Parameters of Color Quality

What do you—as a producer or consumer—want from a color? How do you know when you have it? Why did colors or colormaking techniques available in the eighteenth century need improvement? One way to understand efforts to improve color is to consider expectations and the ability of objects (or their components) to meet thoses expectations. When a color failed, the object did too. How were the failures of color established and how were they understood? To answer these questions, we need to recognize the underlying ideas about quality that were common throughout Europe.

> Outre la beauté qui est requise dans une couleur, un circonstance essentielle est qu'elle soit solide. Il est certain que celles qui s'affoiblissent à la pluie et au lavage, ou qui en peu de temps deviennent pâles au soleil, sont moins prisées: on appelle principalement couleurs fausses celles que le soleil et la lumière décomposent promptement, et couleurs fines celles qui sont très-peu altérées par ces agens, ou ne le sont même pas du tout.
>
> Henrik Teofilus Scheffer, *Essai sur l'art de la teinture*(Paris, 1803), 3–4.

The universal expectation for color in the eighteenth century was that it should be *good*. Good color is an expression that appears frequently in discussions of innovation and in descriptions of objects. The designation implied certain characteristics that were constant across all media and which remained constant even as fashionable colors, color production techniques, and coloring materials changed.[1] Understood implicitly by consumers, the description of good color was explicit for colormakers and for those who judged new products or processes on behalf of institutions. What did good color require? In the eighteenth century, good color was defined by three basic characteristics. It was attractive, it was permanent, and it could be employed easily or effectively. This combination was occasionally tempered by economics—both cost and value.

Parameters of Color Quality

The Attractiveness of Color

> Le vert de saxe est le plus beau vert qu'on ait encore fait en Europe. Cette couleur, nommée en allemagne sans pareille, se fait à Grossenhayn, et l'on y teint les étoffes toutes faites, et non les laines, en 4-nuances différentes de ce Vert. … Il n'est pas necessaire de faire venir des Teinturiers saxons, comme Mr le Mãal de Saxe le propose, puis que les Sr Roederer fait cettte couleur, au moins aussi belle que celles de Grossenhayn.
>
> Jean Hellot, "Sur le beau vert de Saxe," 1 January 1750, ANF F/12/2259.

A good color should be beautiful, of course, or at least pleasant to look at, but what does this mean? Beauty seems an idiosyncratic assessment for inclusion in a system of standards. Eighteenth-century discussions of beautiful color in such practical settings were not so formalized that they referred to aesthetics in a broad sense. The work of Winckelmann, Reynolds, Caylus or other writers who addressed that topic are never mentioned in this context. Nevertheless,

eighteenth-century experts did not regard the beauty of a color as purely a matter of personal preference. Members of committees appointed to judge color innovations regularly agreed about the comparative attractiveness of samples presented, and the exceptional visual effect of a new color was a common claim of inventors.

Late-twentieth-century analyses of historic colors, especially those found in domestic interiors, emphasize the preference for highly saturated colors in eighteenth-century objects. "Bright and lively" are terms that appear frequently in contemporary descriptions of beautiful colors.[2] Difficult and often expensive to produce, intense colors—deep blues, bright clear reds, turquoises—were nearly always in demand. The pinks, purples, and lime greens that rose and fell in popularity throughout the century, colors often associated with style and taste in mid-eighteenth-century France, exhibit the same brilliance and liveliness. Still, such colors as liver-color, goose-shit green, or Paris mud—names suggesting intense if not exactly sparkling shades—also had a recognized place in the eighteenth-century palette.

A beautiful color might be fashionable. When this was the case, demand for that color might cross all media: such colors as pompadour , Saxon green and nankeen were offered to the public by the dyehouse, pottery and pigment workshops. The popularity of a color in fashionable circles could boost interest more generally but, although this aspect was frequently mentioned in publications, it was not a requirement of beauty, or a requirement for production.

The idiosyncrasies of visual appeal did mean that certain beautiful colors might be more valued by certain people than by others. Merchants and manufacturers recognized that color preferences had a regional or national aspect: A color that was not considered beautiful in one district—and so unsaleable there—might easily turn a profit elsewhere. Thus, the potential value of a new and beautiful color could be established by considering colonial tastes or those of foreign indigenous populations as well as the preferences of markets in Britain, France, Germany, or elsewhere in Europe.[3]

Tactile Qualities –Workability and "Hand"

> Die beste Probe, ob die Farbe genug Temperir- oder Gummiwasser habe, ist die, wenn man ein wenig davon auf einem Stückchen Papier trocknen läßt, und dann nachsieht, ob sich die Farbe verwischen läßt, in welchem Falle sie zu wenig hat, oder ob sie beym Biegen abspringt, da sie denn zuviel Gummiwasser enthält.
>
> F. G., *Versuch eines artistischen Handbuchs* (Jena, 1799), 76–7.

