Leonardo as a link from Classical to Modern Theory

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Through his part in the development of spatial colour theory, Da Vinci provided the link to allow colour theory to progress into the Modern era, and acted as a symbol of the wider movement to a new kind of theory. This reached its greatest speed in the Renaissance, when there was an overhaul in the fundamental ideas theory was based on. I propose that Da Vinci acted as a bridge for Spatial Colour Theory to move from the "Metaphysical Perceptualist" theory of the Classical period, to a Modern form of theory.

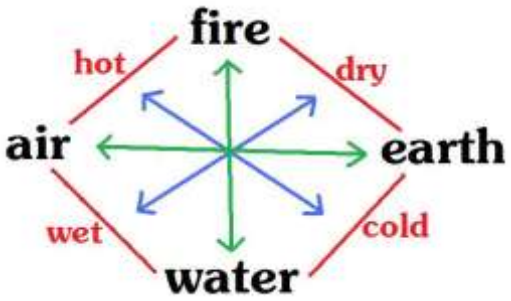
My relationship with colour theory as a painter has always been a peripatetic one, with its importance constantly being reconsidered in the grappling between theory and intuition. This dissertation will be an inquiry into how this relationship with theory came about, with the formation of the first spatial colour theory. I will be focusing on the origins of colour theory, and its development in the Late Renaissance period. This is the time that many of the ancient texts were made available for the first time, and was also a boom time for theoretical development in the field.

Classical Colour Theory; Theory as Belief

Colour was the root of some of the very first theories of painting; it was present at the beginnings of the rational examinations of the world, and formed the basis of attempts to understand the phenomena of the senses.

From pre-Socratic times there are reports of colour being explained by links to its metaphysical "humour", and the sense that colour lay very close to the foundation of all things pervaded theories of those such as Empedocles, who is thought to be the originator of the four elements; earth, wind, fire and water. Empedocles called them *roots,* and were later renamed *the elements* by Plato (Aristotle, 1898).

It was not until Aristotle's treatise on the senses, *De Sensu et Sensibilibus*, that a cohesive attempt to understand sight and colour was formed. The text's title, roughly meaning "On Senses and what is Sensed", lays down the remit of the treatise as an attempt at explaining each of the senses in turn, in what they do and how they function. Despite being the forward-thinking and ground-breaking text, it was still deeply rooted in pre-Socratic metaphysical ideas. Aristotle's explanation of the basis of colours, like Socrates's explanation, was based on the idea that everything was formed from one of the four elements; earth, wind, fire and water, and that each of these had two "humours" as constant characteristics. This was the common understanding of everything in existence at the time, so it is no surprise that this is where the basis of the colours was formed. "Fire" Aristotle explains in *De Sensu*, is by essence hot and dry, the latter it shares with earth, and the former it shares with air. Empedocles arranged them diagrammatically in relation to each other thus (fig. 1), so that the four "humours" would oppose their opposite forming a *chiasmus*, a literary convention used in oratory, where the positioning of the words adds strength to their delivery, in this case it adds potency to the statement that these opposites will cancel each other out.



(1) A copy of Empedocles's diagram of the elements, (Aristotle, p133)

In his text, *Timaeus*, Empedocles stated that fire lay at the basis of sight, and he believed that the fire contained within the eye shone out a cone of light, and made the external world visible;

"And lies hid 'neath the screens of the spherical fashionëd pupi. These keep in check the ocean of water that circles around it, But the fire pierces through," (Aristotle, 1898, 438a 1)

Aristotle forwardly proclaims this as being "absurd", and that it is "obviously better" to say the sensation is due to the characteristics of the object you are sensing, as well as refuting his theory on the grounds that surely the water and fire present in the eye should cancel each other out (Aristotle, 1898, 438a 26). Empedocles's theory is also incomplete, sometimes returning to the explanation of senses functioning via "effluxes"; mysterious forces that carried impressions to the senses. Aristotle claimed that the separation of these two explanations was unsatisfactory, since he desired all theories to be interconnected (Aristotle, 1898, 440a 17).

