

GLASS AND THE RENAISSANCE: ART

The second great expansion of reliable knowledge in the west did not occur in the universities and in philosophy or what we would call 'science', but in the arts and engineering, and in particular in architecture, painting and drawing. It is what we call the Renaissance and here again we can look at the influence of glass. We can examine this in relation to the two major features of the Renaissance. One of these is the changing concept of the individual, the other is in the understanding and representation of the natural world.

As Ernest Gombrich has demonstrated, humans are not cameras.¹ They do not naturally see the world as it is, but as they expect it to be. They see with blinkers on, as it were, selecting bits and pieces which they can comprehend. This view, which has been endorsed by more recent work on the psychology of perception,² suggests that we do not see the world straight on but unconsciously distort it, or rather re-interpret it. A flow of light comes into the eyes, but what we see has to be created from the meaningless jumble of colours and shapes. For example, the image always strikes our retina upside down and we have to turn it over, which we have learnt to do. We use another trick to make sense of mirrors. Now these perceptual constraints are so powerful, yet beyond our control, that they actually make the world into the shape which we expect to see. We are like Wittgenstein's famous fly trapped in the constraining fly-bottle. We are systematically biased. We immediately start to interpret the world, even before the light enters our eye.

This set of constraints is re-enforced by another when we come to represent what we see to others. The result can be seen if we look at any of the great art traditions of the world up to about 1250 A.D. If we survey South American (Aztec/Inca) art it is conventionalized, symbolic, two dimensional, without perspective. It is more similar to a cartoon or to a form of writing than to modern western realist painting. The same is true of the other non Eur-Asian art traditions in Australasia and sub-Saharan Africa. If we are tempted to think that this has something to do with their pre-civilizational (ie. pre-writing) situation, we will soon be disabused by looking at the civilizations of Eur-Asia itself. The early civilizations of Mesopotamia and Egypt, after the invention of writing, have a similar flat, stereotyped, art.³ The art of Greece reached wonderful levels, particularly in sculpture, but the painting shows little sign of the correspondence to nature of modern western art. The majority of Roman art, though having representations in some depth, still lacks true perspective of the kind that was developed in Europe after the fourteenth century.

The development of the various non-Western art traditions is particularly revealing since they

¹ See Gombrich, *Art and Illusion*, which inspired this chapter.

² Cf. particularly the work of Richard Gregory, Colin Blakemore and others.

³ Give refs. in Turner et al.

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did not collapse, unlike Greece and Rome or the early Empires of the middle east. So we can watch their development over the crucial period from the time of the fall of Rome in about the fifth century up to the eighteenth century. In Byzantium, the iconic and non-realist art using conventional symbols continued largely unchanged until the fall of Constantinople in 1453. In Russia, the same was true until the eighteenth century. In Arabic societies, soon dominated by Islam, there is no sign of fundamental change in artistic representations. We can see superb illustrations of the world in the Mughal art of the court of Akbar and Shah Jehan in India in the seventeenth century. Wonderfully detailed, the paintings appear largely flat, shadowless, without accurate perspective or pictorial space.

The art of China and Japan is equally intriguing. It is exquisite, often very finely crafted, yet its essence is, when compared to post-Renaissance west European art, on the same side as all the traditions we have looked at. It almost always lacks perspective depth, it lacks realism, the backgrounds are often impressionistic. It appears to be very highly stylized. To an outsider, it appears to be painting by a code, employing images as symbols which the viewer can interpret as references to something else. Paintings largely seem to be mnemonic devices, reminding the viewer of emotions, but not systematically exploring the world of nature. This tradition, both different from and overlapping with that in the other areas we have looked at, is one which continues with only minor modifications until at least the eighteenth century and later.⁴

Thus we see that the way in which civilizations up to about 1250 visually represented or explored their world were of a particular nature. They all tended to use paintings as anagrams for the world. It is almost as if the painting was a written language where the power is derived from the arbitrariness of the symbols. The gap between the signified (the world of nature) and the signifier (the artistic representations) is often very great. A moon, a twig, a leaf, stands for an immensity of meanings in a Chinese or Japanese painting, as it does in a poem. The paintings are like visual poems, composed according to anciently established rules, turning the artist inwards on himself and away from the outside world. They are concerned with symbolic analogies, with a cosmology where inner and outer essence and form are closely connected.

