Views and Overviews

Color in Western Art: An Issue?

John Gage

Color is still a relatively neglected aspect of the history of art, although historians have been attempting to address its problems for more than a century. The strongest modern school of color study is that followed largely in Germany and depending upon a tradition of aesthetic formalism and philosophical phenomenology. This article reviews the literature of color, as it relates to the history of Western art, over the past half-century or so, and concludes that a broadly anthropological approach is likely to prove the most fruitful one.

Twenty years ago one of my graduate students at Yale (where I was a visiting lecturer in British art) told me that she would have been happy to work on color, but did not have a methodology for it. Nervousness about methods has increased enormously in the intervening period, together with the growth of art history as an academic discipline; but academics have not always recognized that methods have no autonomous status; they are tools developed to serve particular ends, and it is these ends, rather than the methods, which are the primary subject of debate. I have argued elsewhere that the study of color in art must draw on a wide range of other disciplines1; and these days, interdisciplinarity is a fashionable notion. Yet a glance at the literature of the humanities as well as of the sciences will show that they have their own purposes and dynamic, which are not necessarily those of the history of art. Art historians must use whatever they consider appropriate in the findings of scholars in many other areas to pursue the aims that only they can identify as their own.2

I have introduced these generalities at the beginning of a review of the literature of color because color, in spite of a widespread belief in the universality of certain color ideas, is, like all formal characteristics, ideologically neutral. It can be seen to have served a very wide range of aesthetic and symbolic purposes; and the same colors, or combinations of colors can, for example, be shown to have held quite antithetical connotations in different periods and cultures, and even at the same time and in the same place. The politics of color as a subject of study has had a lively history since at least the early nineteenth century, when Romantic commentators on the Norse Edda interpreted the three-color rainbow bridge of Bifrost as symbolizing the three social divisions of nobles (gold), freemen (red), and slaves (blue).3 These color-coded social divisions have been revived more recently by Georges Dumézil to bolster his now rather discredited analysis of the social structures of the Indo-Germanic peoples.4 More fundamental as well as more urgent are the values attributed to black and white in many Western societies, values that have continued to underpin racial prejudice.5 Recent work on the connotations of black has served to give a more nuanced picture of the values attributed to blackness and whiteness, light

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and dark, not least in Black Africa itself, as well as in the United States. Among European historians of art, there have been occasional and rather half-hearted attempts, in the tradition of Wölflinian formalism, to distinguish national characteristics in the color usages of painters; and some more promising work has been done on the propaganda functions of the colors of national flags.

Within the history of Western painting, the structures of power and influence may be seen in the economics of picture-making itself, in which raw materials played a major role. Since classical times it had been usual for the patron to provide the most expensive and brightest pigments, such as ultramarine, a practice that survived occasionally as late as the eighteenth century. This gives us some indication of a split, particularly developed in the High Renaissance in Italy, between the aesthetics of patrons and the aesthetics of artists. What Vitruvius and Pliny had condemned on the grounds of wanton extravagance was now given a more intellectual inflection, encapsulated in Vasari’s story of the treatment of Cosimo Rosselli by Sixtus IV in the Sistine Chapel, where it was the patron, “understanding little of painting,” who rewarded Rosselli, the weakest painter of the team decorating the upper walls, for having concealed his poor “invention and disegno” under a rich coating of bright colors and gold. It was a moral that clearly appealed to painters, and it was repeated for well over a century as a warning against the mindless abuse of color. The growing field of patronage studies has usually rested on some perceived community of interest between commissioner and executant, at least before the nineteenth century; color is one area where this was manifestly not always the case. But none of the considerations mentioned above has so far impinged upon the social history of art.

In Black Athena, Martin Bernal cites the nineteenth-century racial theorist Gobineau’s equation of the male with white and the female with black, a judgment curiously at odds with the Egyptian and Greco-Roman traditions of painting, in which pale skin was already established as a most appropriate attribute of the fair sex. Feminist art historians might well find much to ponder in the history of color, for in one phase of the post-Renaissance debate about the values of disegno and colore, even when both of them were characterized (as attributes of pictura) as female, color was the “bawd” whose wiles and attractions lured spectators into trafficking with her sister, drawing. In the nineteenth century, the French theorist Charles Blanc stated categorically that “drawing is the masculine sex of art and color is the feminine sex,” and for this reason could only be of secondary importance. When, around 1940, Matisse told a friend that for him the opposite was the case, and that drawing, the more difficult task, was female, he was still insisting on this traditional gendering of polar opposites. The polarities that have, since the eighteenth century, increasingly been assumed in the color systems used by painters have also lent themselves to gendering; about 1809 the German Romantic painter and theorist Philipp Otto Runge devised a color circle expressive of ideal and real values, on which the warm poles of yellow and orange represented the “masculine passion,” and the cool poles of blue and violet the feminine. When this scheme was taken up about a century later by the neo-Romantic Expressionists in Munich, these values were reversed, so that for Franz Marc blue became the masculine principle and yellow the feminine, “soft, cheerful, and sensual.”

Perhaps the most interesting area for feminists to explore is, indeed, the recurrent assumption that a feeling for color is itself a peculiarly female province, an assumption touchingly exemplified in the admission by one of the leading mid-twentieth-century German color theorists, Rupprecht Matthäi, that he left all judgments of color harmony to his

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9 For the ancient practice, see Vitruvius, Ten Books on Architecture vii, 7-8; and Pliny, Natural History xxxv. 30. For an instance in 15th-century Siena, see G. Milanesi, Documenti per la storia dell’arte senese, Siena, 1854, ii, 307, no. 215; and for another in Baroque Rome, see D. Mahon, Studies in Seventeenth Art and Theory, London, 1947, 92. For 18th-century Spain, see Z. Veliz, 154.


11 Bernal (as in n. 5), 343.


wife.16 Such beliefs may have a biological as well as a cultural basis, for it is well known that color-defective vision is nearly a hundred times more common among white males than among white females.17 It is also striking that one of the most important areas of color study in the history of art, the study of dress, is — notably through the work of Stella Mary Newton's Department of the History of Dress at the Courtauld Institute in London — virtually a female preserve; although the most important large-scale work of costume history's ancillary, the cultural history of dye-stuffs, has been carried out in recent years by the chemist Franco Brunello.18 But if the history of costume has been attacked with great vigor by feminist historians,19 so far the history of color has not.

The Formalist Tradition

One of the longest-running debates about color has been its cognitive status: ever since antiquity, there has been a fairly clear-cut philosophical division between those, like Berkeley or Goethe, who considered that our knowledge of the world was conditioned by our understanding of its colored surfaces, and those, like the ancient skeptics or Locke, who regarded color as an accidental attribute of the visual world, and visual phenomena themselves as an unreliable index of substance.20 Cézanne's career as a painter might well be characterized as a sustained meditation on this theme. There is now some reason to think that there may be a biological basis for the belief that the monochromatic or dichromatic components of a visual array furnish us with generally adequate information about that array.21 Monochromatic engraving and photography are the most obvious manifestations of this belief in Western art; but it is a belief that would also help us to understand the persistence of value-based color systems in the West, from Greek antiquity until the nineteenth century, as well as the recurrent debate on the respective places of disegno and colore in painting, a debate that took a particularly philosophical turn in the seventeenth century, when, especially among Italian artists and theorists, the cognitive independence of line and "form" was increasingly claimed.22

As it happens, the only "school" of color analysis in the history of art owes its development not simply to the Kunstwissenschaft of Wölfflin, but also, and more importantly, to the philosophical tradition of phenomenology represented in Germany chiefly by Husserl. Lorenz Dittmann's recent and wide-ranging study, Farbgestaltung und Farbtheorie in der abendländischen Malerei, is only the most important summation of a tradition of Koloritgeschichte that goes back in Germany to around the time of the First World War and has engaged a considerable number of distinguished art historians, including, most recently, Theodor Hetzer, Hans Sedlmayr, Kurt Badt, Wolfgang Schöne, and Ernst Straus.23 Husserl's pupil, Hedwig Conrad-Martius, took the study of the phenomenology of colors out of the psychological laboratory and into the studio and the gallery; away from a concentration on nature and into paintings, where nature was exposed in all its chromatic wholeness. As Dittmann put it,

Conrad-Martius's color-theory shows us again [i.e., after Goethe] that only a developed nature-philosophy, a comprehensive ontology, will be fruitful for the perceptive, thoughtful engagement with works of art. An isolated "aesthetic" will hardly serve, and only occasionally the individual sciences, such as experimental psychology, which are tied down to the empirical.24

Within the framework of a phenomenological study of color in art, the role of light and shade (values) and the role of chromatic elements (hues) has been particularly difficult to distinguish, and it is not surprising that the only classic survey of the field is Wolfgang Schöne's Über das

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18 One of the few studies of costume to address itself specifically to historians of art is by a pupil of Newton's: E. Birbari, Dress in Italian Painting 1460-1500, London, 1975. F. Brunello's most important study is L'Arte della tintura nella storia dell' umanità, Vicenza, 1968 (also in English, the same date and place).
22 See, for example, G. Mancini, Considerazioni sulla pittura, ed. A. Marucchi, Rome, 1956, 1, 162; Domenichino a Angeloni (1632), ed. M. Mahon (as in n. 9), 120; and G.P. Bellori, Vita di Carlo Maratti (1732) in Le Vite, ed. E. Borea, Turin, 1976, 632. A critique of the later development of this view has been offered by L. Venturi, "Su' colore' nella storia della critica," L'Arte, iv, 1933, 228-233 (repr. in Saggi di critica, Rome, 1956, 159-169).
23 For a brief survey of this tradition, see E. Strauss, "Zur Entwicklung der Koloritorschung" in Strauss, 331-341.
Licht in der Malerei, which is still being reprinted after nearly forty years. The hallmark of this school of analysis is immediate confrontation with the object, and a systematic and sophisticated technique and terminology for describing the effects of that confrontation. In his large-scale study, Dittmann has been somewhat dismissive of the work of his only rival in the field, Maria Rzeplinska, whose History of Color in European Painting, he claims, neglects the comprehensive study of individual works. But as his own work shows, his is a method that is fraught with pitfalls. Many of his sensitive analyses are masterly—for example, the paragraph on Millet's Gleaners in the Louvre:

The Gleaners... is dominated by a muted brightness with a brownish and gray-violet undertone. The sky appears tinged with a tender violet, as it were a mixture of the two most evident hues in the picture: the very dull gray-blue and copper-red tones in the headscarves of the bending peasant-women. In the white sleeve of the central figure the light gathers with a "filtered" effect. The unusually restrained colors (which seem to contradict the monumental forms) follow a closely-stepped sequence: reddish tones in the central figure, based around copper-reddish, brownish and bright carmine; delicate nuances of colorful grays in the standing figure to the right: silvery bright blue-gray, olive-gray, blue- and turquoise grays. The color thresholds are kept so low that induction effects are made much easier, which allows the indefinite color-tones to appear as "resonances." Thus the barely definable, shimmering brownish tone of the field in the middle distance takes on a tender pink-violet tone against the gray-scale of the figure at the back, which is echoed again in the slightly darkened foreground.