Within Aristotle's own theories, each sense was embodied by one of the elements, (with touch and taste considered as parts of the same sense), with each following very similar reasoning (Aristotle, 1898, p134). In his commentary written around 200 AD, Alexander of Aphrodesias comments that "The presence of fire causes the existence of actual light" (Aristotle, 1898, pp. 21) and that colour or visibility is not innate in any object, but has to be "raised to the state" of visibility by the "presence of fire in it." (Aristotle, 1898, pp. 20). The allocation of the elements progresses, with earth allocated to the

body of all objects, and air and water constitute the "manifestation of colour" that "exists in the boundary or constitutes the boundary of a thing" (Aristotle, 439a 32).

What came next was the bit that makes Aristotle's theory something radically new, and separate from the writings of Empedocles. Aristotle proposes a scale of colours, where each hue would relate to the next, by dint of its mixture of black and white, through which they would be created. This is the first theory which rather than stopping at understanding the basis for the colours, or understanding how we come to see them, a theory was put forward to impose a structure on them. This is not an explanation, but a mode for use, a means of categorising that never went out of use.

The scale itself was somewhat different to the chromatic scales we use today, because its categorisation was largely tonal, where the colours that were darkest when pure (eg. blue) were put toward the black end of the spectrum, with colours that were paler when pure (eg. yellow) at the white end of the spectrum. He did not attempt to detail the formation of individual colours, but explained that "chromatic tones are obtained by a mixture of substances that already have the basal tones of white and black" (Aristotle, 1898, p154). Richard Sorabji analyses in *Aristotle, Mathematics, and Colour* that "elemental fire would be counted as white", and that "elemental earth as black. For he thinks that the fieriness in a body that makes it white, and the absence of fieriness which makes it black"(1972, pp.293).

Aristotle proposed that all colours were attained by different proportions of elemental fire and elemental earth, and from this mixture of black and white in different proportions different colours would be produced.

To continue with Aristotle's aesthetic of interconnected theory, he proposed that this scale works much like scales of musical notes. He detailed that through minute divisions of the mixtures of white and black, the whole diversity of colours could be attained, and that this mixture "may be analogous to harmonies". He predicted that those colours formed of the

"simplest proportions, exactly as is the case with harmonies, will appear to be the most pleasant" (Aristotle, 1898, 439b 33). The concept of colour in a musical scale created a storm of excitement amongst philosophers, however the theory did not have the impact on painters of the day that it would come to have in the Renaissance (Barasch, 1978). When the text was republished amongst radically increased literacy rates in the 1400's, the concept was so popular "nearly every writer on colour, artists and writers alike, proposed a variant of it" (Barasch, 1978, pp.172). New sequences of colour and lists of colours abounded, but very little new colour theory was being written.

The only other contender as a major treatise on colour from the Classical period was *De Coloribus*. Published shortly after *De Sensu*, it was often grouped with Aristotle's treatises, however it is now universally agreed that it definitely "was not written by Aristotle" but later "assigned to both Theophrastus and to Strato" the two leaders of the Peripatetic school of philosophy that succeeded Aristotle, but there is "really no evidence upon which to determine authorship." (Hett, 1955, pp.3)

The *De Coloribus* which for now we shall assign to Theophrastus, is a short practical text, mostly extending the idea of Aristotle's that colour is held in the air and water that surrounds objects and forms the perimeters of objects. The text, largely based on the practices of dyeing, makes the first attempt to explain how some individual colours come about, by "moisture penetrating through [objects], and washing all colours through with it, produces all the possible colours" (Hett, 1955, pp. 27), with extensive examples of colours in nature changing due to a change in the amount of air or amount of water present. These included examples from fruit ripening, and hair changing colour with age, to bird's plumage changing colour at maturity.