It is probable that much of this was deliberate, that as with alphabetic writing, artists had discovered that the more conventionalized the symbol, and the better educated their audience, the more powerfully they could stir their feelings. Yet as well as this, there seem to have been other pressures, and we can see this clearly if we re-consider what our basic problem is.

If we examine the history of representations in early civilizations we find that the story is not as simple as that suggested above. Firstly there is evidence that Greek-Roman art had developed quite good perspective in various representations, and then this was lost for a thousand years.⁵ Secondly there is the evidence of quite realist representations in some of the early paintings in

⁴ White on, and Binyon and others on... refs.

⁵ See in particular, Turner, Perspective on Perspective and Bunim.

caves of the ?C6 in India.⁶ Thirdly there is the case of China. For example, there is the famous eleventh century set of drawings, including 'boats going down the river' which shows some grasp of some of the rules of perspective.⁷ This technique was again largely discontinued over the next few hundred years. Fourthly, there is the case of Giotto in early fourteenth century Italy. His ideas were little developed for nearly a hundred years, to be re-discovered and elaborated in the fifteenth century.⁸

If we consider these examples, we are led to reflect more deeply on the nature of human sight. We know that, with their binocular vision, humans see the world in perspective. They know that things get smaller as they are further away, vanish towards a horizon and so on. A child intuitively knows all these things and **homo sapiens** would not have survived for long if it had been forgotten. They are also able to paint or draw the world in quite reasonable perspective if left to their own devices, as young children sometimes do, and the young shepherd boy Giotto famously did.

So we might turn the question on its head. Perspective and realist portrayals are natural and normal; but usually the cultural conventions of a society teach artists and others that the representations their audience want is not of this kind. Artists are, as it were, systematically taught to distort the world they see and would normally portray, in order to make it fit a symbolic system which conveys deeper meaning than the prosaic world of sight. What is the point of art if it merely duplicates what the eye sees in any case? Putting the problem this way leads us to speculate on what cultural pressures have been erected to stop most art traditions from striving for realistic, perspective filled, representations. We would then be led to ask what it was that so forcefully dislodged these pressures so that for a brief period in one civilization (western Europe from the fifteenth to nineteenth centuries) a realistic form of art came to dominate. What turns rather isolated cases of perspective and realist representations such as those of the early Chinese artist of the eleventh century or Giotto into a vast movement which then transforms the whole of human vision and reality?

What seems certain is that it would require a considerable jolt to push one civilization away from what appears to be a common sense and obvious vision of the world, and hence the only and necessary way of representing it. The fact that no civilization had been able to break out of the fly bottle before 1250, and that, to a considerable extent, the most sophisticated and artistic civilizations of the world - Islam, China, Japan - never did so from within their own resources is indicative of the strength of the tradition. What force could then be strong enough to shatter the glass? Or at least what could make the fly free by making her aware of the invisible constraints on her vision, for which she could then create some artificial compensation?

⁶ My attention drawn by Gerry Martin, see xxx.

⁷ Give refs. for this.

⁸ See White, Birth and Re-Birth; Bunim.