The ease of application for a coloring material—its workability—was a criterion of overall goodness related to the creation of color. A substance was not good if it was not workable, that is, if a skilled practitioner could not use it satisfactorily. Colors that would be painted onto a surface, for example, should be miscible in

the chosen medium. They should flow smoothly in application, should not appear grainy, drag on the brush, or become completely absorbed into the substrate.[5]

Tactile characteristics were equally important to the consumer; a bowl, a box, even a painted wall should be agreeable to the touch, and the color application technique unobtrusive. The thickness of the color layer, its preparatory layers and coatings influence the tactile qualities, too. A color that required a heavy impasto to coat a surface might not be appropriate for an interior wall or a set of dinnerware: aside from problems with permanence, the lack of smoothness would be disturbing. For textile manufactures, a good color was one that did not make the fabric too stiff to drape well; a feature of early eighteenth-century discussions about the wisdom of dyeing cloth black without first dyeing it blue was the degree to which indigo and woad made the fabric more supple.[6]

The Permanence of Color

A good color was also durable: solid, fast, or lasting. It was unaltered by light, water, airborne acids, or other sources of destruction. It did not change color, peel, or rub off in time. It did not alter surrounding colors, ruin the substrate it colored or, as could happen when lead- and arsenic-based colors were used, the health of the artisan or consumer. Permanence was a difficult criterion to achieve and its absence a more serious if more subtle concern than attractiveness. When the color was used to create an image, permanent coloring materials ensured that the balance of colors, the *coloris* or *coloritto*, would remain. Orpiment made a brilliant yellow pigment, but it turned an unattractive dark shade when mixed with or placed close to copper- or lead-based colors such as verdigris or vermilion. Iron was an effective component of the dyebath for black, but it was believed to weaken fibers and so was rarely recommended as a coloring material in dyehouses.

> Il en est de ces ouvrages [toiles peintes] comme de ces tableaux de peintres modernes qui employent beaucoup de glacés ; ils sons infiniment séduisants et frais quand ils sortent de dessous la palette de l'artiste, mais vingt années ne se sont pas écoulées que se sont des tableaux perdus.
>
> "Observations sur l'État de la Manufacture Royale des Gobelins," 31 December 1776, AN O/1/2048

Color prepared in one medium and applied to a surface prepared in one way might look or behave differently in another environment. Permanent color change to objects could result from contact with liquids such as water, lemon juice, and soap solutions. Many common coloring materials change shade or even color on the application of heat, or the introduction of acidic or alkaline substances. This behavior was well known among chemists and, from at least the late sixteenth century, it formed a basis for laboratory investigations of the nature of color and the nature of materials. It could be an amusing party trick to turn blue-colored solutions purple or red and back again, and the variability could be an

advantage—it is the basis of some textile printing techniques—but it was a drawback on objects in use. Brazilwood could produce wonderful red colors on cloth, but they were susceptible to spotting from acidic substances, even weak vinegar solutions. Reports of pitting or cracking to a painted surface due to the composition of the color are not uncommon in painting studies. A similar problem exists for ceramics as a highly acidic or highly alkaline substance could destroy a ceramic glazes but in the eighteenth century the typical uses for ceramics with delicate patterns made this a less significant concern.

A too-energetic cleaning could also damage a colored object. Anecdotes about the origins of the dry-cleaning industry tell of the need, in eighteenth-century France, to overcome the problems associated with water-based cleaning methods for multicolored textiles that might incorporate less stable dyes or metallic elements.

> La peinture à l'huile est le genre dans lequel l'artiste peut saisir la nature avec plus de facilité et la transmettre le plus solidement a la posterité: c'est dommage que le choix et la manipulation des matières qui la composent en aient esté si negligées de la pluspart des peintres; car nos voions presque tous les tableaux à l'huile se degrader insensiblement et même quelque fois se detruire entrez peu de temps: ce qui vient de plusieurs causes.
>
> Arnaud Vincent de Montpetit, *Essais sur les moyens de conserver les portraits peints à l'huile,* 29 April, 1775, AdS *pochette.*

The effort to overcome the lack of durability on existing palettes provided a strong impetus for the invention of new coloring processes for all kinds of color. While poorly made vitreous colors might bubble and crack in the kiln or later peel off from ceramics and glass, well-made ones seemed to possess the ideal balance of sparkling beauty and durability.[7] A layer of varnish might preserve painted designs, but often these coatings were no more stable than the color they were meant to protect. Authors of painting manuals usually indicated appropriate media and appropriate uses of coloring materials discussed as a way to suggest greater permanence. An advantage to the pigment Prussian blue was that it did not darken when mixed with or placed next to most mineral colors. Although the pigment was not problem-free, its stability, combined with its brilliant color, was probably a factor in efforts to adapt the coloring material to textile uses.