But a lengthy book made up of such plums, particularly one for which the publisher has (justifiably) chosen the austerity of an unillustrated text, would indeed be indigestible, and there are fortunately not many set pieces like this. In any event, Dittmann soon gets into trouble with his principle of personal encounter because he has simply not been able to examine in the original all the artifacts he wants to discuss. His chapter on medieval book illumination—that most inaccessible of art forms—depends entirely on descriptions by Heinz Roosen-Runge; and, indeed, Dittmann's text in general owes much to quotations from other scholars, such as Hetzer and Badt and, most of all, Ernst Strauss, whose unpublished notes as well as published works (which Dittmann edited) have provided him with a good deal of material. But the visual analysis of color can, in principle, never be at second hand, for different eyes will, as like as not, see quite different things.

This type of detailed visual analysis works well enough for gallery paintings such as Millet's; far more disturbing than the occasional reliance on informed hearsay is Dittmann's almost complete disregard of the context of seeing. The discussions, for example, of Taddeo Gaddi's frescoes in the Baroncelli chapel of S. Croce in Florence, or Ghirlandaio's in the choir at S. Maria Novella, do not so much as mention the stained glass in the windows; and this is the more surprising in that Schöne had devoted a good deal of attention to the problematic effects of environmental light (Standortslicht), particularly in the context of the frescoes and glass in the Upper Church of S. Francesco at Assisi. (I shall look more closely at the question of viewing conditions in a later section of this review.)

In dealing with the painting of the nineteenth and twentieth centuries, Dittmann gives less and less space to his own visual analyses and more and more to the statements of the painters themselves, even to the extent of reprinting Delaunay's short essay on light in its French original and in the German translation by Paul Klee. A belief in the primary importance of artists' views of their own color practice is also a notable feature of the approaches of Strauss and Badt, whose studies of Delacroix and Van Gogh depend heavily upon those painters' abundant writings. But we are increasingly aware that painters are not nec-


30 Dittmann, 290.


32 Schöne, 32-36, 256-265. For the marked effect of the glass on the murals of the Barocci Chapel, see Hills, 83.

essarily privileged spectators of their own works; and when they turn to words, they may in fact be rather less able than other categories of writer to articulate their thoughts about the notoriously opaque world of visual sensation. We cannot but be struck, for example, by the relative poverty of idea and expression in, say, Mondrian’s writings between 1917 and 1944, or Matisse’s between 1908 and 1947, compared to the richness and variety of the work to which these writings ostensibly relate. In the case of Matisse, we are dealing with a far more sophisticated thinker than Mondrian, but we are no less aware of the simplifications that arise from an essentially propagandistic intent. Artists’ statements are not transparent; they must be unpacked like any others. For example, it would have been helpful to have had Dittmann’s commentary on the manifest differences of tone and emphasis between Delaunay’s La Lumière and Klee’s version of it.

Though in my section heading I characterized the German school of Koloritgeschichte rather crudely as “formalist,” it is clearly not formalist in any rigorous sense. Its very ontological background in the writing of Conrad-Martius would have ruled that out. It is true that one of the few classical archaeologists to have been affected by this approach has undertaken the improbable task of draining the symbolism even from archaic Greek color.32 But the search for literary “meaning” in color has been pursued by followers of this tendency not only where we should most expect it, for example in Uwe Max Rüth’s dissertation, Color in Byzantine Wall-Painting of the Late Paleologian Period (1341-1458),33 but also in Gisela Hopp’s monograph on Manet. Hopp’s treatment of expressive color is particularly interesting, because in her analysis of a number of the major canvases, she makes much of the painter’s use of emerald green, a pigment that in German has quite deservedly been named “poisonous green” (Gifgrün). In Le Balcon (Paris, Musée d’Orsay), Hopp saw this green as overwhelming and oppressive,34 and in her discussion of the late Bar aux Folies-Bergères (London, Courtauld Insti-

tute), she was even tempted to identify the characteristically bulbous bottle on the bar to the right as holding green absinthe, and contrasting with the “heated orange” next to it, helping to establish a mood of tension and irritation in the picture. But, as Françoise Cachin noted in her account of this painting for the Manet exhibition of 1983, the green bottle contains not absinthe but the far cosier crème de menthe, which is still marketed in this format.35 The crème de menthe sits very well with the equally identifiable bottle of English beer. Perhaps Hopp’s interpretation of the greens in Manet’s paintings was largely conditioned by her use of this particular German term, and thus raises the question, to which I shall return in a later section, of how far symbolic interpretation may simply verbalize a visual attribute.

Central to the problem of formalism in this style of color analysis is its relationship to a notion of history. Dittmann’s meticulous and highly selective method resists historical generalization; and Schöne has stated quite categorically that the starting point of any investigation must be the impressions made on the modern investigator herself.36 It is not at all surprising that there is a certain lack of historical dynamic in this sort of writing. Dittmann, to be sure, makes historical judgments from time to time, for example, that the seventeenth century saw the fullest development of chiaroscuro,37 or, less plausibly, that color in the twentieth century gained a quite new independence in art.38 But these judgments are quite ancillary to the detailed characterization of a selection of “key works.” Sometimes Dittmann is struck by what seems to him to be the earliest significant use of a particular hue. Brown is a particularly interesting case in point. As a nonspectral color, brown has been especially resistant to theory, and philosophers and experimental psychologists have generally argued that it is simply a darkened variety of spectral yellow.39 But, although it may be perceived to be unmixed,40 brown also has a very wide range of affinities with the long-wave spectral colors yellow, orange, and red.41 Traditionally, and in some European cultures until remarkably recently, it has,


35 Hopp, 85ff; Cachin, 478.

Schöne, 5.

37 Dittmann, 195; he draws here on the obsessive but very well-documented discussion by Verbraeken.

38 Dittmann, 346; cf. also Strauss, 12.


like blue in earlier periods, had the very general connotation of "dark."42 Because of its importance in painting, brown has particularly attracted the attention of the German school of color analysis, beginning at least with Conrad-Martius.43 Dittmann traces the "discovery" of brown as a unifying pictorial device to the late quattrocento in the work of the Pollaiuoli and Signorelli,44 but other scholars have dated its coming of age to the early work of Velázquez and Ribera.45 The identification of this rather later emergence of brown is given a certain force by the undoubted conceptual link between brown and darkness in the seventeenth century, but it is also supported by the evidence of Iberian treatises on painting in this period, which list an exceptionally large number of earth browns as habitually in use.46 It is this sort of contextual material that is needed to turn visual analysis into history.

The Substance of Color

*Koloritgeschichte* is notable for a certain reluctance to consider the material condition of the works of painting it chooses to analyze.47 Yet perhaps the most important developments in the study of painterly color in recent years have come from conservationists, who have been making the results of their campaigns increasingly available to the general public, as well as to historians of art. Technical discussions have become commonplace in exhibition catalogues dealing with all periods of art, and there have been several popular exhibitions on restoration itself.48 It is particularly remarkable that the specialist literature of conservation, such as *Studies in Conservation* or *Maltchnik*, has now been widely supplemented by periodicals that are clearly aimed at a general readership.49 Catalogues of single artists as well as catalogues of particular collections are now likely to be provided with far more technical information than hitherto.50 Not that conservation is likely to give formalist critics much joy: the enormous help that it can give to matters of connoisseurship is hardly matched by its aid to aesthetic presentation; and conservation methods are, of course, a very controversial area among historians of art as well as among conservators themselves. In recent years, the cleaning of some Titians at the National Gallery in London,51 the restoration of the glass of Chartres West,52 and, most of all, the cleaning of the Sistine Ceiling,53 have given rise to much excited debate, which is not, since it is primarily a question of aesthetics, ever likely to reach any settled conclusions. What restoration reports do offer the historian of color is more reliable information than hitherto available about the methods and materials of painting in many historical periods, methods and materials that have often been part of an ideology or mystique of

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44 Dittmann, 70.


46 Veliz, 3, 109, 154. For Spain as an important source for red earths ("Spanish Brown") in the 17th century, see Harley, 120.

47 See H. Jantzen's remarks on Hetzer's neglect of such considerations in his review of Tiziano: *Geschichte seiner farbe, in Deutsche Literaturzeitung*, xlii, 1937, col. 1657. Cf. also Strauss, 9-10. Schöne was certainly less happy about the problems he faced: see, for example, his remarks on Romanesque wall painting, p. 31; and Dittmann (p. 47) expressed reservations about the condition of Masaccio's frescoes in the Brancacci Chapel in Florence, but not, for example, about Titian's *Bacchus and Ariadne* in London (p. 174) or Suarez's *Grande Jatte* in Chicago (pp. 307-308). From time to time Dittmann cites the work of the conservator Hubert von Sonnenburg in his notes, but none of his work appears in the text.


49 Among them are the National Gallery of Art, Washington, D.C., *Re-
technique specific to those periods and to particular places. There have been a number of recent exhibitions of techniques and materials, but rather less attention has been given to tools. The pioneering work of Schmid and Lane and Steinitz thirty years ago on that most important conceptual as well as practical tool of the artist, the palette, has never been developed. Color symbolism itself has sometimes been thought to depend on the qualities of materials; Michael Baxandall has pointed to the way in which certain Florentine contracts of the fifteenth century prescribed specific qualities of ultramarine for the most important areas of the picture, such as the Virgin's robe, because it was the most costly of all pigments; and this is an attitude also found in seventeenth-century Spain. Yet, as both contracts and the technical analysis of surviving works abundantly show, other blue pigments were used as frequently in these vital places, and the most important Italian recipe book of the period described synthetic blues that were claimed to be indistinguishable from the best ultramarine. Contracts often specified other particularly expensive pigments, as well as gold, and the use of these specified colors was prescribed by many Italian guild regulations: rather than demonstrating a "materialist" attitude to color symbolism in the spectator, they show a concern for the color stability of the product, which, it was assumed, could only be guaranteed by the use of the "best" materials.