In the text there is a brief section of decisive theory, where it is notably stated that:

> "We do not see any of the colours as pure as they really are, but all are mixed with others; or if not mixed with any other colour they are mixed with the rays of light and with shadows" (Hett, 1955, pp.17)

The implication of this is that the colours we observe are not finite mixtures of restricted numbers of the humours and elements. They are not fixed points in a scale of colour made of entirely separate substances, but a sweeping undefined spectrum. The author recaps later that:

> "All colours are a mixture of three things, the light, the medium through which the light is seen, such as water and air, and thirdly, the colours forming the ground, from which the light happens to be reflected." (Hett, 1955, pp.19)

This acknowledgement of the role the atmosphere plays goes a long way towards the understanding that colour is a visible attribute of all things, and not just the surfaces of objects. This is also possibly the first time in writing that the Empedoclean concept of the separation between "real" and an "apparent" colour is refuted. For millennia, the colour of objects and the colour of light were seen to be entirely separate entities, working in separate ways. It was assumed that the colour of a spoon, was a "real" colour, one given to an object with substance, but the light of the sun, a shadow or a rainbow was an "apparent" colour, and was a trait of the "effluxes" mentioned in Empedocles's previous theory. Theophrastus made the observation in De Coloribus, that this could not be true since the colour of the spoon itself would look different when "seen in the light of the fire or the moon" (Hett, 1955, pp.17).

In ancient Greece, literacy was a preserve of the highly elite and philosophers themselves. These speculations on colour and vision were still the preserve of

science, and not meant to have any bearing for artists of the time whose fare was semantic associations and traditional storytelling.

For a long time, the metaphysical basis for colour theory meant that it was left behind, as the study of optics branched out into two schools; the Metaphysical Perceptualist study of optics, with its roots in *De Sensu* was increasingly challenged by Euclid, and the Geometric school of optics.

If we strip Aristotle's theory of both its subject, and its basis, we understand it as purely a revolution in the structuring of colour. However, *with* the basis of Ancient Greek metaphysics, these theories were often seen as no better than extended belief-systems. Without going back to the basics, evidence was used to fit the Perceptualist manner that was understood. Therefore, the theories of Aristotle and other early philosophers, could never be tools to understand colours in the abstract, they will always be shaped by the beliefs these ideas were founded on.

Renaissance Colour Theory; Theory as Artistic Ideal

For a theory pertaining to the use of colour, we have to wait 1700 years. Since Aristotle's *De Sensu* and Theophrastus's *De Coloribus*, little is written about the spatial uses of colour.

Leon Battista Alberti's *On Painting* revolutionised the use of Geometric optical perspective, and radically popularised this mathematical form of perspective, while the Perceptualist, colour-based perspective left to languish. Its problem lay in the fact that Aristotelian colour theory was foremost written as a scientific text, and so as the sciences progressed far away from the Ancient elements and humours, the metaphysical basis for *De Sensu* meant that it lost all validity in the scientific field. Therefore colour theory in the field of optics was a neglected area until the Renaissance, when art theory gained a new strength. Within the context of art, *De Sensu*'s grounding in Empedocles's elements was not so damaging.

Like Aristotle, Leonardo Da Vinci was a polymath, and like Aristotle, believed that all things were theoretically linked. I propose Da Vinci formed an essential link in the theory of colour, singly joining the Classical theory of colour, to a new Modern style of theory that harmonised with the rise of the creatively expressive artist.

Since Aristotle there had been a great amount of theory written about primary colours, as people posited their own ideas for the basic ingredients for the colours. This quest quickly moved away from Aristotle's basis in the Metaphysics of Ancient Greece, and became embedded in the Geometric school of optics, focussing on the refraction of light. These were later posited by Plato, and Alexander of Aphrodesias (who wrote the commentary for the copy of *De Sensu* used in chapter 1).

