Expertise and Experience

or, What is Science, to an Artisan?

Artem experientia fecit.

—Motto on the title page of Jean-Félix Watin,
L'Art du peintre, doreur, vernisseur

> Quel service ne rend pas aujourd'hui M. Watin à tous les citoyens, qui souvent manquent de secours pour entreprendre, ou de lumières pour éclairer les démarches d'ouvriers ignorans, & quelquefois intéressés à tromper.
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> *Année Littéraire* 4, no. 8 (1772): 166–7.

Early in the winter of 1772, Jean-Félix Watin, a Parisian varnishmaker, painter, and color merchant, announced publication of a book. Dissatisfied with all public information about his areas of expertise, Watin claimed that in his *L'Art de faire et d'employer le vernis* the reader would find true and accurate details about varnish, varnishing, colors, and related topics.[1] The declaration and the subsequent appearance of the book were not in themselves remarkable; Watin's publication was one in a long tradition of works that explain and instruct in an artisan specialty. Books and pamphlets of this nature served a variety of audiences and are a common feature in discussions of early modern print industries and of the transmission of information about subjects across a range of disciplines, including the sciences, technology, philosophy, and religion. Apparently, Watin's treatise was a reasonably successful example of its kind; the following year he announced a second edition, rewritten, reordered, and renamed *L'Art du peintre, doreur, vernisseur*.[2]

Just as the second edition was to appear, another book, also describing techniques of paint- and varnishmaking and also by a Parisian merchant, was announced.[3] It was clear from the prospectus that in *Traité des couleurs et vernis* sieur Mauclerc would cover the same information as Watin's publication. Watin protested, leading to a delay in publication, but Mauclerc's book appeared a few months later. A review of it in the *Observations et mémoires sur la physique, sur l'histoire naturelle et sur les arts et métiers* (the *Journal de physique*) suggested that it might have been better called *Critique de l'ouvrage de M. Wattin* [sic] *sur les vernis*; nearly half the book was devoted to a refutation of Watin's presentation and his skills, and his expertise was questioned throughout.[4] Watin did not ignore this attack on his competence. His rebuttal, *Supplément à "L'Art du peintre doreur vernisseur,"* quickly followed.[5] It incorporated Mauclerc's entire treatise, adding comments, annotations, extensive marginalia, and testimony from others against Mauclerc.

This disagreement in print is not especially surprising: published attacks on

published works, public rebuttals and the drawing-in of others occur in all genres of eighteenth-century writing. Nor was this the only attack, real or imagined, which involved Watin. From the first, he had described a need for a new book on varnish, one to supersede the poor work that was then available; in subsequent editions he cataloged the references for and against his own work, and singled out those he believed encroached on his territory—especially his secret odorless varnish recipe and a special interior painting technique.[6]

> Les tableaux pourront conserver une odeur désagréable de térébentine. Pour remédier à cet inconvénient, il faut parfumer la bordure avec le musc, ou l'eau de fleur d'orange; ou bien encore mêler quelque huile essentielle aromatique comme de citron, de cannelle, de lavande, &c. avec l'essence de térébentine, ...
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> "Découverte de la peinture en cire" *Journal œconomique* (June 1755): 97.

Examined together, Mauclerc's *Traité* and Watin's *Supplément* present an interaction that covers considerable ground and is open to a number of interpretations. Given the artisan subject of the books, it would be difficult to dismiss or ignore the idea that the dispute between Mauclerc and Watin was lodged in an economic rivalry or a marketing competition, but it was more than that. The episode also hints at a social dimension to the making and selling of art materials, at the rivalries that existed within guilds and across the boundaries of the guilds, corporate communities, and the scientific communities, as well.[7] Superficially, the disagreement outlined in the two books concerned competence. Therefore, it might be instructive to consider the arguments each artisan presented as a disagreement about the definition of simplicity or, within in a more technological framework, about the definition of personal skill. A prominent aspect of the dispute, however, is the terrain on which its battles are fought. Although the nominal subject of these works is varnish, the disagreements are founded in color and, more specifically, in an understanding of the sciences necessary for a colormaker, color merchant, or colorist. Each man highlights the sciences in his working life, and questions their use by the other. What theories are essential to an understanding of colormaking practices and color use? What must one know? Efforts to prove the incompetence of a rival led both Mauclerc and Watin to describe his own understanding more thoroughly than did many artisan writers of their time period. Both articulate the link between practice and theory through a presentation of color descriptions, characterizations of varnishes, and explanations of their uses. Mauclerc complains about Watin's information and his interpretation of science for artisan practice. Watin criticizes Mauclerc's ideas. Each raises questions about the capabilities of the other. Each assumes his own understanding and practice of science, and therefore all explanations that rely on that understanding and those practices, are correct. How do the sciences support art? How should an artisan use them? What is the best combination of science and practice? These questions are at the heart of the dispute.