One of the important conclusions to be drawn from much recent research in conservation is that practice was often far more complicated than the handful of surviving technical texts would suggest; and, with the exception of Roosen-Runge's study of the Mappae Clavicaula and "Heracleius" texts in relation to English Romanesque manuscript illumination, David Winfield on Byzantine mural techniques, and Mansfield Kirby-Talley's account of the theory and practice of the eighteenth-century English portrait painter Thomas Bardwell, there has, it seems, been little attempt to test the texts against the practice. Nor has the corpus of written sources expanded much in recent years, although there have been important new editions of some of the standard texts. A systematic survey of scientific sources, particularly medical literature, would certainly ex-

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56 M. Baxandall, Painting and Experience in Fifteenth-Century Italy, 2nd ed., Oxford, 1988, 6, 11. For Spain, see Veliz, 118.


58 The fundamental study of Italian artists' contracts is H. Glasser, Artists' Contracts of the Early Renaissance, New York, 1977. There is no comparable study of Northern contracts, but see J. Gage, "Colour and Its History," Interdisciplinary Science Reviews, ix, 1984, 254. For guild regulations, see L. Manzoni, Statuti e matricole dell'arte dei pittori della città di Firenze, Perugia, Siena, Rome, 1904, 32f, 87f; and C. Fiorilli, I Dipintori a Firenze nell'arte dei medici, speciali e merciai, Archivio storico italiano, lxxviii, 1920, ii, 48.

59 For the historian of color in art, the most important publications to come from conservation studies concern the history of pigments, for example, Harley; and R.L. Feller, ed., Artists' Pigments: A Handbook of Their History and Characteristics. 1. Cambridge and Washington, D.C., 1986. For the late 19th century, a key text is still J.-G. Vibert, La Science de la peinture (1891), repr. Paris, 1981.

60 On media, for example, see M. Johnson and E. Packard, "Methods Used for the Identification of Binding Media in Italian Paintings of the Fifteenth and Sixteenth Centuries," Studies in Conservation, xvi, 1971, 145ff; and E. Bowron, "Oil and Tempera Mediums in Early Italian Paintings: A View from the Laboratory," Apollo, c, 1974, 380-387.


tend the range of technical sources for the arts. There is, for example, some particularly rich material on dyeing and painting — including what appears to be the earliest textual reference to oil painting — in a recently published treatise on the elements by the southern Italian doctor Urso of Salerno, dating from the late twelfth century. The vastly expanding technical literature for artists in the nineteenth century has still to be surveyed and evaluated, although Anthea Callen has used some of it in her important study of Impressionist technique. Virtually no work at all has appeared so far on the technical interests of twentieth-century painters, although the commercial development of new artists' materials has been greater in our time than in any earlier period, and they have, as usual, formed an important part of the prevailing aesthetic ideology.

**Theories and Assumptions**

It has been quite a common practice among writers on color in art to preface their analyses with an account of color phenomena in general, an account for the most part based on the literature of experimental psychology of the past century or so. It is quite unrealistic to suppose, however, that the psychology of color perception has reached firm ground, and its relationship to the practice of painting must thus remain highly problematic. The art historian must, I think, be more concerned with the local context of color ideas as they relate to the artist under consideration than with any global, theoretical framework; and in many cases, these ideas will be assumptions, rather than anything that could be plausibly be presented as a theory. The treatment of color theories has usually been the weakest element in the discussion of what may lie behind the choice and handling of color in a given artifact; and this has been because historians of art have found it hard to shake off that whiggish approach to their subject which historians of science have long since discarded. They have tended to expect more coherence in the handling of theory by painters than the evidence would warrant, and to see in the color theories of the remoter past a unity and simplicity that in most cases have barely been achieved even today, as well as a tighter fit with practice than it is reasonable to expect. This does not make color theory any the less important.

Stated in its crudest terms, the theory of color in the Western tradition from antiquity to the present can be divided into two phases. Until the seventeenth century, the main emphasis was on the objective status of color in the world, what its nature was, and how it could be organized into a coherent system of relationships. From the time of Newton, on the other hand, the emphasis has been increasingly subjective, concerned more with the understanding of color as generated and articulated by the mechanisms of vision and perception. At the same time, the relationship of science to color has shifted, from an earlier dependence of scientists on artists, who, in their capacity as technologists of color, supplied science with the necessary technical and experimental data, to an increasing dependence, about the end of the eighteenth century, of artists on scientists, whose increasing professionalism and prestige allowed them to offer more, and more that was beyond the reach of art. Even the early treatises for artists, such as Theophilus's *De diversis artibus* or the anonymous *De clarae*, can now be seen not merely as random collections of recipes, but as incorporating often quite sophisticated statements of theory. Conversely, it is very hard to find artists capable of absorbing the color science of any period after the early nineteenth century.

On the other hand, attempts to reconstruct a philosophical context for ancient color practice, attempts that go back...
at least to the eighteenth century, but are still an active preoccupation of classical scholars, have not been able to overcome the brevity and unreliability of the written sources and the ambiguities of the surviving monuments. As Alberti noted in De Pictura (146), and in support of his own literary efforts, several ancient artists had written on paintings, but none of their writings have survived, and we are still dependent largely upon Vitruvius and Pliny for our interpretation of the styles of the earlier Greek examples of painting that are coming increasingly to light. The key text has always been Pliny’s account (Natural History xxxv. 50) of the four-color palette of Apelles and some of his contemporaries, which has been related to an archaic Greek doctrine of the “basic” colors of the four elements. While several modern scholars have continued to use Pliny’s account as a guide to color principles in the fifth and fourth centuries B.C., others have more plausibly placed it, with the related judgments of Vitruvius and Cicero, in the context of a specifically Roman polemic against extravagance in decoration.60

Alberti’s De Pictura, which includes a number of important remarks on color, was an entirely new kind of theoretical text, in which practicalities played a very minor role, although the author was also a painter.61 It has suffered from being seen as embodying a very medieval attitude toward color, and as depending more or less exclusively on Aristotelian tradition.62 Rather little has been published so far on specifically fifteenth-century developments in optics, but Alberti’s interest in the effect of light and shadow on colors can be paralleled in some contemporary Central European, if not Italian, discussions; and, of course, they anticipated the far more extensive investigations by Leonardo at the close of the century.63 Alberti’s remarks on the harmonious assortment of colors in painting also reflect a contemporary preoccupation in Florence.64 Ghiberti’s Commentaries, and particularly his Third Commentary, may have been stimulated by Alberti’s work, although they were never shaped into a coherent treatise. But where Alberti was content to leave to “the philosophers” the detailed discussion of the nature and effects of colors, Ghiberti drew heavily on these same (mainly medieval) philosophers, so that his Third Commentary is, as it stands, little more than an edited selection of passages from earlier authors.65 But, as I attempted to show many years ago, this does not detract from its relevance to Ghiberti’s practice, especially as a jeweler and a stained-glass designer.66

Leonardo, too, looked very widely at medieval writers on optics, but he found their opinions difficult to reconcile with his own experience and the results of his experimentation. The recent work of Corrado Maltese has sought to weld some of Leonardo’s scattered remarks on the mixture of colored lights into a more or less coherent prefiguring of the modern theory of additive and subtractive mixture; but although Maltese recognizes the many gaps in the painter’s experimental procedures, he has still tried to fill too many of them with his own engaging speculations.67 His argument that, in the course of his work, Leonardo was able to reduce the traditional four-color scheme of “simple” colors to the modern three flies in the face not only of Pedretti’s dating of the Codice Atlantico, where much of this work appears, but also of Leonardo’s frequently changing attitude to what constituted a “simple” color — both green


64 De Pictura, 11, 48; cf. S. Pezzella (as in n. 62). Both Alberti and Antonio da Pisa describe the way that the interposition of white makes the other colors “joyful,” and Alberti uses the same idea when he recommends colors for dress in I libri della famiglia (Opere volgarì, ed. C. Grayson, 1, Bari, 1960, 202).


and blue, for example, appear as compounded colors in various notes.\footnote{77 Kemp, 268f.} Least convincing of all is Maltese’s attempt to link Leonardo’s perception of the formation of colors through semi-opaque media with the methods used in the underpainting of the Uffizi Adoration and the Vatican Saint Jerome.\footnote{78 Maltese, “Leonardo e la teoria . . .” (as in n. 76), 218; J. Gantner, “Colour in the Work of Leonardo,” Palette, xxxii, 1969, 8-26.} What seems increasingly clear is that Leonardo’s inability to elaborate a coherent theory of color, and his traditional distrust of the capacity of color to reveal truth,\footnote{79 Barsch, 64ff; J. Gavel, Colour: A Study of Its Position in the Art Theory of the Quattro- and Cinquecento, Stockholm, 1979, 111f. A useful collection of Leonardo’s notes on color is in M. Kemp and M. Walker, eds., Leonardo on Painting. An Anthology of Writings by Leonardo da Vinci with a Selection of Documents Relating to His Career as an Artist, New Haven and London, 1988, pt. ii.} fueled his inclination to regard light and shade as the primary visual phenomena, and stimulated his development of techniques in drawing and painting to exemplify this truth. Recent commentators have underlined Leonardo’s view of the dynamic power of darkness, superior even to that of light,\footnote{80 Barsch, 53ff; M. Kemp, Leonardo da Vinci: The Marvellous Works of Nature and Man, London, 1981, 97, and idem, 267f.} and his creation of a new and fruitful concept of chiaroscuro.\footnote{81 Verbraeken, 91ff; G.F. Folen, “Chiaroscuro Leonardesco,” Lingua nostra, xi, 1951, 56-62; Z.Z. Filiczak, “New Light on Mona Lisa: Leonardo’s Optical Knowledge and His Choice of Lighting,” Art Bulletin, lxix, 1977, 518-522.} Leonardo was even suspicious of bellezza, because for him it implied lightness.\footnote{82 J. Shearman, “Leonardo’s Colour and Chiaroscuro,” Zeitschrift für Kunstgeschichte, xxv, 1962, 30.} His supremely subtle interpretation of chiaroscuro in art, and particularly his technique of sfumato, was to involve an unprecedented experimentation with media, including the development of soft pastels,\footnote{83 J. Meder, Die Handzeichnung, 2nd ed., Vienna, 1923, 116, 136.} and the extensive use of those most delicate and responsive of all painting tools, his fingers.\footnote{84 T. Bracht, “A Distinctive Aspect of the Painting Technique of the Cinvenra deBenci and of Leonardo’s Early Works,” in Washington, D.C., National Gallery of Art, Report and Studies in the History of Art 1969, 1970, 84ff; idem., “Radiographische Untersuchungen am Verkündigungs- bild von Monte Oliveto,” Maltechnik/Restauro, lxxi, 1974, 180; and idem, “Die beiden Felsgrottenmadonnen von Leonardo da Vinci,” in ibid., lxxxiii, 1977, 11.} Much has been made of the little that Dürer wrote on color — effectively only a short note on drapery painting, in which he advocated modeling without ‘shot’ effects, advice that, as Dittmann has pointed out, Dürer was not always inclined to follow him.\footnote{85 Dittmann, 119; cf. W.J. Hofmann, Über Düriers Farbe, Nuremberg, 1971.} More promising perhaps is the recent linking of Grünewald’s unearthly color with his experience of the theory and practice of metallurgy, although there are no indications so far that Grünewald ever turned to color theory as such.\footnote{86 B. Saran, “Der Technologe und Farbchemiker ‘Matthias Grünewald,’” Maltechnik, iv, 1972, 228ff.}