The Cost of Coloring

Cost was a lesser but not insignificant consideration; coloring materials and techniques should not be prohibitively expensive. For dyed textiles, where surface areas to be colored were relatively large and ratios of coloring materials to fiber were often one-to-one by weight, expenses were closely calculated. Chemists as well as botanists, geologists and other natural historians searched constantly to find local substitutes for those more costly imported colors and coloring materials. When Guillaume Mazéas presented to the Paris Academy of Sciences a report on red-painted textiles from India, he evaluated key ingredients—chayaver, cadoucaïe—in part to determine if native equivalents existed.[8]

The significance of cost was often circumstantial. The use of an expensive coloring source or coloring material was reasonable, for example, when substitutes were not good enough, when the area to be covered was small but central to the design, or when the quantity of coloring material produced was large in proportion to the amount of coloring source used. True ultramarine is a brilliant, beautiful, and reasonably durable pigment. In the eighteenth century it was also extremely costly, a result of its remote source (primarily the region of Asia that is now Afghanistan) and the meticulous detail needed to prepare it properly. In 1775, ultramarine cost 96 livres per ounce in Paris while 16 ounces of Prussian blue, a common substitute, cost 40 livres.[9] Even Prussian blue, cheap in comparison to ultramarine, was a poor value in certain situations. When in 1725 Jacob Christoph Le Blon described the technique of his color-printed pictures, he recommended using indigo for tests and reserving Prussian blue—almost three times more expensive than indigo—for the final versions.[10]

Colormaking methods, especially those demanding constant heat, could raise prices enough to restrict if not prohibit use. Techniques that required a more simple preparation of coloring materials or less fuel in production would make the color less expensive to produce. If the visual effect of the resulting color remained beautiful, if it was solid and application methods were not seriously affected, this new material or new technique might be an acceptable innovation.

Ideals and Realities

The perfect combination of attractiveness, permanence, workability, and hand, with or without cost, was an ideal satisfied by few coloring materials for any medium. Solid colors often lacked brilliance. Purple or black shades made from indigo and woad, the cornerstone substances of blue dyeing, were not as lively as those obtained from logwood.[11] Initially European dyers could produce only fugitive colors from logwood however; this was one reason for its prohibition in the sixteenth century. Continued trials eventually located better mordants, but this experience (plus advocates for the native woad industries in France and Germany) meant that indigo and woad remained in the palette of coloring materials used to make black.

Beautiful colors were often not permanent. Generations of experience determined that lake pigments and vegetable dyes often faded after even minimal contact with light or polluted air, while ochers and other minerals appeared to retain their initial color. This further motivated investigators to experiment with processes to replicate the permanence of mineral-based colors, as well as those that were set by heat.

The difficulties of obtaining and preserving good color were recognizable in common experiences with all objects and they were familiar to a broader public

than simply artisans and manufacturers. Direct experience came from everyday use of objects, in which colors failed by not meeting one or several of these criteria. Investigations into color and coloring processes were often guided by the desire to overcome the deficiencies of existing shades while maintaining, or even superseding, the desirable qualities. They were constant points in discussions of improvement in the arts—discussions that took place or were reported in many public venues. An underlying understanding, when a color was declared "good," or "good enough," was that the balance of its qualities had been considered carefully.

Establishing Goodness

> Mr. Moser who had examined the Enamel, . . . gave an Account that it was too hard for their use, and the colours not so good as the Venetian. Mr. Grignion attended and gave an account that the Workman he had employed to examine the Enamel had acquainted him that the enamel is not so good as that produced the last year.
>
> Committee Minutes of the Manufactures Committee, 21 March 1761 [R]SA Minutes of Various Premium Committees 1760–61 PR.GE/112/12/2.

When you know what you want from a color, how do you determine that you have it? During the eighteenth century, test methods used in all colormaking processes considered the balance of beauty, workability and permanence as they attempted to answer a common question—is this coloring source, or material, or technique good enough? Whatever the source, and wherever its ultimate use, confirming the characteristics of a color or colormaking process—establishing *how* good this good color might be—was necessary before its recommendation or employment.

