perceptual science and theory of art. In this discourse Gibson shows that under natural conditions the traditional distinction between appearance and reality does not hold. Under this condition of – what he calls – “direct perception”, the perceiver is not confined in his act of perceiving to a multitude of snapshot views (appearances) from which one has to infer the “reality” of the scene, but directly picks up the invariances of the scene and thereby has direct access to – what Gibson called – the affordances of the scene. The affordances (all the possibilities a scene *affords* the perceiver to act upon) makes up the “reality of the scene” for the perceiver. These affordances are not inferred (consciously or unconsciously) but are immediately given in the perceptual system.

If – as Friedrich Schiller analyses in his Aesthetics – the traditional task of painting in our culture is the imitation of the appearances (“Schein” or mimesis) then pictures can not convey reality in the way direct perception does under natural conditions. Therefore – according to Gibson – the perception of pictures is indirect perception, necessitating inferences for the

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Dedicated to the Memory of Jörg Traeger, Historian of Art, 1942 – 2005

understanding of the reality *represented* in the picture. A striking example for this is the painting on the ceiling of S. Ignacio in Rom where the depicted space (see Fig. 1) can only be “seen” as the intended mimesis, if the viewer stands on a specific point in the church.

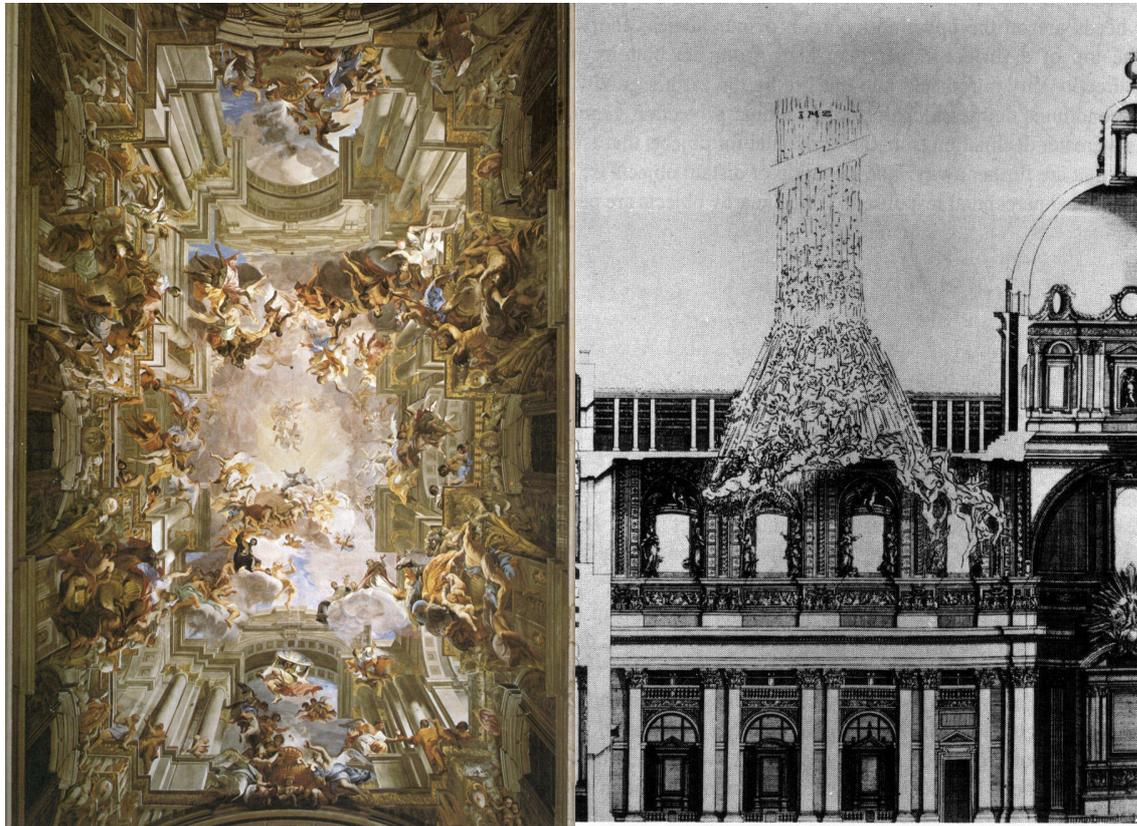


Figure1: The ceiling of S. Ignacio as seen and the intended impression