Although the sixteenth century was unusually productive in color theory relating to the arts, little of it was by or addressed to painters, and it seems to have borne only tangentially on their practice.\footnote{87 Apart from the works by Barasch and Gavel (as in n. 79), the chief studies have been J.A. Thornton, “Renaissance Color Theory and Some Paintings by Veronese,” Ph.D. diss., University of Pittsburgh, 1979; L.K. Caron, “Choices Concerning Modes of Modeling during the High Renaissance and After,” Zeitschrift für Kunstgeschichte, xlviii, 1985, 476-489; idem, “The Use of Color by Rosso Fiorentino,” Sixteenth-Century Journal, xix, 1988, 355-378. I have tried to detect Giorgione and Titian from color theory in “A locus classicus . . .” (as in n. 69), 15-17; but see D. Gioseffi, “Giorgione e la pittura tonale,” in Giorgione: Atti del Convegno Internazionale di Studio per il 500. Cent. della Nascita 1978, Venice, 1979, 95, for an attempt to link Giorgione’s practice with the “four-color theorem” of mathematics.}

Only around 1600 did the theory of color seem to offer something new and exciting to artists, and the widespread movement to integrate the art and the science of color, which began essentially at the court of Rudolph II in Prague, was to last for nearly two centuries. In the era of the Kunst- and Wunderkammer, color and colors, like painting and engraving, were among the wonders of art to be set beside the wonders of nature. In Rudolph’s entourage, several artists and scholars — the painter Arcimboldo, the mathematician Kepler, the physicians de Boodt and Scarmiglioni — were interested in color, and especially in its relationship to music.\footnote{88 For Arcimboldo, see T.D. Kaufmann, The School of Prague, Painting at the Court of Rudolph II. New Haven and London, 1989; for Kepler, Opera Omnia, ed. C. Frisch, i, Frankfurt-am-Main, 1858, 200; and for de Boodt, C. Parkhurst, “A Color Theory from Prague: Anselm de Boodt,” Allen Memorial Art Museum Bulletin, xxix, 1971, 3-10. Scarmiglioni’s De Coloribus was published at Marburg in 1601. For the general cultural milieu of Prague, see R.W. Evans, Rudolf II and His World, Oxford, 1973; and Essen, Villa Hügel, and Vienna, Kunsthistorisches Museum, Prag um 1600: Kunst und Kultur am Hofe Rudolphi II, 1988.} During the seventeenth century, many artists became involved in color theory, and many theorists of color looked to painting for enlightenment. It was the period when Leonardo’s writings were first evaluated and published, and when artists in both Northern and Southern Europe turned their hands to writing. There have been recent studies of the theoretical interests of Rubens, Poussin, and Pietro Testa,\footnote{89 See Kemp, 275-282, for a summary of this literature. For Testa, see Cropper (as in n. 12).} as well as of the minor painter, but influential theorist Taddeo Zaccolini.\footnote{90 J.C. Bell, “The Life and Works of Matteo Zaccolini (1574-1630),” Regnum Dei, xi, 1985, 227-258. Janis Bell is preparing an edition of Zaccolini’s writings on color, part of which appeared in her dissertation, “Color and Theory in Seicento Art. Zaccolini’s ‘Prospettiva del Colore’ and the Heritage of Leonardo,” Ph.D. diss., Brown University, 1983.} In the burgeoning French Academy of the 1660s, color and its relationship to design became a standard topic of formal
as well as informal debate, generating an important and influential literature, especially by Félixbien and De Piles.\footnote{B. Teyssèdre, Roger de Piles et les débats sur le coloris au siècle de Louis XIV, Paris, 1965. For a brief English summary, see A. Soreil, “Poussin versus Rubens: The Conflict between Design and Colour in France,” Paléte, xxi, 1963, 3-12; and for some Roman antecedents to this debate, see M. Poirier, “Pietro da Cortona e il dibattito disegno-coloro,” Prospettiva, xvi, 1979, 23-30.} Paradoxically, since it was also the period that gave the greatest value to darkness both in theory and painterly practice,\footnote{M. Rzewińska, “Tenebrism in Baroque Painting and Its Ideological Background,” Artibus et historiae, xiii, 1986, 91-112.} light and color found for the first time a unified theory in the work of Descartes and, especially, Newton, who showed that color was indeed illusory, and that light was its only begetter. Yet artists were at first both willing and able to draw on Newton’s ideas, especially his conjectures about harmony, and his circular arrangement of colors, which eventually gave them a clue to the nature of “complementary” contrast.\footnote{J. Gage, “Newton and Painting,” in M. Pollock, ed., Common Denominators in Art and Science, Aberdeen, 1983, 16-25; Kemp, 286-290.} Contrasts are, of course, subjective effects, and it was one of the greatest achievements of Newton to have shown that all color is intrinsically subjective.

After Newton, the aspects of color theory most interesting to artists have been, in addition to theories of harmony, the devising of color systems\footnote{Color systems have been investigated recently by F. Gerritsen, “Evolution of the Color Diagram,” Color Research and Application, iv, 1979, 33ff; C. Parkhurst and R.L. Feller, “Who Invented the Color Wheel?” \textit{ibid.}, vii, 1982, 219ff; M. Richter, “The Development of Color Metrics,” \textit{ibid.}, ix, 1984, 69-83; S. Hesselgren, “Why Color-Order Systems?” \textit{ibid.}, 220-228; Matile, 58-83; and Kemp, 289-292.} and the exploration of how colors relate to the mechanisms of perception and affect the feelings of the spectator. Many of these concerns had long since developed in artists’ studios themselves, but they were now investigated and codified systematically. Long before the Czech physiologist J.E. Purkinje announced the principle of chromatic shift in subdued lighting that now bears his name, for example, it had been part of studio lore that paintings should only be examined in the conditions in which they were made.\footnote{On Meyer’s contribution, see Strauss, 335.}

The most significant contributions to the study of color for artists, which laid great emphasis on these subjective phenomena, was Goethe’s \textit{Farbenlehre}, published in its final, three-volume form in 1810. It has a claim to being the most important single text on color for artists, and indeed for historians of art, since one volume is devoted to “materials for a history of color,” including what appears to be the first historical outline of color in painting, contributed by the painter Heinrich Meyer.\footnote{J. Gage, “Runge versus Newton Today,” Spring Valley, N.Y., 1986 (a trans. of Zum Studium von Goethes Farbenlehre, Basel, 1951); D.L. Sepper, “Goethe against Newton: Towards Saving the Phenomenon,” in Amrine, et al., 175-193; \textit{idem}, Goethe contra Newton. Polemics and the Project for a New Science of Color, Cambridge. 1988 (the most useful history of Goethe’s researches for readers without German); and J.M. Duck, “Newton and Goethe on Colour: Physical and Physiological Considerations,” Annals of Science, xlv, 1988, 507-519.} Recent studies of the \textit{Farbenlehre} have tended to concentrate on reviving the old controversy of Goethe contra Newton,\footnote{D. Gray, Goethe the Alchemist, London, 1952; and B.J.T. Dobbs, \textit{The Foundations of Newton’s Alchemy}, Cambridge, 1975.} and it is remarkable that this campaign has ceased to be the preserve of Anthroprosopohists, and has joined the mainstream of the history of science. Newton is, of course, no longer the Enlightenment idol he was in Goethe’s day: we have long had Goethe the alchemist, and we now have Newton the alchemist, although Newton’s alchemy has hardly been brought to bear on the history of his optics,\footnote{See, however, the over-optimistic discussion by M.K. Torbrügge, “Goethe’s Theory of Color and Practicing Artists,” \textit{Germanic Review}, xlix, 1974, 189-199. Torbrügge finds little evidence of Goethe’s effect on artists in any period, although his impact on the early 20th century, on the avant-garde, and other artists is well documented: A. Brass, \textit{Untersuchungen über das Licht und die Farben}, 1, Teil, Ostewiek, 1906. Brass was close to an unspecified group of artists in Munich (M. Richter, \textit{Das Schriftum über Goethes Farbenlehre}, Berlin, 1938, no. 41). For the revival of interest in Goethe’s work in Kandinsky and Mondrian, see J. Gage, “The Psychological Background to Early Modern Colour: Kandinsky, De launay and Mondrian,” in Tate Gallery, \textit{Towards a New Art: Essays on the Background to Abstract Art}, 1910-1920. London, 1980, 24-26, 40. The use of Goethe’s Theory by E.L. Kirchner and the Dutch painter Jan Wiegers was the subject of the exhibition, “Goethe, Kirchner, Wiegers. De Invloed van Goethe’s Kleurenliefde,” Groningen Museum, 1982.} as Goethe’s has. What is more important for us is the puzzle of why a theory of color so patently directed at artists, and deriving partly from Goethe’s theoretical and practical experience of art, should have made so little impression on artists for nearly a century.\footnote{Most recently Heinz Matile has represented the view that Runge’s and Goethe’s views on color were closely related: P.O. Runge, \textit{Farben-Kugel. Neudruck der Ausgabe Hamburg 1810 mit einem Nachwort von Heinz Matile}, Mittenwald, 1977, Nachwort n-11; Matile, 148, and esp. 224-227 on Runge’s links with Goethe’s earlier Beiträge zur Optik; on p. 231 Matile points to some important differences between Goethe’s and Runge’s views, and on pp. 235-241 to their very similar approach to harmony. For a more skeptical treatment, see J. Gage, “Runge, Goethe and the Farbenkugel,” in H. Hohl, \textit{Rune Fragen und Antworsten}, Munich, 1979, 61-65.} Unlike Goethe, Runge was unable to develop an integrated theory:
his published Farbenkugel of 1810 was in the tradition of European colorimetry in the seventeenth and eighteenth centuries — the direct descendant in fact of the 1611 color sphere of the Swedish mathematician Sigfrid Forsius\textsuperscript{101} — but his unpublished thoughts were in the metaphysical tradition of Lomazzo or Athanasius Kircher.\textsuperscript{102} Neither Runge's practical experiments with transparency, which may be related to his delicate watercolor technique, nor his ideas on color meaning, which he sought to exemplify in the unfin-
ished cycle of the Times of Day, bore fruit in the rather austere format of the Kugel, although Matile has recently shown how Runge brought his published ideas of harmony to bear on the small version of Morning in the Hamburg Kunsthalle.\textsuperscript{103}