Tests of coloring materials were familiar in all production houses, as each shipment was proofed (proved) to confirm its quality and to determine its working properties. This testing allowed colormakers and manufacturers to adjust production processes, and so reduce the risk of a poor result, based on an assessment of the actual materials to be used. No matter how experienced the workers, creating color in objects involved constant testing of materials and preparations, temperatures, and application methods.

> On fait rougir la pointe d'une épingle; on l'enfonce dans un petit morceau d'indigo afin qu'il puisse s'y attacher. On l'expose ensuite à la flamme d'une bougie. Si cet indigo est de bonne qualité, il brûle vivement, & les flammes divergent à une distance assez éloignée. Si cet indigo est de moindre qualité, la flamme ne diverge point, & est tranquille comme celle d'une lampe. Enfin, si c'est de l'indigo inférieur, il donne très-peu de flammes. Cette expérience simple est quelquefois mise en usage par des Commerçans intelligens pour s'assurer de la supériorité des indigos, & sur-tout, reconnoître ce que l'on appelle les *fausses pierres*, quand on soupçonne cette fourberie dans la marchandise que l'on veut acheter.
>
> [Louis-Guillaume] de la Follie "Réflexions sur la téorie de la teinture" *Journal de Physique* 10 (January 1778), 68.

Establishing the goodness of color in objects was also a traditional responsibility of the colormaking guilds or communities. Their tests, common in format across

disciplines throughout Europe, were comparative. Any substance was good enough as long as it was as good as existing materials or methods, and an additional value of the tests lay in the wide range of results they permitted. In the eighteenth century, decisions to accept or reject a proposed invention by a government committee or an independent society were linked to the same questions about goodness. In these instances, a set of tests established the quality of the innovation and, through that, the quality of the outcome. In more-explicit tests of novelties, this standard might be applied twice, first to determine which methods were adequate and then, in a comparative assessment, to determine which one was best.

Testing Colors for Dyes, A Testing Model

> It would ultimately be of general service if some such regulations were established [in England] as they are in France concerning Dyers; those who dye fast colours and those who do not, being deemed of distinct professions, and fast and fugitive colours being confined to certain kinds of cloth.
>
> Charles O'Brien, "Of Colour-Making," in *The Callico Printers' Assistant* (London, 1789) 2:n.p.

Eighteenth-century European techniques to make enamels, pigments, and dyes have a common background. All were based in longstanding craft traditions and all changed through exposure to foreign techniques. All were subject to early and varied publication and considerable interest from many quarters. In France, dyes and dyeing, a segment of the textile industry that had national economic significance, were codified as part of Colbert's economic reforms of the 1660s.[12] Although ultimately their value to the growth of the French textile industry is ambiguous, these regulations are a remarkable feature within textile history, and they remained a source of emulation and envy for textile colorists in other countries even after they were essentially abandoned in France. British artisans and observers alike often expressed regrets that a similar system could not be instilled there. In Germany, the relationship between the French code and eighteenth-century changes within the traditional guild divisions of *schönfärber* and *schwarzfärber* remains to be explored.

A noteworthy aspect of the French regulations was the division of dyestuffs and their products into the categories *grand teint* and *petit teint*, according to the goodness criteria described above. Colors made from *grand teint* dyes were more solid and therefore longer lasting. For that reason (as well as the price of the dye drugs), they were more costly. *Petit teint* colors, while often livelier, were less permanent, and often less expensive.

> La simple exposition à l'Air est un équivalent du débouilli, car les couleurs s'y passent plus ou moins vîte selon le teint dont elles sont. Mais l'operation de l'Air trop lente, M. du Fay a trouvé sur quelques couleurs principales qu'il employoit, qu'elles perdoient autant en 5 minutes de débouilli, qu'en 12 jours d'Eté qu'elles avoient été tenuës au grand air.
>
> "Sur le Mélange de Quelques Couleurs dans la Teinture," *Histoire de l'Académie royale des*

Sciences année 1737(Paris, 1740), 59

The regulations, which were intended to preserve the reputation of the French dye industry, addressed the problem of fraudulent substitution of *petit teint* colors for the more expensive *grand teint*. When necessary, guild adjudicators might mention appearance and tactile qualities as telltale characteristics of a specific dye process, but in such situations examinations concentrated on the degree of permanence the colored goods achieved. The prescribed test involved boiling a sample of the questionable goods in a solution of alum and tartar and then comparing the result to a cutting from a reference standard treated in the same way. When the correct dyestuffs were used in an appropriate process, the new cloth looked the same as the reference fabric. As Charles-François Dufay noted, the purpose of the chemical test was to simulate the time-based color change. This process induced, in a few minutes, changes that in regular use might have occurred over months or years and it could indicate not only loss of beauty but also decay and destruction of the fabric.