Throughout the beginning of the 16th century, Leonardo was speculating and forming a wide collection of theories about colour and visual phenomena, with a healthy community of writers and theorists. However I am particularly interested in one section of the *Vatican Codex*, the *Hammer Codex*, and the lost text of the *Codex Urbinas*. Da Vinci notably took his ideas recorded in the *Vatican* and *Hammer* codices, and applied them to a number of ancient texts, namely, *De Coloribus* and *De Sensu*.

Fascinated by the ideas of the "participation" of colours and the "transmutation" of colours, Da Vinci took Aristotle's embryonic idea of the colour interacting with the environment, and by detailing his ideas of the composition of the ether, proposed that this formed a pervasive semi-transparent illuminating medium, through which everything distant would eventually become blue with the amount of "illuminated" ether between the object and the observer. Da Vinci's explanation of the movement of light had remained unchanged since Aristotle's theories of a surface being activated by light, but colour then being carried through the ether by its "species" (Bell, 1993b, pp.110). The greater the distance, the less of the colour would be carried far enough to the observer before the "species" lost energy. Therefore very distant things would not be illuminated at all, and would appear black with darkness, except for the shroud of ether which would transmute the colour from black to blue, the next colour on the scale. Da Vinci argued that the air was essentially "illuminating", because of the:

> "infinity of atoms which infuse the air,
> rendering it bright to our eyes." (Bell, 1993b, pp.110)

This proved why the sky was blue, as a shroud of atmosphere over the blackness of space, and also why the blue at the zenith is a deeper clearer blue than at the horizon where there is "a greater thickness of air" (Bell, 1993b, pp.110). Bell considers this explanation to be "an absurdity by modern standards", which I disagree with, because Da Vinci's explanation greatly resembles the Rayleigh Scattering model, which is an accepted model of the effects of the atmosphere on light (1993b, pp.110)..

This joining of Aristotelian theory with a Renaissance attitude to the act of painting denotes the first time that a spatial colour theory, as we would know it today, came into existence. Leonardo's previous studies in his *Codex Atlantica* led him to conclude that the earth's atmosphere is a series of concentric bands, formed of "the liquid that is constantly evaporating from the earth's surface" and that these small quanta of water formed tiny mirrors in the air. These droplets would let the light easily pass through, because they were still "rare", but at the same time scatter the light, redirecting a portion to the observer. This idea of the droplets acting a small mirrors is one of the many instances of Leonardo's close knowledge of Aristotle's writings, especially his *Meteorology* where an experiment is described where water sprayed into a beam of light in a darkened room would display a rainbow (Bell, 1993a). Here it is also concluded that the tiny quanta of water suspended in the air can act as a mirror.

From these ideas of the atmospheric conditions, and with knowledge from *De Coloribus* of the transmutation of colour Leonardo formed his theory of the behaviour of colour in space; his Spatial Colour Theory. Da Vinci set about formulating a means of describing spatial depth of field in painting where geometric perspective is ill-suited.

By applying this notion of the white illumination of the atmosphere "pulling" the regions of shadowed areas from blackness to blue, Da Vinci divided the pictorial realm into four separate areas (fig.2). These would segment the space into zones of atmospheric intervention, which would determine the instructions for the painter. In the first zone comprising the foreground, very little atmosphere intervened, and so strong naturalistic colours would prevail, then in the second area of distance, a slight element of blue. Then for the third furthest area of distance a strong use of blue was advised, until the fourth area of far distance required a pervasive use of blue with white to make forms less precise.

(2) Leonardo Da Vinci, *Madonna of the Yardwinder,* (1501) Displaying the zones of Da Vinci's colour perspective.

In comparison to his other works, this is a very minor theory of Leonardo's, but instrumented the transformation of this theory from Classical theory, to Modern theory. His part in the shift was not one that affected great change in what work was produced, or through influencing popular thought, but it carried one line of theory from one great era to the next, ensuring its survival. At a time when Euclidean geometry and geometrical optics were one of the most popular strands of theory present in Renaissance art, the idea of spatial colour could easily have been left to the Antiquity.