Whereas, in the seventeenth century, the scientific theory of color drew largely on the experience of painting, not least in the search for a set of “primary” colors,\textsuperscript{104} by about 1800 the balance had shifted, and the very extensive development of scientific color theory since Newton was now directed at artists through many popularizations, sometimes at the request of the artists themselves.\textsuperscript{105} This does not mean that artists were invariably willing, or even able, to use the color information supplied to them in this way; and the more circumspect studies of the relationship of color theory to painting in the nineteenth century have shown that theory and practice very rarely went hand in hand. But then we should not have expected that theory, any more than “nature,” would have been ready for direct and complete transposition into art. The extraordinary vitality and tension of much nineteenth-century coloristic painting derives precisely from the struggle with the intractable ideas and sensations of color. The Newtonian solution to the problem of an antithesis between “apparent” and “ma-
terial” colors had thrown the scientific emphasis entirely onto the study of light, and decisively separated the procedures of the laboratory from those of the painter's studio. Runge, who experimented in both traditions, remained hopelessly, if fruitfully, confused about the relationship of theory to practice.\textsuperscript{106} Most painterly theory in this period was more or less anti-Newtonian, and it is not surprising that Turner, for example, felt himself drawn, even at an advanced age, to study the theory of Newton's leading opponent, Goethe. But Turner's theory of color was entirely eclectic, and it remains an open question how far he understood the main issues at stake.\textsuperscript{107}

Delacroix's thoughts on color have also generally been linked with the publications of a single theorist, the chemist M.E. Chevreul.\textsuperscript{108} But, for example, the well-known color triangle with a note on primaries and secondaries in the Chantilly Sketchbook derives from a less abstruse source, J.F.L. Merimné's De la Peinture à l'huile, of 1830,\textsuperscript{109} and it was not apparently until about 1850, when Delacroix was deeply involved with the technical problems of large-scale ceiling painting, that he seems to have turned to Chevreul for advice, acquiring a set of notes from a lecture series of 1848, and proposing to visit the chemist in person.\textsuperscript{110} It was at this time, too, that Delacroix came to know Charles Blanc, whose Chevreulian interpretation of the painter's color handling served to assure the younger generation of the 1880s that Delacroix was indeed a “scientific” colorist.\textsuperscript{111}

Blanc was perhaps the most important of the mid-nineteenth-century French writers on color because he was read so avidly, by Seurat, Gauguin, and Van Gogh, among others.\textsuperscript{112} An admirer and follower of Ingres, he regarded coloring, paradoxically, as an inferior part of painting; and it was from a pupil of Ingres, Jules-Claude Ziegler, that he

\textsuperscript{101} This was, however, only published in recent times: S.A. Forsius, Physica, ed. J. Nordström, Uppsala Universitets Arsskrift, x, 1952, 316–319. Forsius's color space is not three-dimensional in the modern sense, as Runge's is, since the Swede sought to incorporate black and white into the two-dimensional section of the sphere. On Forsius, see R.L. Feller and A.S. Stenius, “On the Color-Space of Sigfrid Forsius.” Color Engineering, viii, 1970, 48–51.

\textsuperscript{102} H. Matile has related Runge’s metaphysics to Jacob Boehme's color theory, pp. 130-142, and to German Romantic thought, “Runge's Farbenordnung und die 'unendliche Kugel.'” in Hohl (as in n. 100), 66-77. The most coherent account of Lomazzo's color theory is now Kemp, 269-272.

\textsuperscript{103} Matile, 202-203.


\textsuperscript{106} Matile, 185-191.


\textsuperscript{109} For the note and the triangle, see Kemp, 308; J.F.L. Mérimée, De la Peinture à l'huile (1830), (Paris, 1981), ill. facing p. 272 and 274-275. For the disputed date of the note, see Matile, 362, n. 461. Delacroix and Mérimée were both members of a government committee on the arts in 1831 (L. Rosenthal, Du Romantisme au réalisme, Paris, 1914, 5). I shall discuss Mérimée's interesting career as painter and theorist in my forthcoming book, Color and Culture in the Western World: Aristotle to Albers.

\textsuperscript{110} For the lecture notes, now in the Cabinet des Dessins of the Louvre, see Kemp, 300, and for Delacroix's proposed visit to the chemist, see Signac (as in n. 62), 76.

\textsuperscript{111} For Blanc's interpretation of Delacroix, see Johnson, 63-72.

took his color diagram and, probably, his first knowledge of Chevreul.113 Like Ziegler, Blanc moved easily between the fine and the applied arts — he also wrote a *Grammaire des arts décoratifs* — and he saw no contradiction in applying the same color theory to both. With far-reaching consequences, he also praised Oriental cultures, especially the Chinese, as expert in color and models for European color usage. It was onto an Oriental — albeit a Turk — that Gauguin foisted his amusing pastiche, the brief essay on color harmony that he circulated among some friends in Paris in 1886.114

Seurat’s reputation as a theorist has suffered somewhat in recent years, and it is certainly not easy to understand why he remained so loyal to Chevreul, when the literature of color for artists in the 1870s and 1880s had introduced the far more sophisticated notions of Hermann von Helmholtz.115 The explanation may lie in Seurat’s belief in Blanc’s view of Delacroix as a Chevreullian painter; for it seems that the color circle that he drew on a sheet of sketches for *La Parade* is a reminiscence of the circle that Delacroix sketched in a notebook of about 1840, and that had been published by Auguste Laugel in 1869. Laugel’s commentary is interesting, for he introduces the new research of Helmholtz into the colors of light, with its scheme of complementaries red-blue/green, orange-cyan, yellow-indigo, yellow/green-violet, but he argues that Delacroix’s “diagramme grossier” of Chevreulian complementaries is far more practical for artists. Seurat clearly agreed.116 The context of Seurat’s scientism has still to be examined, but it seems likely that in the future less emphasis will be placed on the physics of Helmholtz and more on the psychophysics of Charles Henry.117

If Seurat as a color theorist has been the victim of revisionism, Van Gogh’s approach to color has remained essentially where Badt left it in 1961.118 Vincent’s own writing has continued to be the almost exclusive source of documentation, and although we know a good deal about his reading of the theoretical literature of the period, very little has been done to evaluate his use of it.119 Nor has the crucial friendship with Gauguin in 1887 and 1888 been looked at closely from the point of view of their rival conceptions of color. Gauguin’s sympathy with Vincent’s notions, shown in *Vision after the Sermon* in Edinburgh, and in the lesson he gave to Paul Sérusier in 1888, gave way increasingly to the Frenchman’s dislike for what he considered to be Van Gogh’s very crude color aesthetic. Although Gauguin never showed much interest in color theory as such, the color system later published by Sérusier, with its emphasis on warm browns and cool grays and its avoidance of complementarity, may substantially represent Gauguin’s views.120

Cézanne’s late work is perhaps the highest exemplification of a nineteenth-century theory of color perception made popular in France by the publications of Helmholtz and his followers. Shiff has recently drawn attention to this strand of thought,121 but he has not explored the consequences of these ideas for Cézanne’s style; and the debates continue about whether he may be considered to have had a “theory,” and the relationship of theory to painterly practice.122 Here is one area where formal analysis still has a major role to play.123

The historiography of color in the art of the recent past has faced two intractable problems. The first is that the categories of color analysis — the terminology introduced in modern color systems, and the concepts of the psychophysical effects of colors — are the very same ones that have been developed over the past century or so; and they have thus tended to be taken for granted and exempted...
from historical analysis. The second problem has been the hermetic character of modernist criticism and, together with this hermeticism, the extensive self-analysis of artists themselves, which this criticism has often seen as sufficient. Criticism, that is to say advocacy, has naturally taken precedence over the more analytical procedures of history. Thus, although the more or less collected writings of some of the major figures, such as Russian Constructivism and the Bauhaus, and some of the major figures, like Matisse, Kandinsky, Delaunay, Klee, Malevich, and Mondrian, and minor ones like Marc, Van Doesburg, Hans Hoffman, and Winifred Nicholson, are now readily available, there has been remarkably little secondary discussion of the color ideas of twentieth-century artists. General several general treatments of individual artists, however, such as Hoelzel, Itten, Matisse, and Van Doesburg, and groups such as the Orphists, Russian Constructivists, and De Stijl, have included important considerations of their theoretical interests in color. There have also been a handful of short essays on Orphism, on Russian Constructivism, on Marc, on Klee, on Picasso, and on Rothko, that have focused on color, and a few monographic studies with the same emphasis.

Several exhibitions in recent years have also dealt with color theory in the twentieth century, or have given a large place to it in the context of some other concern. What these studies have usually lacked has been some sense of the ways in which the discussions and usages of artists have related to the more general concerns of color theory in their time. I have made a limited attempt to point to the psychological context of Kandinsky’s, Delaunay’s, and Mondrian’s ideas, and to the debates on the structure of color space that form such an important part of early twentieth-century color science. The wide range of attitudes toward color that Kandinsky deployed, for example, in his On the Spiritual in Art (1912), including a color system that owes as much to Hering as it does to Goethe, can be paralleled remarkably closely in the long series of interviews, chiefly with artists and professional people, conducted by the psychologist J.G. von Allesch in Germany in the decade before the First World War. At the Bauhaus in the 1920s, Kandinsky was probably the teacher most inclined to draw, as we know from his lecture notes, on...
the most recent literature of experimental psychology, notably Neue Psychologische Studien (1926f.).