It is important to recognize that, although the same test was used throughout France, the reference textiles that established the quality standard were a local responsibility, produced annually in each city or district. Thus there was a national standard, but its qualifications were protean, able to accommodate local traditions as well as changes in fashion. Enforcing the rules did not standardize either the process or the result. To communities of dyers and administrators, this flexibility was a source of both pride and frustration.

The need for the flexibility is evident in an anecdote about Jean-Michel Haussmann, owner of a Turkey-red dyehouse in Rouen during the 1770s.[13] On returning to his native Colmar in order to establish the same, Haussmann found that the formulas that worked so well in Normandy produced unattractive colors in Alsace. Further study of both technique and material showed that differences in water quality were a deciding factor; new formulations were necessary. Skill in manipulating common materials determined the ultimate result, but the need to accommodate uncontrollable differences in essential materials was critical. The tests allowed such variations.

Autrefoit, . . . on vouloit les écarlattes pleines, foncées, d'une couleur que la vûë foutenoit aisément. Aujourd'hui, on les veut orangées, pleines de feu, & que l'oeil ait peine à en soutenir l'éclat.

Jean Hellot, *L'Art de teinture des laines*(Paris, 1750), 277.

Quality examinations also had to accommodate changing tastes. Writing about scarlet-colored cloth in his 1750 treatise on dyeing, Jean Hellot commented on the change in its meaning. Scarlet had become a brighter and more orange color in Hellot's lifetime; it was not unusual to enhance scarlet colors by over-dyeing or glazing them with orange.[14] In general, the tests that governed textile dyeing in France accepted both variation in local circumstances of production and change in

public taste. These tests set a standard without enforcing standardization. As long as it was "as good as" the reference, a color was good enough.

Testing Vitreous Colors

Similar regulations did not exist for the pigments, enamels, or glazes, but reports about new materials confirm similar tests, used with the same goals, for those colors. In the early 1750s, Jean Hellot outlined the trial process for colors at the Vincennes ceramics manufacture.[15] Long-term permanence was not considered a problem for ceramic colors, but tests of a "good" glaze or enamel followed the same pattern as that of tests for other coloring materials. As Hellot described, to know the properties of a new composition for a ceramic color, take some of the color and grind it fine. Mix the powder with a solution of water and gum arabic and apply several strokes to a piece of waste porcelain: Number or otherwise mark it. Repeat the procedure with other colors you wish to test. Fire the sample as you would any similar ceramic and examine the result.

The testing process tells those who follow it a great deal about the color. Is it workable—easy to grind, easy to apply? Is it beautiful—transparent and bright? How can it best be used—as a covering color? To paint designs? For demi-tints? Hellot also noted that orderly samples were valuable as an inventory and a color guide for the painters—a secondary but significant purpose for color testing in a workshop.

Josiah Wedgwood's notebooks record a similar testing-and-comparison process in his development of new colors. Wedgwood's experiment books list systematic trials of colors and of clay bodies numbering into the thousands. His remarks compare the effect of varying quantities of materials and sample placement within the kiln. Textile colorists and pigmentmakers followed the same general procedure, the observant or analytical preparation and use of a sample of the coloring material or technique.

Using the Test Methods

The close relationship of materials, techniques, and skills in colormaking had a decided effect on new materials and new processes devised in the eighteenth century; understanding this relationship also explains some common eighteenth-century vocabulary about color itself. A new color was not necessarily something never before seen or simply a color newly in fashion. A new color could be one that looked familiar but used a new production process or included a new coloring source or coloring material. The defining characteristic could be a change to the materials or techniques as understood by those familiar with common practice. So, when the Lyonnais merchants Daubert and Maille developed their own technique to dye silk, they, and the French government, described the product as a new black, meaning one better than those achieved through other

then-standard processes.[16] In French discussions of an act of the British Parliament granting Edward Bancroft exclusive rights to import the dyestuff quercitron, it was noted that, while the palette of yellows that quercitron produced might be familiar, incorporating this substance created a new industry, because quercitron was a different and presumed better material.[17]

Confirming Good Color

> You desire of knowing the experiments I made on Mr. Chambers's painted marbles, ...
> [T]he colours are good . . . therefore it is probable that Mr. Chambers's Method of staining or colouring marbles is extremely good.
> This art will be usefull in blazoning arms on monuments for inscriptions tables of the decalogue over the altars &c as by this method they will be preserved ages from the injuries of the weather. tho at the same time the stone itself will be somewhat hurt or corroded by the Air.
>
> Emanuel Mendes da Costa to Anthony Keck, 21 March 1759, [R]SA PR.GE/110/7/47.