Obviously, the first thing to do is to show that the revolutionary change towards accurate perception and representation of the natural world has, indeed, once happened, and where and when it happened. The case is well known and is indeed one of the most famous episodes in history. If one looked across west European art in the eleventh and twelfth centuries, it was essentially similar to all those other traditions I have described. It was iconic, mainly religious, with strong symbolism, flat, stereotyped, painting by a code. Although the content was different from Islamic or Chinese art, the aim, to remind people of other things, to present a set of linked symbols, to explore inner emotions rather than the material world, was similar. It was as far away from naturalism, from a photographic representation of the world, as was any other art tradition. Nor were there any obvious signs of something different that was about to emerge.⁹ Then, in the two hundred or so years between 1300 and 1500 there occurred a revolution in seeing and representation to which we ascribe the label 'Renaissance', which set one part of the world off on another trajectory.

The revolution, particularly in painting and architecture, with particular emphasis on pictorial space and perspective, which occurred between roughly 1300 and 1500 is the subject of libraries of books. Many believed that Giotto effected the first transformation, the ability to move from what Gombrich calls 'picture writing' to painting with some depth, for he had 'rediscovered the art of creating the illusion of depth on a flat surface'.¹⁰ Although revolutionary, this was an intermediary stage between the earlier Graeco-Roman art and a new realism which suddenly emerges in the period roughly from 1400-1500. This revolution brings in the rules of perspective, and with it a host of new technical methods. If we look at the art and architecture produced after about 1400 simultaneously in south and northern western Europe, from Alberti, Brunelleschi, Massacio and later Leonardo in the south, and from Van Eyck and Rogier van der Weyden to Pieter Bruegel in the north, it is an enormous shock. It is as if the world has suddenly been uncovered, a layer stripped away. There is enormous clarity, interest in detail, a mirror-like accuracy. The quantity of reliable knowledge purveyed by a picture is increased enormously. Pictures no longer serve principally to remind or signify, they open magic casements upon new worlds. It is like looking through a strong lens at the world. The world is often richer and brighter in the picture than it is in reality. It is as if it seen through a magnifying glass.¹¹

So why and how did this revolutionary change occur in only one civilization - from Italy to the Netherlands - when artists saw and represented nature accurately for the first time? Here we are in for another surprise, since it appears that we lack a plausible explanation for one of the greatest changes in human history. The starting point might be Burckhardt who documented the revolution, describes its quintessence as a new individualism, rejects the revival of classical

⁹ See especially Bunim, but also...

¹⁰ Gombrich, Art, 144

¹¹ Cite a few of the classic works on - and pictures.

learning as its main inspiration, and so leaves us with another description of what happened, but not why.¹² Gombrich likewise documents the transformation and that it happened nowhere else. But again we have no explanation of why it happened.¹³ A glance at other more recent books by historians and art historians do not take us much further.¹⁴ This is obviously an immensely complex problem, and there are likely to be numerous chains of causation. Our task here is just to look at one of them, which has often been ignored, in other words the role of glass in providing both the jolt and technical support for a re-alignment of vision.

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While it is true that we see realistically and children without lessons can represent the world quite realistically in perspective, there is more to it than that. As Gombrich shows, it is difficult to turn such knowledge and fairly elementary ability into a convincing representation that will give others the illusion of real space and form. To proceed far, requires making the implicit more explicit in the consciousness. But while it is difficult, it is not impossible for a person to work out the method for themselves, as our examples including Giotto have shown. Yet to transform this achievement into a movement which will alter the world, as the Renaissance did, requires three added features.

One is an audience that wants to be 'deceived' into thinking that what is in fact two-dimensional seems to be three-dimensional. Here is one of the great differences. It is well known that Plato felt that realist, illusionary, art should be banned as a deceit and most civilizations have followed Plato, if for other reasons. Let us look briefly at two of the most famous examples. For the Chinese (and Japanese) the purpose of art was not to imitate or portray external nature, but to suggest emotions. Thus they actively discouraged too much realism, which merely repeated without any added value, what could anyway be seen. This could be documented, for instance, from Lawrence Binyon's excellent works.¹⁵ A Van Eyck or a Leonardo would have been scorned as a vulgar imitator.