In the following I want to show that not only psychology of perception can contribute something to a theory of art (Gombrich has done this already, see especially 1972) but that Gibson`s skepticism about the information contained in pictures is only partially valid. Furthermore I want to claim that closer analyses of painters´ implicit theories of perception can contribute something about the topical discussion in the 15<sup>th</sup> d 16<sup>th</sup> century on the theory of painting, namely, “Disegno” vs. “Colore” or the “Southern” and the “Northern mode of seing”.

### 1. Starting example: Reality in pictures

We all know that contrary to the legend told about Zeuxis birds do not get fooled by painted fruit because – as Gibson would point out – painted fruit

does not exhibit the invariances of real fruit and therefore does not provide the affordances for the birds. However, more detailed analyses of phenomena show that this answer underestimates the information provided by pictures as a simple demonstration can show (see Fig. 2).

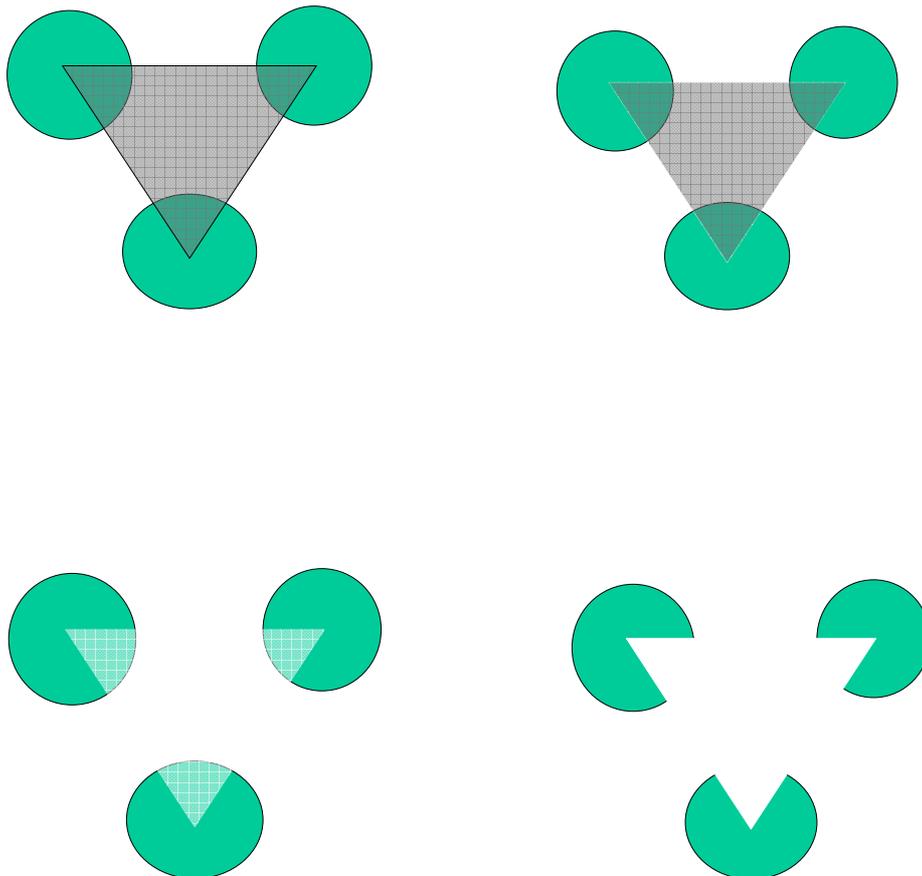


Figure 2: The relation between apparent transparency and illusory contours.

Simply by changing the greyness values in the different segments systematically, at first phenomenal transparency appears and finally even illusory contours (see Kanizsa 1979). For painters the techniques for producing these effects are part of the craft since antiquity (see the still life of a glass bowl with fruit in the villa of Julia Felix in Pompeii). However, experimental psychology can show that for the perceiver there is in such pictures more than an imitation of appearances: The perceived distance to the transparent layer is less than to the background and the figure

constituted by the illusory contours is hovering above the plane of the circles and their surrounding. That is, the picture conveys – at least partially – affordances, albeit illusory ones: they not only fool the eye but also the pointing finger.