Good color does not spring unaided from the mind of even the most experienced practitioner onto the object without some testing and adjustment. Even if the large number of trials cited in many petitions was exaggerated for effect, the need for repeated tests was certainly true. For those called upon to judge these innovations, the only way to determine that a color was good enough to use was to test a sample or re-create the process.

As reasons to confirm that a color was "good enough" expanded, the testing procedures were altered to correspond. For institutions seeking to understand or reward inventions, the test methods used elsewhere to guard against false claims or to determine the reasonable expectations of a coloring material were easily adapted to these new uses. Typically, institutional testing would begin with the presentation of a sample, perhaps preceded or accompanied by a letter describing the invention. The sample and its description would be inspected and discussed, usually by a committee. Was the color beautiful? What claims did the inventor make for this novelty? Did it appear to be something new? If it had some special qualities, did those qualities solve problems known to exist in a similar color?

In the next step, the uniqueness of the materials and the process were considered. Was this color or coloring process a desirable and hitherto exclusive product of a foreign region? Was this technique perhaps novel in the region of its origin but already a common practice elsewhere? Coloring materials, colors, specialized tools, and techniques might have several common names; this often created confusion.[18] For novelties presented as foreign secrets, a common occurrence for vitreous colors, the testing procedures often began with discussion of the foreign goods, how the color was used, and whether it was worthy of emulation. Many offers were rejected at these early stages and never tested further.[19]

When a new color passed the initial tests, assessments moved to considerations

of permanence. A prepared sample would be subjected to tests designed to replicate known problems. For textiles, this meant boiling a sample in an alkali, soap, or tartar solutions or sometimes all three in sequence. Pigments might be treated with the same substances.[20] Textiles and painted surfaces might be placed in a sunny window or exposed to the rigors of city airs for a prescribed number of days. At the end of the test, the new invention would be compared to a reference sample treated the same way.

If the color was successful to this point, the recipe was then made up, in order to understand the production process. Was a technique or required tool unusual? Did the process take place as expected? When examiners lacked the necessary skills, one or several artisans might be asked to undertake a part of the project, and to offer an opinion about the experience. Finally, the committee would convene to discuss whether the new color was good enough to deserve an award. In most cases the threshold was comparative. These inventions did not have to surpass existing materials; they needed only to meet the recognized standard. Was it as good as the reference sample, as good as similar products, according to artisan experience?

Improving Goodness

The same general process for testing unknowns was also applied to questions of color quality, used to indicate opportunities for improvement. In 1777, the French Council of Commerce assembled a committee to discover whether it could be claimed that French-dyed black silk was as good as silks from Genoa, reputedly the source of the most beautiful and durable black fabrics.[21] The commission acquired samples from several Lyonnais manufacturers and from the best manufacture in Genoa. They brought out samples of the best cloth (Genoese) from a similar comparison made thirty years earlier. The resulting report describes every process and calculation made on these specimens. The same testing protocols I described above were applied to the collected samples; the judges compared beauty, permanence, and cost. When the work of some French black dyers did appear to meet the standard established in Genoa, discussions of ways to teach their techniques to others, or to increase their number, followed.

In addition to efforts to determine and advance national skill levels in this general manner, two other activities frequently employed similar attempts to assess color. Appropriation of foreign coloring methods was one activity. The second involved exploration of new substances or new techniques. As efforts toward improvement, either activity might call for close studies of chemistry, mineralogy, botany, or current colorhouse practices. In each case, the procedures that established quality standards in a color or production method were equally valuable as analytical tools. The original question—Is it good enough?—here became under two new questions: "What is it?" and "How was it made?"

The nature of the standard tests made possible their use to determine construction of a color. The episode of Roederer's Saxon green suggests typical parameters of this use. When Hellot, in his treatise on wool dyeing, described the boiling tests devised by Dufay, he included a list of the expected behaviors that each color would exhibit when exposed to soap, alum or red tartar. Cloth that responded differently was suspect, and worthy of further investigation. Comparing the results of a test to this list could also indicate the use or absence of certain coloring materials and so contribute to investigations of foreign or simply unusual-looking goods. Examination of the way a new, popular object passed or did not pass the quality tests—study of its failure, so to speak—became an acceptable analytical technique.