Da Vinci's theories, however, are marked by a certain rigidity, whereby the theory is almost more sublime than anything that could be done by following it. These are works that seem particularly "led" by the theory, which may have been apt for some painters wishing to attain the grace of god in their painting; however this was soon to be at odds with the role of the emerging artist. Soon on the horizon were the Mannerists, not depicting the height of excellence and the grace of god, but the turmoil and chaos of the times, actively seeking an "anti-classical" and painting-led form of theory (Friedlaender, 1990).

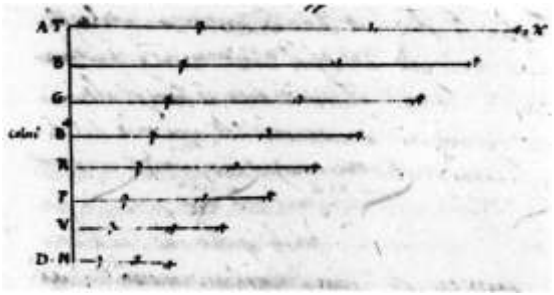
Modern Colour Theory; Theory as Working Method

With the artistic freedom of the Mannerists, where artists are aiming for things other than a saintly truth, comes a new relationship between painters and painting theory. Theory, rather than a rule book, by which to achieve perfection, began to evolve into something more like a tool.

Zaccolini took this notion of theory as a tool and started to rework Da Vinci's theories of Colour into a fully useable theory to work by in painting. Zaccolini would have undoubtedly been informed by his practise as an artist, but since none of his works survive, he is now mostly known for his written texts; *De Colori*, *Prospettiva del Colore*, *Prospettiva lineale*, and *Della Descrittione dell'Ombre prodotte da corpi opachi rettilinei*. Being well read, it is highly likely that Matteo Zaccolini was aware of Aristotle's works, and we know that he had a close knowledge of Da Vinci's writings on colour, in both his Manuscript A, and his journals (Bell, 1991). Much of what we know about Da Vinci's writings on colour come from Zaccolini's writings, because the key texts, including Da Vinci's own on treatise on Colour, and the vital *Codex Urbinas*, are both lost today. One copy of the *Codex Urbinas* remains in the Vatican Library, but is locked away from public view. We will be focusing on his *Prospettiva del Colore*; his Colour Perspective, published in 1622.

Zaccolini proposed that rather than everything uniformly turning blue at a certain distance, as had become popular with Da Vinci's theories and Italian mannerist landscape paintings. He proposed that each colour would turn blue at a different distance depending on how close it was to black on the colour spectrum. So that not only did "each hue transmute at a different distance" dependant on what we would today call the frequency, but also took into account the colour of the light falling on the subject (Bell, 1993b). Zaccolini

advised painters to take the method of dividing a landscape into 4 sections of distance, and apply his method to each individual colour, rather than across each "zone" of the picture. In the foreground full colour was advised, to add vibrancy and bring the subject to the surface. In the second, a bluish tinge is advised in the shadows, in amongst the original hues of the scene. In the third zone: an element of blue to be added in the light areas with an increasingly strong blue in the shadows. In the final area of distance a blue and white mixture should pervade both light and dark areas. The main revelation of Zaccolini's theory, was that by extending the notion from De Coloribus of colour as one single sliding scale, to Da Vinci's investigations into the action of environmental factors into colour, Zaccolini actually got quite close to prefiguring how Modern day understanding of light frequencies. With Zaccolini's sequence of each hue transmuting at a different distance there would be no point that affected every colour at once. When the dark greens and blues are in the 4th zone, an orange may still be in the 2nd zone and the white in the 1st zone. So rather than four distinct areas of a painting, Zaccolini envisaged a gradual tactile and pervasive altering of the palette.