## 2. Why theories of perception tend to be neglected in the teaching of painting

The inherent tension between the art of painting and theories of perception becomes pointedly patent in the Bauhaus curriculum of the 1920s which was meant to comprise all preconditions for the craft that enables to produce art which in itself cannot be taught. This curriculum – as far as it is concerned with the *craft* of painting – reduces perception, especially color perception, to physics and chemistry, neither Helmholtz's physiological nor Hering's or Mach's phenomenological approaches are even mentioned and the topic of form (Gestalt) is not mentioned at all – at the same time when the concept of gestalt dominated the discussion between psychologists, epistemologists and physicists in Germany.

Actually, the Bauhaus position can be seen as an attempt to circumvent the controversial discussion in the Renaissance and Baroque time about the proper theory of painting, namely, what Nicolas Poussin in his letter to De Noyer called “deux manières de voir les objets”: “Two ways of viewing objects: *Simply seeing them*, and *looking them attentively*. Simply seeing is merely to let the eye take in naturally the form and likeness of the thing seen. But to contemplate an object signifies that one seeks diligently the means by which to know the object well, beyond the simple and natural reception of its form in the eye. Thus it can be said that mere *aspect* is a natural operation, and that what eye call *Prospect* is an office of reason which depends on three things: The discriminating eye, the visual array and the distance from the eye to the object” (Jouanny, 1911, p.143, my italics). These different ways of seeing reflect the conflict between “painting what is seen” vs. “painting what is known”; or more technically: Seeing an object from a fixed viewing point in contrast to perceiving an object as it is – namely including all possible transformations, that is its invariances (Gibson).

Actually, Michelangelo (as quoted by Francesco de Hollanda) contrasts Italian vs. Flemish painting in a similar way: “In Flanders they paint with a view to external exactness or such things as may cheer you and of which you cannot speak ill, as for example, saints and prophets. They paints stuffs and masonry, the green grass of the fields, the shadow of trees, and rivers and bridges, which they call landscapes, with many figures on this side and many figures on that. And all this, so it pleases some persons, is done *without reason or art, without symmetry or proportion, without skill for choice or boldness and, finally without substance or vigour* (de Hollanda, 1928 p.16).

In a certain way, the differences between the Southern and the Northern view of painting can be traced back to different interpretations of Alberti’s treatise on painting (1972, p.53) “Large, small, short, long, high, low, wide, light, dark, bright, gloomy and everything of the kind, which philosophers termed accidents, because they may or may not present in things, – all these are such as to be known only by comparison – ...as man is best known of all things to man, perhaps Protagoras, in saying that man is the scale and the measure of all things, meant that accidents in all things are duly compared to and known by the accidents in man.” What Alberti describes here is the concept of frame of reference in a general way. The different interpretations of “seeing” start with the meaning of “man is the scale and the measure of all things”, namely, if scale and measure are to be interpreted literally as in Poussin’s *aspect*, that is, as in geometry of physics, or in a more general way, taking into account world knowledge and implicit cultural background as in Poussin’s *prospect*.

The Northern mode (aspect) is best represented by Johann Keplers theory of perception (Kepler, J. “Ad Vitellionem” p. 143):

“Thus vision is brought about by a picture (pictura) of the thing seen being formed on the concave surface of the retina...and thus the origin of errors in vision must be sought in the conformation and the functions of the eye itself”.

From this follows the principle of the Northern mode “ut pictura, ita visio” and for this reason it is not astonishing that historians of art (e.g. Panofsky or Lord Clark) have interpreted the art of Jan van Eyck or Vermeer by using terms from photography: “Jan van Eyck’s eye operates as a microscope and a telescope at the same time” (Panofsky, 1953, p.1:182) or about the View of

Delft “this unique work of art is certainly the nearest which painting has ever come to a colored photograph” (Clark, 1976, p. 263).