> Les chimistes ont trouvé le blanc de Cremnitz, qui n'est qu'un blanc de plomb purifié, et qui seroit le plus parfait de tous les blancs s'il n'étoit un peu trop transparent; mais peut-être est-il impossible de purifier le blanc de plomb sans lui faire perdre de son corps. Le blanc de plomb ordinaire est la couleur la plus propre à la peinture, parcequ'il a l'opacité convenable pour couvrir suffisamment, et assés de transparence pour laisser apercevoir et jouer le fond. Il est très sécatif, ce qui est une qualité essentielle, puisque la couleur qui sèche le plus vite est celle qui change le moins; il se broye parfaitement, obéit et s'étend facilement sous le pinceau.
>
> "Raport. . . de MM. les Commissaires du Blanc de Zing," (6 July 1782) *Procès-verbaux de l'Académie royal de peinture et de sculpture 1648–1793* (Paris, 1889), 9:116

There were, however, sites of conflict among inventors, judges, and the communities that might make the adoption of an invention difficult or, occasionally, impossible. Friction among the academies and relationships with nonmembers often played a part; judging criteria and results could be different. When a committee of scientists in 1782 approved zinc white as a good substitute for lead white, they cited as one reason for the substitution the danger of working with lead-based colors. The zinc-white pigment had been invented and tested in Dijon. It was used there for some years with success before it was sent to Paris; and judges at the Paris Academy of Sciences believed this was further proof of its goodness. The committee of painters chosen to adjudicate zinc white on behalf of their academy disagreed. They pointed to zinc white's greater transparency and slower drying time as principal reasons for withholding endorsement. Their refusal contributed to the delay of zinc white's regular presence on the palettes of French painters and, because of the significance of the Academy of Painting and Sculpture and the regular reporting of its activities, in regions beyond France.

Value of Testing Systems

The route from submission to testing to reward also gave committee members an opportunity to sponsor inventions. Occasionally it led to a dialogue between the inventor and one or several judges, especially if continued work might raise a promising color to the necessary standard. Some colormakers appear and reappear, working for decades on their invention or inventions. A few offered successive variations that never passed the tests; others eventually received

approval. These efforts, more and less successful, further expand our picture of the relationship between color quality and production and of the ways testing could change to accommodate new economic factors and scientific ideas as well as changing tastes.

The request for affirmation of an invention was often more than a bid for recognition of an effort toward the common good. In France, the custom of reporting new inventions to the local authorities for approval and transfer to an appropriate national body linked local activity to the national administrative system rather than to an independent society. Approvals from the police and the appropriate guild or corporation were required to establish a factory and, for those without well-established social connections or sufficient financial support, the extra endorsements offered some protection against harassment.[22] Furthermore, the prospect of a monetary reward could be critical to the creation or maintenance of a business. A statement of approval from a scientific or improvement society was a desirable promotional tool.[23] In Britain and Germany, affirmations were equally significant to manufacturers as they attempted to establish new manufactures, and as tools for promotion. Overall, the testing system allowed a great degree of flexibility—in use of techniques that recognized differences in local water quality, in accommodations made for changing tastes for colors—even to the point at which a new production technique would be adopted within a community. Throughout these changing purposes and changing tastes, the underlying criteria remained constant: good color was beautiful, permanent, and appropriate for its uses.

Notes:

Note 1: Sarah Lowengard, "Colour Quality and Production: Testing Color in Eighteenth-Century France," *Journal of Design History* 14 (2001): 91–103.

Note 2: M. Bencard, "The Boucher Tapestry at Rosenborg Castle," Caisse Nationale des Monuments Historiques et des Sites, colloquium, Château de Chambord, 19–20 October 1996; Ian C. Bristow, *Architectural Colour in British Interiors, 1615–1840* (New Haven, 1996); Ian C. Bristow, "Ready-Mixed Paint in the Eighteenth Century," *Architectural Review* 161 (1977): 246–68; Roger W. Moss, ed., *Paint in America: The Colors of Historic Buildings* (Washington, D.C., 1994).

Note 3: "Couleurs pour la Peinture Nouvellement Inventées: Extrait d'une Lettre Écrit à Londres 15 Avril 1730," *Mercure de France*, no. 737 (May 1730): 968–9; Trade card of De La Cour, London, mid-eighteenth century, British Museum, Department of Prints and Drawings, Heal Collection, 89.45; Jean Michel Haussmann, "Observations de M. Haussmann sur Rouge d'Andrinople," *Annales de chimie et de physique* 12 (March 1792): 196–219, 250–272.