(3) Zaccolini's diagram of the comparative precedence of colours, from *Prospettiva del Colore*,

Zaccolini used this diagram to visually depict the process of each colour "transmuting" at a different point. By looking at a vertical cross section of the diagram, you notice that there is no point at which all colours are in the same zone at once, and was included by Zaccolini to be used as an immediate visual cue for painters to work with. With this structure the painted image would look nothing like Da Vinci's four zones of blue, which Zaccolini felt left the

image overly "abrupt" and disjointed, and much more like a gradual transmuting of the palette across the whole picture plane (Bell, 1993b, pp.103).

Like the diagram, the ideas in Zaccolini's theory, were meant as a practical, flexible working guide, he advised that they were supposed to be "general guidelines to increase awareness, not as a systematic procedure for practice" (Bell, 1993b, pp.98). The four stage landscape was not something new in 1620, and Zaccolini openly professed that he was "merely recording what the best painters were already doing" (Bell, 1993b), and wanted his writings to "serve solely to open the eyes of the painter" and make him aware of the "force and truth of the picture of nature" (Zaccolini, 1622).Bell goes on to remark that this shows his "free attitude toward the purpose of rules" which distinguishes him from his "Renaissance predecessors, such as Leonardo", who's theories were much more inflexible, and seemed to precede the act of painting (Bell, 1993b).

We can see in the illustrations below, how notable the presence of the pronounced divides in the painting by Paul Bril dominate the image (fig. 4). The Painting is called "Fantastic Landscape", making note of how the image is defined by its fantastical and unreal vista, overshadowing any of the other elements, including the narratives of the people in its foreground. With Pieter Brueghel the Elder's epic landscape (fig. 5), a colour perspective much more akin to Zaccolini's method exaggerates the enormous distance of the journey introduced in its title. The distance in *Landscape with the Flight into Egypt*, is elongated by the gradual, almost imperceptible gradation into blue, where no harsh lines break up the space as with Paul Bril's treatment of the Da Vinci perspective. We can even note on the promontories in the middle of the picture plane, the inclusion of softened earth tones in amongst the other colours that have already transmuted to blue.

We cannot state any direct link that Pieter Brueghel must have been influenced by Zaccolini's writings, but what these two paintings illustrate, is the value of the delicacy and flexibility of a painting theory. We can clearly see how the rigidity of the Da Vinci method creates an outlandish over-dramaticism, which is in danger of dominating anything else in the image,

whereas the flexibility of Zaccolini's method lends itself to be used as a subtle element that pervades the image without dominating it.

(4) Paul Bril, *Fantastic Landscape* (1598), Da Vinci's Perspective.

(5) Pieter Bruegel the Elder, *Landscape with the Flight Into Egypt* (1563), Zaccolini's Perspective

One rival spatial colour theory that was a contemporary of Zaccolini's, was the Quadratura School, practiced most famously by the Alberti brothers. This form of attaining distance through colour was largely practiced in the form of frescos, on the oculi and lunettes of high vaulted ceilings, though also translated into many painting practises. This used a gradation of both hue and saturation, with the most intense hue forming the foreground, travelling through yellow till white at the distance. Bell described the visual affect as; "Contrast of pure colour versus lightened colour, modelled relief versus flatness, distinctness versus vagueness" (1993b, pp. 103). You can see the effect in this painting by Herman Van Swanevelt (fig. 6) with the division of each rocky outcrop formed by a change in the saturation of the hues, stepping to a

misty distance, with all the definition of forms relinquished to the uniform neutral hue.

(6) Herman Van Swanevelt, *Huntsman at Rest*. (c. 1640) Quadratura School.

Using colour to define space is an area of particular fascination for me, as a painter in the 21st century, I find myself constructing my own theories and methods of manipulating the elements within the painting. I often desire a pictorial space which is conflicted or confused, which I try to achieve by using different descriptors of pictorial depth to contradict each other, creating a sense of a "trapped space". I try to achieve this by utilising both geometric perspective and colour perspective in conflict with each other, contorting the spatial field of the painting into something enclosed. The elements of spatial colour, and colour perspective that I use are somewhat different to those of Zaccolini and Carracci, but employ the same attitude and analysis of the natural properties of colour, to use and manipulate in images. The notion of examining and analysing the qualities of visual elements in painting, is something that I find essential to my painting today, but is deeply rooted in the renaissance painting theories.