### 3. The camera metaphor for visual perception

The theory of vision as proposed by Kepler regards seeing as a passive process and Panofsky and Clark in using the metaphor of a photographic camera concur with Kepler “...the retina is painted with the colored rays of visible things.” According to this theory, the starting point for any perception is the projection of the external world upon the concave retina, actually Jan van Eyck alludes to this theory in “The Arnolfini Wedding” by showing the backs of the bride and the groom plus himself in a blue gown reflected on a convex mirror, thus representing the projection on the concave retina (Figure 3)



Figure 3: Detail of the Arnolfini Wedding

In this modeling of the perceptual process neither the movements of the perceiver’s eyes nor the observer’s movements relative to the perceived object are taken into account. Actually instruments like the Dürer window (see Figure 4) enforce the rigid constellation of percept and perceiver – and thereby making perspective painting easy.



Figure 4: The Dürer Window from 'Unterweysung der Messung', reflected for better comparability with Figure 9.

Another mechanistic approach to perspective is the Camera Obscura which in the version of Drebbel has had a strong influence on the practice of painting in the Netherlands during the 16<sup>th</sup> and 17<sup>th</sup> century (see Figure 5). C. Huygens (1596–1687) who described in his autobiography of 1629 many details concerning the cultural background of pictorial art in the Netherlands writes about Drebbel's instrument in a letter to his parents: "I have in my home Drebbel's other instrument, which certainly produces admirable effects in reflection painting in a dark room. It is not possible to describe for you the beauty of it in words: all painting is dead in comparison, for here is life itself, or something more noble, if only it did not lack words. Figure, contour, and movement come together naturally therein, in a way that is altogether pleasing" (quoted by Alpers, 1983, p. 12).

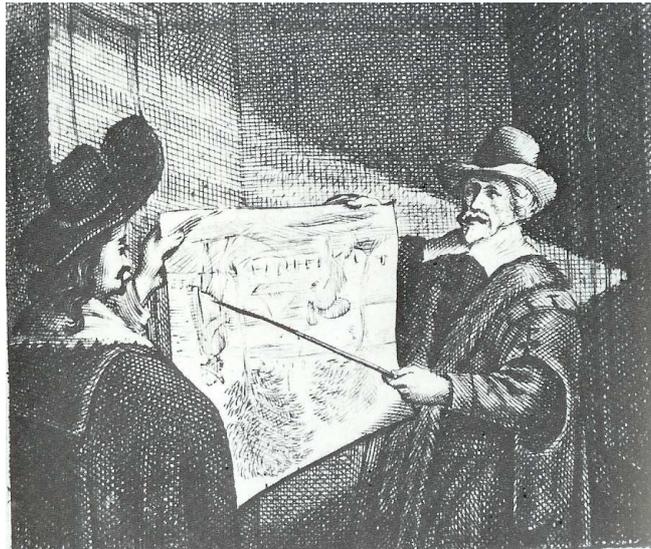


Figure 5: Johan van Beverwyck's (1667) theory of perception for artists in *Wercken der Genees Konste*.

There is strong evidence that the camera obscura was a common instrument for Flemish painters; Steadman (2001) even suggests that in Vermeer's studio was installed a huge camera obscura (see Figure 6):

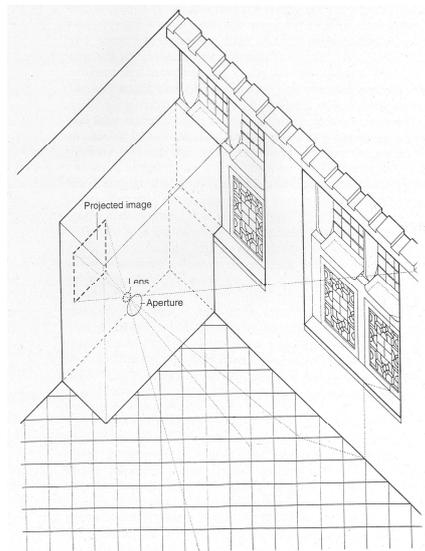


Figure 6: The lay-out of Vermeer's studio according to Steadman (2001). The windows and the tiling of the floor can be used to identify the position of projected images for the different interiors as painted by Vermeer.

In the 19<sup>th</sup> century Helmholtz proposed a technique for the demonstration of his theory regarding 'unconscious inferences' in perception by using a peep

hole box as developed by van Hoogstraten ( *Perspectifkas*, National Gallery London) but distorted in such a way that size illusion even with common objects result. This technique has resulted in the so-called Ames room (see Figure 7).