Note 4: John Holker to D. Trudaine, dated Rouen, 9 January 1762, in dossier concerning Morris and Joppe [Hope] AN F/12/1334A.

Note 5: [Jean Hellot], "Essai des couleurs et emaux sous la mouffle," *Recueil de tous les procédés de la porcelaine de la Manufacture royale de Vincennes, décrits pour le roi: Sa majesté, s'en etant réservé le sécret, par arrest du 19 Aoust 1753*, [1753-4] BMNS,

Y.51bis.

Note 6: "Arrêts sur la teinture du blanc en noire avec racine de noyer," 2 documents, dated 22 February 1709, and 1715, AN F/12/1329; "Maitres teinturiers de Rouen. Condemnation de teinture noire avec racie de noyer," 5 June 1717, AN F/12/1334A; "Notice des inspecteurs, teinturiers et marchands, Orleans. Arret qui permet les teinturiers noire et blanc d'employer et d'utilise un bain d'racine de noyer, pour étamines, voiles et autres petites etoffes . . .," 28 May 1718, AN F/12/1329.

Note 7: Boileau to Pierre-Joseph Macquer, 18 August 1769, BNF, *M.F.*Fr. 9135, no. 89; Anne Lajoix, "Alexandre Brongniart et la Quête des Moyens de Reproduction en Couleurs," *Sèvres*1 (1992): 64–73.

Note 8: Guillaume Mazéas, "Recherches sur la Cause Physique de l'Adhérence de la Couleur Rouge aux Toiles Peintes qui nous Viennent des Côtes de Malabar et de Coromandel," *Mémoires de mathématique et de physique présentés à l'Académie royale des Sciences par divers sçavans, & lûs dans ses assemblées [Savants étrangers]*4 (1763): 1–32.

Note 9: Jean-Félix Watin, *État et detail des principales marchandises et autres objets relatives aux trois arts* . . . (Paris, n.d. [1775]).

Note 10: Antoine Gautier de Montdorge, *L'Art d'imprimer les tableaux traité d'après les ecrits, les opérations et les instructions verbales, de J. C. Le Blon*(Paris, 1756), 115–6.

Note 11: Rita Adrosko, *Natural Dyes and Home Dyeing*(1968; repr. New York, 1971), 45–49.

Note 12: *Statuts, ordonnances et reglemens que Sa Majesté veut être observez par les marchands maîtres teinturiers en grand et bon teint des draps, serges et autres etofes de laine de toutes le ville et bourges de son royaume* (Paris, 1670).

Note 13: Haussmann, "Observations sur Rouge d'Andrinople."

Note 14: Jean Hellot, *L'Art de teinture des laines et des étoffes de laine en grand et petit teint. Avec une instruction sur les déboüillis.*(Paris, 1750), 277.

Note 15: [Jean Hellot], "Essai des couleurs et emaux sous la mouffle." .

Note 16: "Mémoire sur les couleurs nouveaux du sieurs Daubert et Maille," [ca. 1780], AN F/12/1332.

Note 17: Meeting Minutes for 30 May 1785 and 27 June 1785, *Procès-verbaux de le Conseil de Commerce*1785, AN F/12/2259.

Note 18: Taboreau to the Director [of the Gobelins manufacture, Jacques-Germain Soufflot] 20 April 1777; and responses dated 7 and 9 May 1777, AN O/1/2047.

Note 19: "Manufacture du "Terre de Levant". . .privilège du Sr. Duhenois," 5 December 1754, AN F/12/ 1497A #29; "Lambert et Boyer, Entrepreneurs d'une manufacture des cristaux, emaux et cendres bleue . . .," 14 January 1783, AN F/12/1489B #15.

Note 20: Jean Hellot, "Instructions Pour la Debouilli des Laines et des Etoffes de Laine," *L'Art de teinture des laines,*617-31.

Note 21: Pierre-Joseph Macquer, "Examination et comparaison de la solidité du teinture de soie en noir des principaux teinturierers de Lyon et Gênes," 10 October 1777, AN F/12/2259.

Note 22: Merlin, teinturier à Paris, "Petition d'établir une teinturerie," 9 May 1783, AN F/12/1330; "Mémoire lu par Hellot écrit par sieurs Gly et D'Heure concernant son bleu de Prusse," 6 and 9 February 1765, AdS *pochette*.

Note 23: Collin, "Rouge vegetal pour la toilette des dames," 10 January 1773, AN

F/12/1473 #2.