The Bauhaus represents a particularly rich field of color study, where the traditional concentration on the work of the most famous of the individual teachers has given quite a false impression of what was actually taught about color there. Itten is assumed to have taught the Basic Course (Vorkurs), compulsory for all students, from the outset, in April 1919, but the first prospectus makes no reference to it, and it does not appear in the deliberations of the Masters' Meetings until October 1920. At Weimar, after Itten's departure in 1923, color was taught in the Vorlehrle by Kandinsky, for a mere hour a week, compared to the eight hours of form study under Moholy-Nagy, plus an hour of the same with Klee, two hours of drawing with Klee, and two of analytical drawing with Kandinsky. Klee's color lectures of 1922-23, excerpted by Spiller in his edition of the Notebooks, and now available in facsimile, must have been given to more advanced students in only some of the workshops. After the move to Dessau, under Moholy-Nagy and Albers, color appears to have been dropped from the Vorkurs entirely. Albers, however, came to put color at the center of his interests, and, after his move to the United States, he taught the color courses that gave birth to his great Interaction of Color of 1963. In this beautiful and influential book, Albers relegated "theory" to the final stages of practice; and it is certainly questionable how far he had a coherent conception of color theory at all.

Color as Content

In a review of the Titian exhibition in Venice of 1935, and of Hetzer's book on Titian's color, which coincided with it, Oscar Wulff accused Hetzer of setting up far too abstract a model of that painter's color concerns, and of neglecting color's Darstellungswert (representational function). Since Hans Jantzen's pioneering essay, "On the principles of color-composition in painting" of 1913, which introduced the concepts Eigenwert (autonomous function) and Darstellungswert of colors, German scholars have sought to understand the role of color in painting as moving essentially between these two poles. Hetzer himself argued that in the 1530s Titian solved a coloristic problem that had plagued painters since the early fifteenth century; that of striking a balance between the spatial function (Raumwert) and the surface function (Flächenwert) of color, between its nature as phenomenon (Erscheinung) and as material pigment, between color as beauty and color as meaning. But what these scholars understood by representational or meaningful color was essentially its capacity to imitate the object; that it had any intrinsic capacity to convey meaning they left entirely out of consideration. Wulff suggested, for example, that Titian's great command of black may have derived from his experience as a portrait painter rendering the black dress of his many male sitters; but Wulff did not inquire why black was such a high-fashion color in the mid-sixteenth century. In figure painting, of course, the deployment of colored drapery has always been a major vehicle for the free exercise of aesthetic choice; and Cennini, for example, in a little-noticed passage of the Libro dell'arte, argued that the designs of leaves or animals used in block-printed fabrics were entirely a matter of fantasia, provided they created an appropriate contrast. Here, of all places, we might expect color to be unencumbered by any but formal considerations.

And yet textiles are perhaps the colored artifacts most expressive of social values, and, through these values, of ideas. Historians of textiles and costume have not yet given much attention to questions of color, and historians of
art have so far used costume almost exclusively as an aid to dating. There has indeed been a tendency to treat the handling of color composition in painted draperies as if it were entirely an aesthetic matter. The art-historical treatment of “shot” materials, or cangianti/changeantes, is particularly instructive. Since Siebenhühner’s study of 1935, several historians of Italian Renaissance art, notably John Shearman, have discussed the technique of color modeling by hue rather than value shifts, resulting in effects that seems close to those of silks woven so the weft of one color is dominant when seen from one direction, and the warp, of a contrasting color, is dominant from another. Although not directly related to the distribution of light and shade, color changes do relate to the three-dimensional character of folds, and can thus serve as a form of modeling. The question is whether they were adopted, as modern scholars have suggested, because of their formal capacity to model without value contrast, and hence maintain a high key throughout a particular form, or whether they bore the connotations that derive from representing a particular sort of fabric. Shearman, for example, has argued that Andrea del Sarto used color changes “of an entirely new order of subtlety.” Unlike those of the quattrocento, which make a sharp contrast of chromatic and tonal value, from yellow to red or green to rose, . . . they [i.e., del Sarto’s color changes] move between values that are deliberately selected for their close association. Highlight and shadow are not, to a greater or lesser extent, made from separate pigments, but are carefully adjusted mixtures; cream-grey and lilac grey may be coupled together, or shell pink and lavender, turquoise and grey-green. When the colour-change is a matter of nuance, like these, it can appear to be the fall of light on a lively and uniformly coloured material.144

Very little is known about the early history of shot fabrics; none have apparently survived from the Middle Ages or the Renaissance, perhaps because they were not figured, and perhaps for the same reason very few were mentioned in the early sources. The earliest literary references seem to be in early fourteenth-century commentaries on the Sentences of Peter Lombard,145 and the earliest inventory reference I have discovered is at Assisi in 1338.146 The related discussion of lightening or darkening the colors of drapery in manuscript painting occurs in treatises from the mid-thirteenth century onwards; here it is often difficult to separate the idea of value from the idea of chroma; yellow and green, for example, so often encountered together in the drapery of trecento painting, had been, since antiquity, regarded as the light or dark species of the same genus of hue.146 The pairing of black and blue, mentioned by Cennini in his chapter on block-printing, and recognizable in many paintings, is subject to the modern eye to similar confusions. Cennini (chap. lxxxvii) assumed that cangianti draperies were suitable for angels, and this is often, though not exclusively, where they appear in Italian trecento and quattrocento painting. But what was perhaps most important was that they clearly connoted silk, probably exotic silk, and hence great expense; at the end of the sixteenth century, Lomazzo, who provides the most extensive treatment of cangianti combinations (Trattato della pittura, 111, x), regards them as appropriate to nymphs and angels, insists that they are silks, and seeks to restrict the vast range of color possibilities to those giving a convincing rendering of actual stuffs.149

Historical semiotists of color would need not only to look at the recent literature on the affective characteristics of color;150 but also to embrace that area traditionally called color symbolism. By far the most useful source for the Middle Ages is still Haupt’s dissertation of 1940, Color-Symbolism in the Sacred Art of the Western Middle Ages,151 which surveys and excerpts the medieval literature with admirable thoroughness. But Haupt, like more recent students of medieval color iconography, notably Peter Dronke,152 depends very much on texts, and he is naturally

144 J. Shearman, Andrea del Sarto, Oxford, 1965, 1, 135: the whole of the account of Sarto’s color in chap. viii is masterly; idem (as in n. 82), 14ff; and M.B. Hall, “From Modeling Techniques to Color Modes,” in Hall, 3 and n. 9.
145 K.H. Tachau, Vision and Certitude in the Age of Occam, Leiden, 1988, 96, n. 34; cf. also 327, n. 36 and 329, n. 43. The discussion of the fall of light on a dove’s neck or a peacock’s tail is here supplemented by reference to the new (shot?) textiles. The “birds’ feathers” tradition has been surveyed from the Peripatetic De coloribus to Newton by H. Guerlac, “Can There Be Colors in the Dark? Physical Color Theory before Newton,” Journal of the History of Ideas, xlvi, 1986, 3-20.
146 Architum franciscanum historicum, vii, 1914, nos. 207, 208, 227, and esp. 239 (cagucolor). Donald King has kindly informed me of a Pisan broker list of 1323 referring to tartarini dicti cangia colore, which suggests a central Asian origin.
148 As late as 1436 an inventory of St. Peter’s in Rome described a dalmatic and tunicle as “viridia sive crocea” (E. Müntz and A.L. Frothingham, Il Tesoro della Basilica di S. Pietro, Rome, 1883, 65).
149 Gavel (as in n. 79), 115, n. 15 distinguishes between “color-change,” which he sees as a modeling technique only, and cangianti, which is related to specific textiles.
150 The best survey is still B.J. Kouwer, Colours and Their Character: A Psychological Study, The Hague, 1949. Several important essays on Western color symbolism from antiquity until the 19th century were included in The Realms of Colour (Eamos Year book, 1972), Leiden, 1974, and three of them were reprinted in S. Haule, ed., Color Symbolism, Dallas, 1977.
somewhat at a loss when color terms and color usage do not seem to marry. In the pre-modern period, the study of colored artifacts or materials seems to be a more fruitful line of inquiry than the study of abstract hues, and some excellent work has been done along these lines by Christel Meier, who is preparing a comprehensive dictionary of medieval color symbolism. In her study of the interpretation of gemstones from antiquity until the eighteenth century, Meier has shown a subtle understanding of the way in which perceptions of color may be affected by conceptions of what the stone in question may be expected to mean: the same material may be seen as variously colored according to need, and this imagined need is primary, rather than flowing from the perception of the color. Many observers may share my experience that the identification of a color in a given array is a conscious and verbalized act, and that it is thus dependent upon the available color language.

On the other hand, a good deal of the color terminology in European languages is derived not from perceptions of hue but from the materials that characteristically embodied those hues, and from which the hues derived their value and meaning. The most studied example of this is scarlet, but the most striking instances are to be found in the language of heraldry, all of whose specialized color terms derive from precious materials. In a remarkable series of books and articles, Michel Pastoureau has transformed the modern study of heraldry, and brought it out of the almost exclusive province of genealogists and into the history of ideas. Pastoureau started from the brilliant perception that imaginary coats of arms might be more revealing of attitudes to symbolism than historical ones; and he has gone on from there to survey the vast field of medieval secular symbolism. Heraldry offers a particularly fruitful area for the study of color language because of the abundance of more or less datable armory from the early thirteenth until the seventeenth centuries, many of which are illu-

minated. The detailed analysis of this language remains to be done, but it is likely to reveal a gradual shift from object-based terms to more abstract ones, a shift in line with the greater capacity for conceptualization perceptible in other areas of color experience in the later Middle Ages. Closely allied to heraldic attitudes to color meaning are those of liturgical usage in the Christian Church; and the study of liturgical color, both Catholic and Protestant, has now received an incomparable boost from the exhaustively documented articles in the Reallexikon zur deutschen Kunstgeschichte, which, as usual in this encyclopedia, are far from confined to German examples.