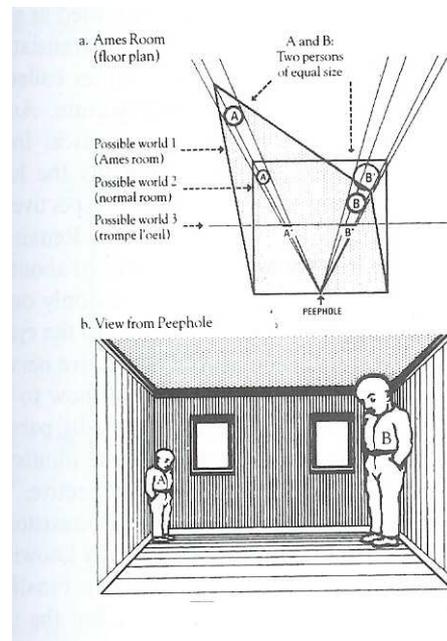


Figure 7: a) the ground plan of the Ames room b) the resulting appearance if viewed through a peep hole.

Helmholtz too regarded the process of *seeing* as passive as, that is, governed by the sensory input (Kepler's projections on the retina) but he proposed that higher cognitive processes lead to the conscious *perception*. In the case of the Ames room, the higher cognitive processes *interpret* the angles as perpendicular and therefore the observer *rescales* the size of the persons watched through the peep hole.

Apparently, Gibson had this in mind when he classified picture perception as well as Ames room perception as *indirect*, namely, either not affording the observer with invariant information or even inducing illusions. However, a closer look at the artists' work even if supported by the Dürer Window of the camera obscura shows that the artists intended to provide invariant information albeit not by means of perspective geometry.

#### 4. How to depict the “what” and the “how”

If one reconstructs what the artist in Dürer’s illustration really could have seen, one arrived at a grossly distorted reclining woman (see Figure 8)

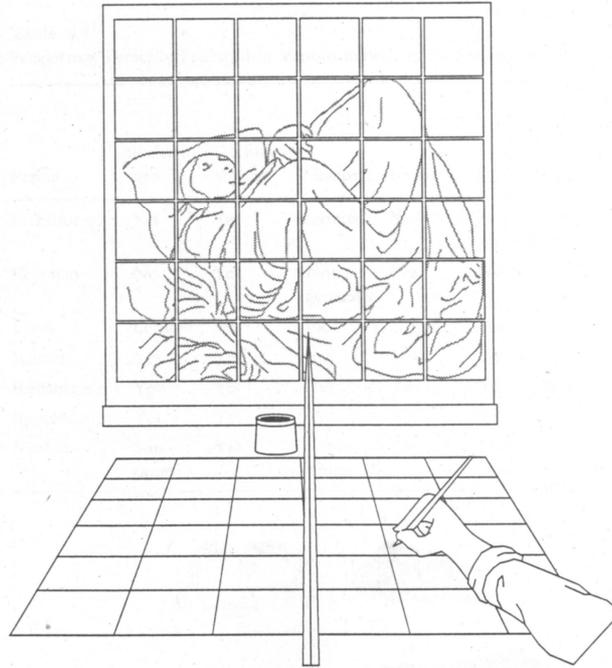


Figure 8: What the artist in Dürer’s ‘Unterweysung’ saw (after Kubovy, 1986).

If one uses Dürer’s graphic work for comparison, one can immediately see what for Dürer the artist has to do *beyond* following the rules in ‘Unterweysung der Messung’, namely, to *stage* the to be depicted objects in such a way that their major axes of orientation are parallel to the fronto-parallel plane of the observer (the grid in the Figure above).

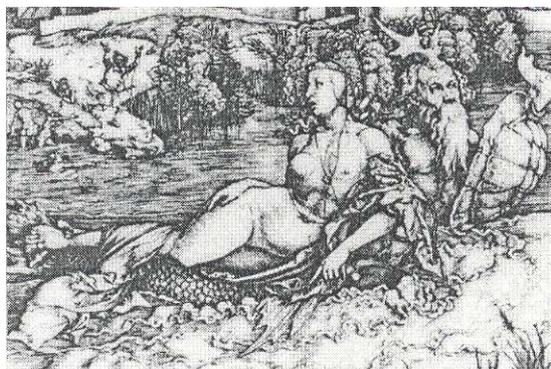


Figure 9: a reclining nude (Das Meerwunder, 1498) by Dürer.