Considerations of the role that the sciences play in early modern European art

have a well-established place in the historiographies of both sciences and art. The premier science in the study of the history of art is, and always has been, the science of vision, because "the distinction between what we really see and what we infer through the intellect is as old as human thought on perception."[8] In painting and in architecture, the sciences served design by allowing more-realistic illusions: The invention of perspective in the Renaissance and the increasing geometricization or mathematization of painting and of architecture have been central issues. Scientific understanding was also a component of the philosophical debates regarding the nature of light that, from the seventeenth century, encouraged the definition of painting as a representation of light and shadow.[9] This emphasis loses some relevance, however, when the focus shifts from the fine arts of drawing and painting, sculpture and architecture, when the function and usefulness of the object is a factor in its form, design and value.

In a similar manner, historians of science have often turned to art in their consideration of seventeenth- and eighteenth-century philosophies and to examine visual, especially public, representations of key ideas.[10] Other connections between art and science are based in the shared craft origins of artistic and scientific practices. Alan E. Shapiro, for example, has used Newton's *Optics* as a springboard from which to examine the presentation and acceptance—and rejection—of Newton's theories about color by artisan and nonacademic communities.[11] Michel Blay has also addressed the combination of art with science, commencing with science and often with Newton.[12] In these studies, too, scholarship is concentrated on theoretical foundations, in essence giving the scientist the tools of art to express and explain ideas. The complement is less often considered.

I have argued elsewhere that, in the eighteenth century, conceptions of color were inseparable from the materials that comprised it and those onto or into which it was incorporated. Artisan communities—and also consumers, institutions, governments concerned about the ramifications of color production—knew that an understanding of materials was the foundation of success. These groups believed that sciences such as physics, optics, chemistry, and geometry could aid that understanding. Despite the complaints, which are well documented in modern histories, communities of practitioners often welcomed "rationalized" techniques, and the opportunity to add the sciences to their practices.

What does this mean? What is science, to an artisan? The jousting between Watin and Mauclerc offers insight into this question, suggesting what the union of science and technique meant to those who, according to common rhetoric, would be the greatest beneficiaries of this union. In this section, I will outline the presentations of Watin and Mauclerc and their disagreements. I will then use this dispute to consider the role of science and the meanings of technology for

members of a group of people whose attitudes and opinions about those subjects are generally obscured.

The Presentations

Although neither Watin nor Mauclerc claimed to be a savant, each man offered his readers more than a collection of the well-known scientific ideas of the time. Each described his presentation as a summary of his own understanding, the result of combining practical experience with scientific and technical works and with personal efforts to understand essential theories. Both emphasize the personal experience that led to the adoption of their ideas. Both claimed a desire to extend public knowledge of their arts and to use them as a conduit to the sciences. Despite the similar statements of purpose, they did not agree about what an artisan needs to know or about the appropriate way to incorporate the sciences into practice. The disagreements cover a wide range of concerns. What do theories of physics and chemistry offer colormaking and varnishing practices? How far must one take exhortations to observe and experiment in order to understand and further the goals of rationalized practice and useful theories? Pieces of the argument are scattered throughout the books. For clarity, I will sort them into three parts: physics, chemistry, and workshop operations.

Discussions of Physics, Primarily Optics

Both Watin and Mauclerc attempted to communicate a familiarity with and comprehension of prevailing ideas about color and optics. Neither author, however, states or restates the basics of Newton's optics, or of Descartes' or Aristotle's. A good artisan is aware of the basic theories, but this information is easily available elsewhere.

Which parts of physics are important to a practitioner? In the first edition of his treatise, before the public argument began, Watin outlined his answer to this question. Whether color is resident in an object or is the product of vibrations and refraction of light is not significant, he stated. Nor are the general descriptions of color relative to the light that produces it, the sensations that receive it, or those it gives off. He will side with neither Newton nor Grimaldi regarding diffractions and inflections. The nature of light is not the same as the nature of color, and here it is less important. And so, having indicated that he knows the groundwork well enough to dismiss its irrelevancies, Watin continued with the parts of physics and its theories he believed important to artisans. "Terrestrial physics," Watin's concern, runs counter to the "celestial," the physics that includes optics. In the former, black must be a positive color, and white can exist by itself, not only as a mixture. The primitive colors are red, yellow, and green; blue, indigo, and violet are produced only by composition and mixtures. White and brown are secondary colors, supplied as pure materials by the earth. For Watin, artisans must take

ideas and terms from physics but use them as practice indicates.