Another example comes from parts of the Islamic tradition. This is one example of a widespread ban on realistic artistic representations of living things above the level of flowers and trees. This was, at certain periods banned as a blasphemous imitation of the creator's distinctive work.¹⁶ Humans should not create graven images, or any images at all, for they thereby took to themselves the power of God. Again, van Eyck or Leonardo would have been an abhorrence.

¹² Burckhardt, Civilization...

¹³ See Gombrich, Illusion, History and other works.

¹⁴ Cf. P.Burke, John Lerner, John Hale and many others who have written on the Renaissance...

¹⁵ Binyon and other works, and see chapter xxx below.

¹⁶ See Goody, xxx and others on icono-phobia.

Even mirrors can be an abomination, for they create duplicates of living things.¹⁷ So in considering the development of the extraordinary movement in the West, we always need to bear in mind the wider cultural setting. That is to say we have to consider the audience and the general view on the role and limits of artistic work.

The second factor is how the prospective patrons and customers themselves saw the world in their normal life. It is one thing to see an actual three-dimensional external world realistically; it is another to 'read' a two-dimensional, artificial, representation of that world in a way which tricks the mind into suspending disbelief sufficiently to feel one is seeing a slice of reality. It is constantly stressed by art historians that the audience has to be taught to read realist (or any other) form of art. [There is a nice anecdote about a Chinese gentleman who came to 'see' how a perspective drawing of a box was not lop-sided...; see also the story of the Chinese visitors to a western art gallery...] The audience also has to want to be tricked by artists. So in order for such art to spread two things have to occur more or less simultaneously. The artist has to educate his audience, to shape them so that they can read his work. At the same time, there has to be enough in what he portrays which is in conformity with their vision for the audience to feel attracted to his work.

Here we may be getting closer to an area where the development of glass technologies began to have an effect. It is conceivable that the widening experience of seeing the natural world more realistically and intensely, in better mirrors, through window frames, through spectacles in older age, may have tipped the balance just enough to change the world. That crucial bourgeois patron group who bought and exhibited the new art now found it meaningful and attractive. Their experience made them feel more like cameras, and they adored the painters who captured for them the world on a glass plate. As Mumford asked, 'what was the new easel picture, in fact, but a removable window opening upon an imaginary world?' Thus glass was 'in fact the peep-hole through which one beheld a new world'.¹⁸

The third factor is related to the development of the technology of enchantment, as Gell calls it, or what, after Gombrich, one might call the illusionist technology.¹⁹ There are several aspects to this. One concerns the replicability of realist art. That is to say, how easy is it for someone who is not a genius like Giotto to be able to deceive other people's eyes into believing they are seeing the three-dimensional world on a two-dimensional surface? Another aspect of this is the need for an explicit methodology to make it possible to explore the more difficult areas of realism and to lay down the rules so that gains in knowledge are not lost. There is a long way between even the eleventh century Chinese drawing or Indian painting, and the work of Van Eyck or Leonardo.

¹⁷ See for example, Borges and others.

¹⁸ from Mumford, *Technics*, pp. 124-131

¹⁹ Refs. to Gell and Gombrich.

Let us look first at the question of replicability or multiplication. As Alberti, Leonardo and Durer, among others, fully realized, the new realist art would only flourish if its principles were made explicit in a set of manuals which would spread the techniques from geniuses to the merely talented. Not everyone was a Giotto or Van Eyck, so it was essential that people understood, in detail, how to look at nature, how to translate what they saw onto paper or canvas, and how to deceive the eye of the beholder into seeing the same thing. The rules they were to learn, as we see from the manuals, were largely mathematical, concerned with the properties of light and the nature of the eye.²⁰ An artist had to have a course in basic geometry and optics. And where had these rules come from? The writers of manuals openly acknowledged that they had come from Greek sources, through Arabic scholars, and been made useful by medieval scientists like Pecham, Grosseteste, Bacon and Witelo. To what degree these later authors realized that glass in the form of lenses and mirrors had been an essential tool for these philosophers is not clear. Yet there can be no doubt that at this point there could not have been a set of rules for them to follow without the philosophies developed with the aid of glass.