The *staging* of the to be depicted objects combined with a *scaffolding* of the space into which they are embedded has been identified by Alpers (1983) as one of the core principles in Flemish painting.

However, his staging and scaffolding techniques can not explain the difference between the Northern and the Southern View in art because it is ubiquitous in paintings of this time. What is discriminating between these approaches can be seen in Dürer's *Unterweysung* where he uses a combination of two different perspectives: one for the artist and another for the reclining woman. And, actually, this combination of multiple vantage points is closer to the modern psychological view on the perceptual processes than Kepler's theory: The percept is the result of an integration of many glances at a scene, these different glances focus on different parts of the scene, directed by attentional processes, and their acuity is only high in the focus and then degenerates rapidly (see Figure 10)



Figure 10: A demonstration of the degradation of acuity in the periphery of a glance. Actually, the saturation of the colors decreases, too.

Due to the blurriness in the periphery of the glances, it is possible that local deviations from the global orientation are not detected if a consistent global percept is possible, most of the so-called Gestalt phenomena work on the local as well as on the global level.

For the artist this implies that by mixing perspectives it is possible to depict the isolated object in its canonical form and at the same time to construct a global scene which has not to be consistent with the isolated views. For example, in Raphael's School of Athens Euclid and Ptolemy are depicted presenting perfect spheres, despite the fact that in a peep hole view of the general perspective these spheres had to be transformed into ellipsoids (see Figure 11)

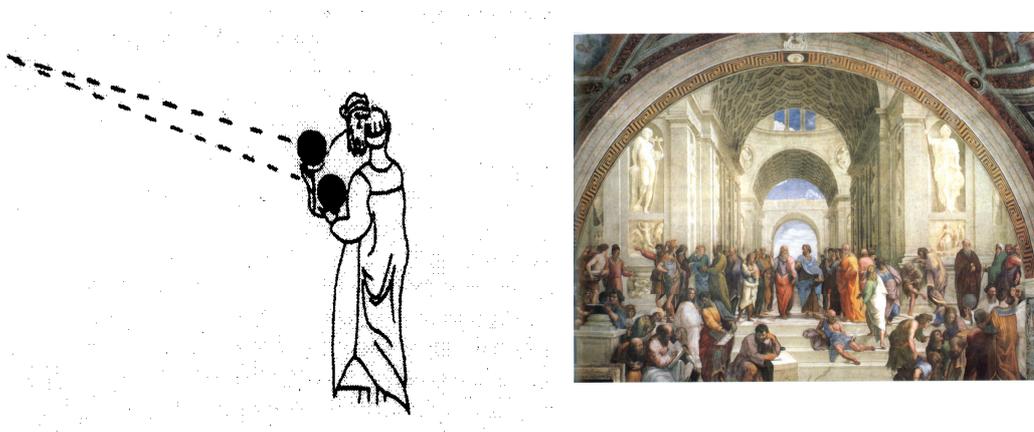


Figure 11: Euclid and Ptolemy presenting spheres which are distorted according to the global perspective

By using this mix of perspectives it is possible to depict at the same time 'what is known', namely the sphericity, and 'what is seen', namely its position at unique point in the spatial scene. That painters like Raphael were well aware of this Platonic influence on their art becomes apparent in his letter to Baldassare Castiglione "... in order to paint one beautiful woman I'd have to see several beautiful women ... I make use of a certain idea which comes to my mind. Whether it carries any excellence of art I do not know but I work hard to achieve it."

Perhaps, this is the essence of the Southern view as implied in Michelangelo's critique of Flemish painting: skilful choice or boldness .. substance or vigour. Uccello's painted epitaph of John Hawkwood exemplifies the application of these principles (see Figure 12).