Mauclerc pointed out that it is easy to locate the sources of Watin's definitions. Primitive colors are determined by the pocketbook. They are the colors that can be found inexpensively and in abundance in the earth and in the color shop. White and red lead; brown, red, and yellow ocher; terre vert—these are among the least-expensive colors offered for sale. A list, issued by Watin himself, confirms this assertion. It does seem that Watin equated basic colors with simple preparation and low cost. These were significant concerns for a true practitioner, but not necessarily obvious ones to the more theoretically inclined.

Mauclerc also suggests some novel ideas, but his scientific presentation is more traditional in its scope and content. Both his vision of what art requires from physics and his presentations of that vision are less coy. Claiming that his discussion includes information of concern to both painters and savants, Mauclerc offers the key points about color, light, or optics. Light comes from the sun, and colors are derived from light. The basic colors, those which Newton found in his prism, are red, orange, yellow, green, blue, indigo, and violet. Between these are undetermined shades, each of which combines the color that precedes and the color that follows it. Mauclerc's characterization of the prismatic colors led to his explanation that this is why light could be called *septuliée*, a term Watin found objectionable. It is an unusual expression in French, Watin comments, but he knows it is used in the translation of Francesco Algarotti's *Il newtonianismo per le dame.*[13] Therefore, Watin suggests, Mauclerc's interpretation not based in artisan experience and it is not even his own. Furthermore, Watin continues, Mauclerc includes a section in which he compares the different kinds of colors, employing distinctions of impalpable and luminous, material and opaque. Watin circumvented this confusing and useless discussion by identifying his concern as only the terrestrial (i.e., material and opaque) colors. Watin's implication is that this physics has no place in the workshop.

> L'on a observé qu'un brillant de onze grains, éclairé d'un rayon de soleil, réfléchissoit sur un papier qui lui est opposé, trois couleurs; savoir, bleu, jaune, rouge, sans aucune couleur intermédiaite; & comme le diamant a plusieurs faces, il répétoit ses réléxions faits autre changement, que dans l'horizontal; les unes avoient le rouge à la partie supérieure, les autres le bleus & que dans le perpendiculaire, le bleu & le rouge se placent indifféremment à droite & à gauche, & que le jaune occupoit toujours le milieu.
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> Mauclerc, *Traité des couleurs et vernis* (Paris, 1773), 13.

It is not that Watin made no effort to reconcile theories and practices, however. Chief among his statements are that the primitive colors are red, yellow, and green, and that white and brown can be considered primitive colors as well. Mauclerc uses this description to point out the truth of Watin's claim that he is no physicist. In what system do you find that a color (green) produced from a mixture of colors is primitive, while a simple color (blue) is classed as a

compound or secondary? Why should white and brown be considered pure colors? Furthermore, Watin is so inept at ideas, his notions contradict his claim to knowledge of artisan practice and even the systems he advocates. He states that black is a color existing by itself rather than the mixed composition of other colors. A consequence of this false understanding, Mauclerc states, is the equally false conclusion that black and white must be primitive colors. Watin responded in the margins of the *Supplément*, that yes, this is true—for material substances.[14]

Mauclerc's own statements about the sciences would have been be familiar to anyone even nominally interested in color, establishing his recognition (and acceptance) of what was held as common knowledge. He adds to this information, to indicate the depth of his engagement with scientific studies. Mauclerc does not base his presentation on personal observation, as Watin has: Instead, he establishes his knowledge by references to past and current activities at scientific institutions and references to other published sources. He too demurs from siding with Newtonian or anti-Newtonian optics and comments instead, for example, on the use of diamonds as a refracting tool. In choosing to discuss optics through that subject, Mauclerc alluded to the extended and scrupulous studies undertaken at the Paris Academy of Sciences.[15] He builds a connection between his beliefs and academic concerns by describing how a ray of light that is passed through a diamond divides into only three colors: blue, red, and yellow. This confirms that these are the true primitive colors and that in a rainbow, as in a prism; the intermediate colors are only notable points on a continuum.[16] According to Mauclerc, there is only one set of true primitives, the same three known to artists and to artisans. Where Watin rearranged the meanings of certain terms in physics to coincide with his observations and his experience, Mauclerc chose to interpret scientific information so that it would combine better with the practical situations he knew.