A further aspect of the technology of enchantment was the elaboration of tools to make the exploration of reality more complete. This is particularly obvious in the work of Alberti and Leonardo, where the same foundation of earlier geometry and optical knowledge is used to work out stratagems to make paintings and buildings in a new way. Although Giotto and some Roman, Indian and Chinese artists had achieved a great deal with craft skills, the extraordinary realism and accuracy of the greatest of the Renaissance artists required further serious thought about the properties of light and space. This then required advanced geometry and knowledge of how the eye might work. This in turn depended on the flourishing of a glass-enhanced science of geometry and optics in medieval Europe. Without this, it is very difficult to see how the Renaissance could have occurred.

The third area lies in the tools that an artist could use. One of these, of course, was the development of oil paints associated with Van Eyck, which allowed new possibilities. Yet less noticed, but I would suggest equally important was the development of tools of glass. These glass tools were important in three major ways.

The first was to provide a shock, corrective or extension to the eye. The main tool here was the mirror. As many have pointed out, we tend to become too familiar with the world around us. The mirror throws it into a new light and, in a curious way, makes it more intense. This has often been commented on - and some comments can be included. We, and particularly artists, see the world differently with a mirror. It was for this, among other reasons, that Brunelleschi used a mirror to make his dramatic break-through in architecture known, or Leonardo called the mirror the 'master of painters'.²¹ It is no accident that a mirror is the central device in two of the

²⁰ Examples of manuals by Alberti and co.

²¹ Leonardo, On Painting, xxx

greatest of paintings - Van Eyck's 'Marriage of Arnolfini', and Velasquez' 'Les Meninas'.²² It was a tool that could be used to distort and hence make the world a subject of speculation. It was also a tool for improving the artist's work, as Leonardo recommended. Holding a painting against a mirror corrected defects. Finally, it gave the artist a third eye, an eye on a stalk as it were, so that he could see himself.

A second way in which glass was important was in framing and fixing reality. This is the area where panes of glass rather than mirrors are important. A painting is a window into another reality, and the window here is not just a metaphor. The magic casement through which one looks into three-dimensional space was an increasingly everyday experience of Europeans from the fourteenth century as good window glass spread. In a civilization where oiled or mulberry paper was used, as in China or Japan, the idea of sitting inside and looking through a small, painting-sized, aperture which focused a scene would hardly be developed. Either the wall was taken away completely, as with a **shoji** or window screen and one was, in effect, outside, or one was inside with whiteness between one and the outside. Yet for richer Europeans, houses became like camera lenses or peep-shows; one sat in muted light and looked out on the richness of colour. Or, as in Dutch interiors, one looked into rooms filled with light through the windows. Whichever way the influences worked, and they are beautifully explored in **The Window in Art**, windows with glass and the Renaissance seem deeply linked.²³

The window-like panes of glass had another effect. The major development in perspective in the fifteenth century, which we are told was a vast and unprecedented step, was when people began to conceive of the painting as if it were a pane of glass that cut across sight.²⁴ Leonardo has a famous piece on this, on the transparent cross-section in the cone of sight that bisected vision.²⁵ This is half metaphor and model, half a practical technique. What it did was to make two things possible. Firstly, one could now work out the exact mathematics and angles for correct perspective, as Alberti, Leonardo and others did. Secondly, if help was needed to put this new technique into practice, one could actually paint or sketch on the glass and then transfer the marks onto paper later, with exact measurements. Sometimes Alberti's famous invention, the 'veil' (made of threads) was used, but it was explicitly stated that this was really a sort of window without glass. So the flat pane of glass in the window was essential for both working out solutions to problems in perspective and to help the weaker brethren do really excellent perspective drawings. Again, one wonders where the developments would have gone if windows had been covered in strong white paper.