The color content of artifacts in the post-medieval period has not necessarily been limited to what may be understood as color symbolism in the traditional sense. From around 1600 at least, a handful of paintings have referred to the current doctrines of color theory itself, and examples of this in Rubens, Poussin, and Turner have recently been the subject of extended art-historical treatment. A conspicuous modern instance, characteristically more self-referential than these, is Joseph Albers's long series Homage to the Square, beginning in 1950 and continuing until the year of the artist's death, in 1976, which relates very closely to his experimental work published as Interaction of Color.

Reception and Response

A good deal of recent art-historical writing has been concerned with the reception of artifacts, and it would be surprising if color did not find an appropriate place in these discussions. Museology has certainly given an impetus to the study of the visual context, in particular to the history of frames and hanging, and the lighting of the gallery environment. Framing is perhaps closest to the interests of the originating artist, who at least from the mid-nineteenth century often designed his frames himself; but, like the conservationist, the modern framer is often at a loss to know

153 See, for example, Haupt's remarks on red and purple and yellow and gold, c. 46f; also C. Meier, Gemma Spiritualis: Methode und Gebrauch der Edelsteinallegorese vom frühen Christentum bis ins 18. Jahrhundert, Bk. 1, Munich, 1977, 152.

154 For example, see Meier, 147ff, on the srd. See also her general discussion of the problems of symbolic interpretation in "Das Problem der Qualitätenallegorese," Frühmittelalterliche Studien, vii, 1974, esp. 387ff, on color; also E. Ohly, Schriften zur mittelalterlichen Bedeutungsforschung, Darmstadt, 1977, xvi-xxi.

155 See, for example, M. Bornstein, "Name Codes and Color Memory," American Journal of Psychology, lxxix, 1976, esp. 274.

156 The classic treatment of J.-B. Weckerlin, Le Drap "escarlate" au Moyen Age, Lyon, 1905, has now been subject to revision by J.H. Munro, "The Mediaeval Scarlet and the Economics of Sartorial Splendour," in N.B. Harte and K.G. Ponting, eds., Cloth and Clothing in Mediaeval Europe, London, 1983, 13ff; but there is no doubt that the documents record "scarlets" of many hues. A case in point is the obsolete color term perse, which comprised many colors, and may also refer to a quality of cloth (Gage, as in n. 1, 105).

157 M. Pastoureau, Traité d'héraldique, Paris, 1979; and idem, Armorial des chevaliers de la Table Ronde, Paris, 1983. Arthurian heraldic blazon has also been treated in detail by G.J. Brault, Early Blazon. Heraldic Terminology in the Twelfth and Thirteenth Centuries with Special Reference to Arthurian Literature, Oxford, 1972. Many of Pastoureau's essays have been gathered in L'Hermine et le sinople, Paris, 1982; Figures et couleurs: Études sur la symbolique et la sensibilité médiévales, Paris, 1986; and Couleurs, images (as in n. 5). Pastoureau's insistence on the abstract character of heraldic color, restated recently in "Vers une histoire sociale des couleurs," (Couleurs, images, 43) seems to me to overlook the history and concrete character of heraldic language, which he has also noted in passing ("Couleurs, décors, emblèmes," in Figures et couleurs, 52).

158 "Farbe (Liturgisch)," Reallexikon zur deutschen Kunstgeschichte, vii, 1981, cols. 54-139.


what the original character of the artifact was. Lighting has naturally been far more the preserve of curatorial specialists, but even here the experience of conservators and other optical scientists is emerging from the technical literature and appearing in more general art-historical publications. Framers and lighting technologists are usually, I suppose, animated by the same urge to re-create an “original” state of affairs that stimulates conservationists and even art historians: Wolfgang Schöne once proposed — seemingly without irony — that historians of art should equip themselves with sets of dark glasses that approximated as closely as possible the original lighting levels of the artifacts under examination. But, like the conservationist, the technician has to come to terms with the fact that the history of the object in question may include the history of its presentation in an inappropriate frame or environment; and that the response of the public to the work in these unoriginal circumstances must be seen as no less valid than that of the originator and her circle.

Perhaps the least developed area in the history of color is indeed the area of spectator response, and this is probably because the very impressive advances in the modern understanding of color vision have not been matched by advances in the theory of color perception. It may well turn out to be in this area that the historian of art has most to offer the sciences at large. The distinction is of course that vision is a matter largely of bio-physical mechanisms, whereas perception depends upon the psychological controls to which this vision is subjected. The one is relatively easy to examine and test by laboratory methods; the other is not. This distinction is very graphically illustrated by the fact that the number of color sensations that can be discriminated by the human visual system is numbered in millions, while the number of “basic” terms used to classify these sensations in most languages is believed to be around a dozen. The number of these “basic” terms can be further reduced to three or four “primary” colors, relating to the mechanisms of the eye, which translate incident light into sensations of color; and the idea of primariness itself has had a particular resonance in modernist art.

Several researchers into color-defective vision have recently turned their attention to artists. Patrick Trevor-Roper’s study, The World through Blunted Sight, for example, has now appeared in a revised edition. The effects of congenital or temporary abnormalities, of aging, and even of drugs might have been expected to be very marked on the color practice of artists; yet the very tentative results these studies have produced must remind us that, in its broadest sense, psychology is more important than physiology for color usage, and psychology depends upon a


162 There have also been a number of recent exhibitions on framing: Italianische Bilderrahmen des 14-18 Jahrhunderts, Munich, Alte Pinakothek, 1976; Le Città degli Uffizi, Florence, Uffizi, 1983; Prijst de Lijst, Amsterdam, Rijksmuseum, 1984; The Art of the Edge: European Frames 1300-1900, Chicago Art Institute, 1986; Or et couleur: Le Cadre dans la seconde moitié du dix-sevième siècle, Paris, Musée d’Orsay, 1989 (see the book of the exhibition, I. Cahn, Cadres de peintres, Paris, 1989). Just as exhibitions of paintings now encourage studies of problems of technique and conservation, so scholars are beginning to take more notice of frames: see, for example, P. Mitchell, “Wright’s Picture Frames,” in J. Egerton, Wright of Derby, London, Tate Gallery, 1990.


165 The standard study is now B. Berlin and P. Kay, Basic Color Terms, Berkeley, 1969, but see also n. 183 below. On trichromacy in color vision, see J.D. Mollon, “Colour Vision and Colour Blindness,” in Barlow and Mollon (as in n. 17), 165ff. To my knowledge, only one modern artist, Gerrit Rietveld, has related his use of “primary” colors (implausibly) to the mechanisms of vision (Gage, “Colour Systems and Perception,” as in n. 130, 195). For the notion of “primary colors” in aesthetics, see E.E. Gloye, “Why are There Primary Colors?” Journal of Aesthetics and Art Criticism, xvi, 1957-85, 128ff.


wide range of often imponderable cultural factors.\textsuperscript{168}

The study of the effects of colors on the physiological functions, a branch of research that was especially active in Europe in the late nineteenth century, and, in the form of chromotherapy, especially interesting to Kandinsky, has also proved surprisingly inconclusive, although this therapy is a form of alternative medicine still practiced in several countries.\textsuperscript{169} A century of research seems to have shown little more than that exposure to red light increases the pulse rate and blue light retards it. Also heavily implicated in modern practices is the use of color in psychological tests, notably in the personality testing developed in the 1940s by the Swiss psychologist Max Lüscher. The Lüscher test is based upon assumptions about preferences for single colors and color pairs. In its simplest and most widely used form, the subject is asked to arrange a set of eight colored cards in a descending scale of preferred hues. The order which, according to Lüscher, gives the "surface indications of complete normality":\textsuperscript{170} blue, green, orange-red, yellow, violet, gray, brown ("a darkened yellow-red"), black is close, in the broadest terms, to the results of earlier tests with many thousands of subjects.\textsuperscript{171} Lüscher's test, which is apparently used widely in medical psychology and personnel selection, as well as by ethnographers and artists,\textsuperscript{172} has come in for a good deal of criticism for its lack of precision and concreteness.\textsuperscript{173} But in the recent literature there is also some skepticism about the capacity of colors to evoke or expose states of mind at all,\textsuperscript{174} a skepticism that has spread to the very notion of color harmony, which was such a sustaining ideal of color theorists until well into this century.

Traditional theories of color harmony may be grouped roughly into three classes: those regarding the spectrum of white light as in some sense analogous to the musical scale, so that it could be treated in a "musical" way (e.g., Newton); those requiring the presence of all "primary" colors in any harmonious assortment, often in a "complementary" arrangement (e.g., Goethe); and those regarding the value content of hues as the primary determinant of their harmonious juxtaposition (e.g., Ostwald).\textsuperscript{175} More recently, experimental psychologists have sought to ground theories of color harmony in the empirical study of responses to single and paired color samples by a variety of subjects.\textsuperscript{176} This empirical work has done little either to substantiate any of the traditional systems, or to replace them;\textsuperscript{177} and yet it remains that harmony is still a very prominent concept among students of color, and that behind several of the color systems currently in use among painters and designers, as well as art historians, in Europe and the United States, lies the urge to organize color in a harmonious way.\textsuperscript{178} Is this another instance of the gap between theory and experience in modern color practice?

One aspect of the doctrines of harmony that has maintained a certain buoyancy among historians of art is the analogy with musical harmony, whether through that branch of psychology known as synaesthesi (not necessarily involving musical, i.e., pitched sounds), or through looser associations. The high period of synaesthetic research was from about 1890 to about 1930, and it made a notable impact on attitudes toward color among painters during this period, especially in Germany and Russia.\textsuperscript{179} In


\textsuperscript{170} The Lüscher Colour Test, trans. and ed. I. Scott, London and Sydney, 1971, 50.


\textsuperscript{172} For a Constructivist artist who has used the Lüscher system (as well as those of Aristotle, Goethe, and G. Wyszecki), see H. Stierlin, ed., The Art of Karl Gerstner, Cambridge, Mass., 1981, which includes (pp. 164ff) an appreciation by Lüscher himself.


\textsuperscript{178} See, for example, H. Zeilhofer, "Philosophy of the Ostwald Color System," Journal of the Optical Society of America, xxxiv, 1944, 355ff; Heselgren (as in n. 94); and R.S. Berns and F.W. Billmeyer, Jr. (as in n. 130).