The theories of Zaccolini and Carracci represent the beginnings of reading pictorial elements in the abstract. That is, to not see elements as what they represent in real life, but seeing elements of the picture as things that can be manipulated to make a point. These theories also came at a very particular

time in western painting. The exact beginning and nature of the Mannerist movement is still debated, many place its beginning around 1540, however Walter Friedlaender was able to "recognise earlier manifestations of the 'anti-classical' spirit" and situate the origins of Mannerism "precisely around 1520" (Friedlaender, 1990, pp. xv). Rather than aspiring to the most accurate imitation reality, this era would see artists claiming a riotous freedom to express movement, sentiment and unease in the structure, colouring and "treatment" of their subjects. The spirit of "anti-classicism" would see painters striving for a freedom from the regularity that typified the early-renaissance style. Friedlander argued that "the irrational spatial constructions" represented a "deliberate denial of the classical aesthetic", and a will to redefine painting theory by their own requirements (1990, pp. xv). In this way, these Renaissance theorists started a relationship with theory that would later lead to the ideas of Cezanne, of Picasso, the Impressionists and countless other ideas in painting.

Cezanne in particular seems to have shared an affinity with the spatial colour theories of Zaccolini, in his paintings of distant scenes. Where Zaccolini mentions that:

> "it would be a good idea for the painter to place some blue at every grade of distance, manifesting the subtle distinction of its gradations with the sweetness of the half-tones,"
> (Bell, 1993b, pp.94)

(7) Paul Cézanne, *Mount Sainte-Victoire view from Lauves*, (1904-06)

I do not think we can draw any direct links from this, or derive any direct influences, but we can get a sense of how the artistic attitude towards the use and manipulation of colours, was fully formed with Zaccolini's ideas, and marked, with mannerism, the beginnings of "modern" painting theory.

Conclusion

In conclusion, as we track the gradual shifts and unpredicted leaps of an idea, it becomes apparent that the development of any theory is approximate and post-the-fact. What we really see is the relationship of artist to theory through each writer's own context. To speak of the universal relationship of the artist to theory is a fallacy when the relationship is not determined by the theory, but by the time and the artist. The beginnings of the evolution of colour theory took place in a very different place to the one where it bloomed, but what remained was the will to examine and analyse the behaviour of the visible world.

It was seen in chapter one, however, that theory for the sake of theory will soon be left to stagnate if it does not have any link to the minds and the actions of those that would carry it on. Colour theory was only continued when, with the renaissance, it had a new link to the inquiries of artists and the processes of constructing the ideal vista. With Da Vinci's additions, the theory was sculpted for this new age, however it already seemed out of date. Da Vinci's theory modernised and revived an ancient set of inquiries, but it was not a fully useable theory to work by because the idea outshone the painting. Da Vinci's contribution of this theory was a great one, however he was not the one to fully modernise the theory. Therefore if Da Vinci's contribution was not to create a fantastic theory, it was to simply revive the theory, and pass it on to future painters.

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Appendix

Timeline

Name	Date	Contribution of Interest
Empedocles	490 - 430 BC	Elements
Aristotle	384 BC - 322 BC	De Sensu
Theophrastus	371 BC - c. 287 BC	De Coloribus
Euclid of Alexandria	fl. 300 BC	Euclidean Geometry
Pliny the Elder	23 AD - 79 AD	Alt. Colour scales
Alexander of Aphrodesias	fl. 200 AD	Commentator on Aristotle
Da Vinci	1452 AD - 1519 AD	Colour Perspective
Zaccolini	1574 AD - AD 1630	Colour Perspective