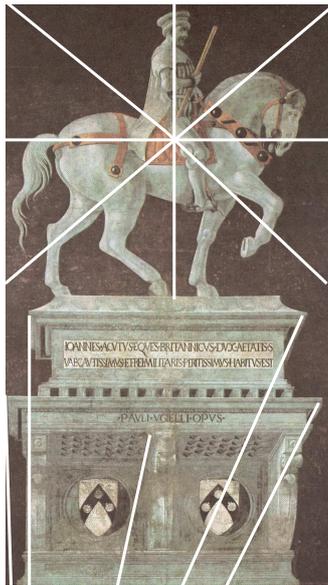


Figure 12: the epitaph of John Hawkwood with the respective lines converging to the different vanishing points.

At least partially, these examples show that in a kind of cooperation between the artist who depicts multiple views in order to show ‘what we know’ and the perceptual processes of the observer there emerge affordances for the perceiver about the world represented in the pictures.

## 5. Conclusion

Recent results from cognitive neurology (Zeki 2000) indicate that there is a neurological basis for abstraction which resolves the clashes between the sensory input and ‘ideals’. Insofar the Southern Mode of depicting is in accordance with psychological approaches to picture perception. The interaction between experimental perception science and pictorial art can best be demonstrated by an example: Hockney’s assembly (Figure 13) of Polaroid shots results in something resembling Hochberg’s (1962) theory of glance integration, insofar not only on a theoretical level as in Gombrich’s and Gibson’s discourse but also in the practice of art a level of complementarity between art and science can be achieved.

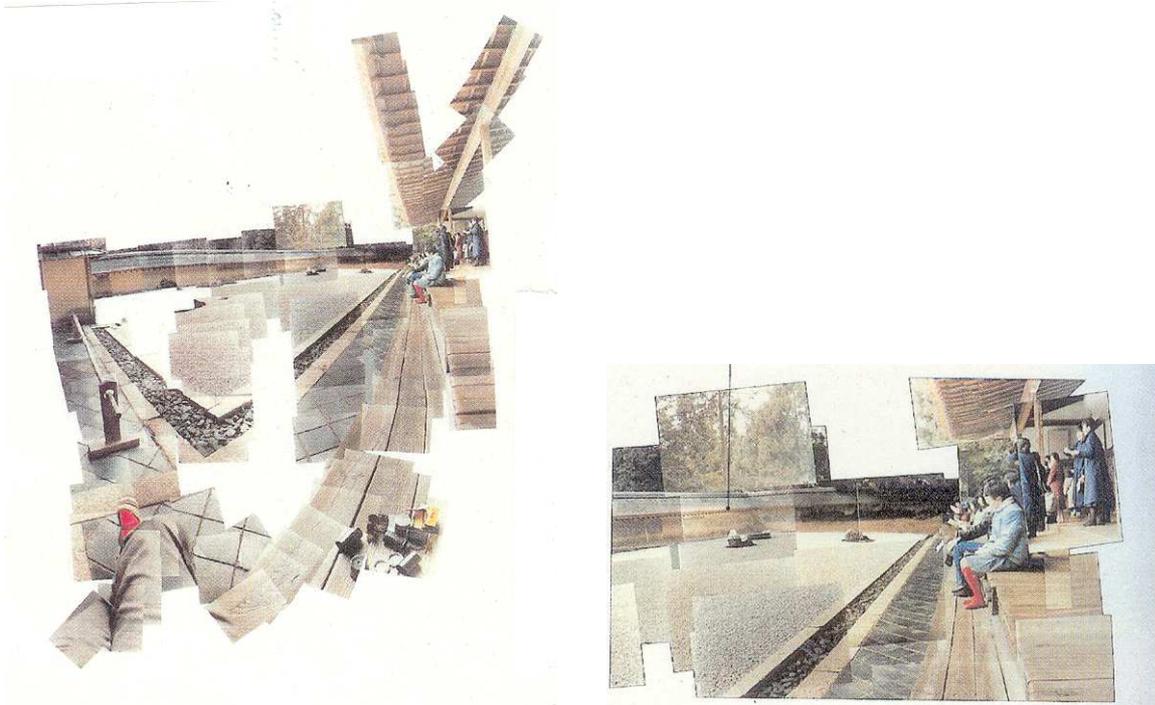


Figure 13: Zen garden and details

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