\textsuperscript{179} See the extensive bibliography in F. Mahling, "Das Problem der Aktion Coloree," Archiv für die gesamte Psychologie, lvi, 1926, 165ff. For some effects on painterly research and practice, see Gage, "Colour Systems and Perception" (as in n. 130), 196-198.
recent years there has been something of a revival of interest among psychologists in cases of synaesthesia\textsuperscript{180}; but it no longer seems to play a role in visual aesthetics, as it did at its beginnings in the nineteenth century.\textsuperscript{181} The looser affinities between color and music, on the other hand, continue to fascinate painters and other students of the harmony of colors. The links between color interests and musical skills in Matisse, Kandinsky, and Klee, for example, have always impressed critics; and in the case of Kandinsky we can now be more certain that his friendship with Arnold Schoenberg helped him move away from a more traditional striving after color harmony. As he wrote in On the Spiritual in Art (1912):

From what has . . . been said about the effects of color, and from the fact that we live in a time full of questions and premonitions and omens — hence full of contradictions . . . we can easily conclude that harmonization on the basis of simple colors is precisely the least suitable for our own time. . . . Clashing discords, loss of equilibrium, "principles" overthrown, unexpected drumbeats, great questionings, apparently purposeless strivings, stress and longing (apparently torn apart), chains and fetters broken (which has united many), opposites and contradictions — this is our harmony.\textsuperscript{182}

In sharp contrast to the fitful light thrown by experimental psychologists on the uses of color in art is the stimulating work of philologists and theorists of language over the past two decades. The puzzle of color terminology — why such a rich human experience of color has issued in such a universally impoverished vocabulary — is one that has taxed students of classical philology for well over a century; but it has also attracted the attention of art historians anxious to bring greater subtlety and precision to their own subject.\textsuperscript{183} The mapping of color space through language can of course suggest far-reaching consequences for our understanding of mental structures, and the extensive discussions that have been generated by Berlin and Kay's synthesis, Basic Color Terms, of 1969, have extended into many areas of psychology, ethnology, and psychology.\textsuperscript{184} Much of the raw material has been taken from non-European cultures, but it is clear that very similar structural patterns apply in Europe, especially in early periods, and that the use of linguistic material must be drawn into the assessment of color meaning in a far more systematic way than has been done so far.\textsuperscript{185} But, of course, lan


guage is also the tool of the art historian, who can learn much from masters of color description such as (to name only those writing in English) Robert Byron, Adrian Stokes, Lawrence Gowing, John Shearman, and Paul Hills, writers who have sought to extend the range of hue description and to introduce important considerations of surface texture as well as of synaesthetic effects into the taxonomy of pictorial color. Here is Byron on Andrej Rubley’s *Trinity* in the Tret’yakov Gallery in Moscow:

The central angel and that on the beholder’s right wear full-sleeved robes, round which cloaks are draped to cover one arm and shoulder. On the central angel these garments are respectively of rich flat chocolate, tinged with red, and of a brilliant lapidary blue, a colour so emphatic, yet so reserved, that in all nature I can think of no analogy for it. The angel on the right wears a robe whose tint is of this same blue, but whose intensity is less. Across this is draped a cloak of dry sapless green, colour of leaves at the end of summer, whose high-lights are rendered in light grey-green shading off into pure white. The angel on the left wears a robe of reddish mauve lit with pale translucent slate colour, over a white vest. All the faces and hands are nut-brown, modelled only by variations in the tone of the same colour, and outlined in black. The outspread wings, whose feathers are denoted by thin gold lines, are a flatter and paler brown, something between tea and toffee, which strikes a mean plane between the figures and the tree.186

It hardly needs to be underlined that this degree of engagement in conveying visual sensations will draw untold benefits from the reading of descriptive fiction.

On the other hand, several historians of art have sought to avoid the snares of subjective language by recourse to one or other of the color-order systems available since the early years of this century. Some early German mono-

186 R. Byron, *First Russia, then Tibet* (1933), London, 1985, 99-100.
188 H. Fuerstein, ed., *Fürstlich Fürstenbergische Sammlungen zu Donaueschingen: Verzeichnis der Gemälde*, 3rd ed., 1921, xi, and, for example, 15, no. 98. Ostwald’s system was applied only in a few instances; for a later recourse to it, see H. Chorus, *Gesetzmassigkeit der Farbegebung in der ottonischen Buchmalerei*, Ph.D. diss., Cologne, 1933, 8f. 54.
192 For example, the processes described by E. Robinson and K.R. Thompson, “Matthew Boulton’s Mechanical Paintings,” *Burlington Magazine*, cx, 1970, 497ff.
the early years of our century\textsuperscript{194}; and it took almost as long — until the 1950s — to be widely accepted as a research tool, although Aby Warburg and, surprisingly enough, Bernard Berenson used it in the form of lecture slides around the time of the First World War.\textsuperscript{195} The English art magazine Colour, which started then, depended upon the extraordinary new developments in mass-produced color-reproduction; and in 1920 it carried testimonials to their fidelity from a number of "great artists."\textsuperscript{196} But for the scholar, acceptance of color either in books or in slides came very much more slowly: in the early 1930s the possibility of color documentation through photography still seemed to be in the future.\textsuperscript{197} Twenty years later, a conservative wrote that color reproduction seemed "fast approaching perfection" as a research tool,\textsuperscript{198} but there was still only a grudging acceptance in other parts of the profession.\textsuperscript{199} In the early 1950s, when UNESCO began its catalogues of good color reproductions, the Skira series Peinture-Couleur-Histoire, the first series of art books, it seems, to print all the illustrations in color, appeared to Roberto Longhi to usher in a new era, when all art archives would be stocked with color photographs.\textsuperscript{200}

The case of color slides is somewhat different, although in the United States they were widely recognized as teaching aids as early as the 1940s, not long after commercial color film became generally available.\textsuperscript{201} This was not the case in Europe: Edgar Wind never used them at Oxford in the 1950s,\textsuperscript{202} and when I first lectured at Cambridge a decade later they were the exception rather than the rule. This is not the place to argue the pros and cons of photographic color reproductions, whose limitations are as well known to technologists as to their clients\textsuperscript{203}; it is only necessary to point out that, as Wind recognized, these limitations are themselves part of the history of color in art.

**Conclusion**

This has been a largely bibliographical survey, but it will be clear from my comments, omissions, and emphases that I think that some lines of inquiry have proved, or are likely to prove, more fruitful than others. Like Michel Pastoureau, I believe that the study of color in Western art must proceed along broadly anthropological lines. But in many cases, its raw materials, artifacts, and their documentation are more sophisticated and complex than those familiar to anthropologists, so that their methods cannot always be usefully brought to bear. Like Pastoureau, too, I believe that a diachronic overview of the history of color is essential, if we are to overcome the standard misunderstandings of local and period-specific aspects of color in art (such as the notion of a fixed set of color values in medieval art, or the scientific competence of Seurat). Historians of color must also face the possibility that, throughout much of European history, their interest has indeed been a very marginal one; that, for example, coats of arms were often presented in a monochromatic form on tiles and seals, and that when they came to be engraved, there was little attempt, until the early seventeenth century, to convey the identity of the blazon by graphic signs. But this possibly marginal concern must itself be a fact of the history of color, and the perennial uncertainty about the nature and even the identity of certain hues (e.g., yellow/gold, red/purple) must be understood as part of the historical experience of color itself. In this sense, disputes about color in all periods can be particularly valuable to the historian.

I have sought to address these and many other issues in a forthcoming book, Colour and Culture in the Western World: Aristotle to Albers, which identifies and examines a number of cases of color thought and usage from antiquity to the present day. Color seems to me to be of special importance to the art historian precisely because it obliges her to engage with so many other areas of human experience. Because it is almost invariably itself, and very rarely a representation of itself, and because it is the stuff from which representations are made, color must be experienced concretely in artifacts. Thus it offers a corrective to that lively branch of our subject that, despite the voguish topic of "the gaze," has sought in recent years to exclude visibility from its discourse. In short, color must redirect the history of art toward the assessment of the visible; and this alone

\textsuperscript{195} For Warburg's use of a colored "Lumière-Lichtbild" at the 1912 International Congress of Art History, see T. Fawcett, "Visual Facts and the Nineteenth-Century Art Lecture," Art History, vi, 1983, 457, Berenson, who had, of course pioneered the use of black-and-white photography in the 1890s, seems by 1921 to have considered colored slides to be superior to black-and-white ones for lecturing (A.K. McComb, ed., The Selected Letters of Bernard Berenson, London 1965, 90).
\textsuperscript{196} Colour, Oct. 1920, 43.
\textsuperscript{199} For example, J. Widman, "Die Colorphotographie im Dienste der Kunstpflege und Forschung," Festschrift Johannes Jahn, Leipzig, 1958, 223-224.
\textsuperscript{202} See E. Wind, Art and Anarchy, London, 1963, 165f: "Since the ordinary photographic plate is sensitive to a larger range of shades than can be recorded in colour, the best black-and-white reproduction of a Titian, Veronese or Renoir is comparable to a conscientious piano transcription of an orchestral score, whereas the colour print, with some exceptions, is like a reduced orchestra with all the instruments out of tune."
\textsuperscript{203} For example, R.G.W. Hunt, "Problems in Colour Reproduction," Colour 73 (as in n. 173), 53ff.
should put it high on any future art-historical agenda.

**John Gage has edited the Collected Correspondence of J.M.W. Turner (1980) and was responsible for the exhibition “G.F. Watts: A Nineteenth-Century Phenomenon” (London, 1974). His work on color theory includes the book Colour in Turner (1969) [Department of the History of Art, University of Cambridge, Cambridge CB2 1PX, England].

**Appendix**

The Bibliography of Color

Because of its ramifications, color has always presented problems to bibliographers, and it may be helpful here to list some of the main bibliographical sources. There are now a handful of general bibliographies of color,204 but rather more on different aspects of the subject, notably color theory and on color language and literary usage.205 None of these is conspicuously helpful to the historian of art, who nevertheless now has a number of resources at his disposal.206 In recent years, several symposia and collections of essays on color have also produced a rich harvest for the art historian.207 Academic dissertations are at best a sort of half-way house to publication, more so in Germany and the United States than in Britain and elsewhere, so I have not generally treated them as books. But among those not cited in nn. 65, 74, 87, 90, 107, 108, 125, and 126 above, it may be useful to list the following:


**Frequently Cited Sources**