A third area which will not concern us here, but is of broader interest, is the use of various other devices, the **camera obscura**, the Claude glass (a form of mirror) and so on, all drawing

²² See xxx

²³ Ref. to Window in Art.

²⁴ refs. to the literature

²⁵ Leonardo, On Painting, xxx

on optics and experiments with mirrors and prisms. They were important in early optical experiments by Al Hazan, and later used by great artists, for example XXX in Holland.(ref) and XXX in England.

So one could argue that while we all see the world in perspective, it is very difficult to work out what we see just by looking at the thing itself. Rather as one cannot look directly at the sun, but look only at its effects, one has, ironically, to look through the artificial medium of glass in order to see the world as it is (which is, of course, the theme of **Alice Through the Looking Glass**). If this is correct, then glass becomes as important in clearing our vision and showing us our world as it really is, in relation to seeing and representing, as it was in the other sciences where the mirror, prism, lens and later the telescope and microscope clarified vision.

In all these cases the human eye, weak and entangled with the interpretation of the brain, cannot see clearly. It cannot see the constituents of light, or how it bends; it cannot see objects below a certain size or beyond a certain distance, though they are there in front of the eyes. At the deepest level, the eye sees the world through a glass darkly, that is an eye is a glass with its own distorting lens and interpretative frame. It is as if all humans had some kind of systematic distortion like myopia, but one which made it impossible to see, and particularly to represent, the natural world with precision and clarity. Humans normally saw nature symbolically, as a set of signs, not for what it 'really' is, undisturbed by the mind. What glass ironically did was to take away or compensate for the dark glass of human sight and the distortions of the mind, and hence to let in more light.

However gifted the artist, if he looked and painted, he ended up seeing and painting in symbols, like almost all those before Giotto. But if one was forced to follow nature, by painting, copying, photographing so to speak, exactly what was there on a pane of glass, or painting an existing painting done by a mirror, in other words copying rather than painting, miraculously it would be more accurate than a painting of nature itself. Once done, one could work out why that should be so. One could establish the artificial rules which would deceive other human eyes into thinking that what was represented on a two-dimensional surface was a three-dimensional mirror or photograph of nature.

If this connection between sophisticated glass technology and the new realist art is correct, it is not surprising to find that Italy in the fifteenth century was at the fore-front of the new vision. The Venetian glass industry was a glory of the world; the wealth of the small, competing, courts was invested in conspicuous consumption. All one had to add was luck and chance, for example Brunelleschi's accidental discovery of the virtue of the mirror, originally developed for another purpose, to give a picture of what a new building in situ might look like. The similar wealth and highly-developed glass industries of northern Germany, France and the Netherlands gave the new vision its other home.

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Yet the links between glass and the Renaissance do not end here. Long ago the great historian Burckhardt suggested that one central feature of the Renaissance was a new concept of the individual, unique to the west and to the period from about the fourteenth century.²⁶ While many have subsequently queried the dating, suggesting that the heightened concept of the individual probably went back to the thirteenth and perhaps twelfth century, it is usually agreed that this tendency towards stress on the individual grew stronger and reached its peak in the fifteenth century onwards.²⁷ What seems indisputable is that a great shift took place. As Mauss famously described it, "From a simple masquerade to the mask, from a 'role' (personnage) to a 'person' (personne), to a name, to an individual; from the latter to a being possessing metaphysical and moral value; from a moral consciousness to a sacred being; from the latter to a fundamental form of thought and action - the course is accomplished."²⁸ So a great change occurred sometime between the twelfth and sixteenth centuries. Could this also have been connected to glass?

²⁶ Burckhardt, *Renaissance*, esp. I, 143

²⁷ On the early roots, see Gurevich, *Historical*, 88 and Morris, *Discovery of the Individual*, passim; on its flowering later, Abercrombie et al, *Sovereign*, 67

²⁸ Reprinted in Carrithers (ed.), *Category*, 22