> Les mathématiques n'ont point donné de regle aux Peintres, mais elles ont réglé ce qui étoit connu & pratiqué par les grands Maîtres. Les regles dans la peinture, comme dans les beaux arts, ne sont que le résultat d'une bonne pratique.
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> Jean-Félix Watin, *Supplément* (Paris, 1773), 15 note (k).

Mauclerc's insistence on the primacy of his primitive colors is also evident in the way he reconciles other differences between the colors of light and the colors of objects. Artists' colors do not combine as colors of light do. While white is the "mass and chaos" of impalpable colors, and black their absence, the reverse is true for material colors. Investigators and writers—including Watin—from all backgrounds offered this same conclusion: Artists' colors are not scientists' colors. Mauclerc believed that the proof that red, yellow, and blue were the three primitive and impalpable colors established this concept more solidly. Watin argued in the margins of the *Supplément* that the color resulting from the combination of red, blue, and yellow pigments is an indescribable and brownish

color. Could Mauclerc be trusted to know anything, if he believed this color was black? A true practitioner would know better.

> Que le sieur Mauclerc n'a fait que répéter en d'autres termes, & par une tournure déplacée ce que Watin a dit avant lui, & n'a nullement traité ni des couleurs ni des vernis.
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> Jean-Félix Watin, *Supplément* (Paris, 1773), 4.

In a culture characterized by the search for grand unified theories of everything, the urge to reconcile practical uses of color to theoretical order was irresistible. But how can you join the impalpable and the material, the celestial and terrestrial, when their configurations exclude each other? Would the correct classification system, incorporating the appropriate form and number of colors to include, indicate a resolution? That would seem to be an underlying assumption of several systems created by physicists, mathematicians, and natural historians. Watin's reconciliation of the different aspects of the nature of colors is more typical of artisan treatises; he acknowledged the contemporary scientific canon but made no effort to create a unified description. Watin's was not typical, however, in that his writing suggests considerable ambivalence toward academic sciences in all their forms. While arguing that the sciences cannot rule practices, Watin nevertheless highlighed his personal connections with some respected savants, particularly anti-Newtonian savants. Watin's presentation is full of admonishments that reasoning from observation is more important than reasoning from theories. For Watin, an artisan may use the sciences, but must do so cautiously. In contrast, Mauclerc's attitude more closely follows common rhetorical patterns about potential connections between the arts and the sciences, and he expressed this as an even-handed attempt to support theories and practices alike. For Mauclerc, color represented the confluence of many ideas and actions; there was a direct value to understanding the work of the most eminent academicians. He recognized the same discrepancies acknowledged by others, but could offer no better resolution.

Watin's rebuttal to his rival's statements dripped with sarcasm: Mauclerc's ideas were not his own but repetitions of the ideas of others, including Newton and even Watin himself. Everyone knows of Newton's ideas about color and everyone knows that he was a genius. Newton's reputation notwithstanding, Mauclerc claimed the prism had fooled him into finding seven principal colors when there were only three. Was Mauclerc, like Grimaldi, contradicting The Master? Mauclerc's practices were bad, Watin asserted; and it was on the basis of his inferior experience that he accepted the theories that he did. His science is confused, his ideas are wrong. He dares to reject Newton yet has no good ideas of his own.

Both Mauclerc and Watin responded to an implicit obligation to demonstrate familiarity with the precepts of physics that were associated with color. Both

offered a personalized interpretation of the information they presented rather than simply reiterating information published elsewhere. Watin demonstrated his knowledge of science first by mentioning what he wouldn't cover and later by citing scientific publications of several individuals and such institutions as the Paris and Berlin Academies of Sciences. Mauclerc included more details about physics and optics but without academic connections, and he called on his own experiments and experience to support his conclusions. Each based his main ideas in common information, but neither simply copied information published elsewhere. Both were skeptical of the outlook and interpretation of the other.

Chemistry and Its Uses in Color Production

> Le vrai secret de l' Artiste, est d'être simple dans ses procédés. Cette simplicité, que l'on n'acquiert que par une très-longue expérience, paroît à l'ignorant l'ignorance de L'art; il ne croit aux succès qu'autant que ses recettes & ses manipulations sont bient chargées, & c'est précisement ce qui le fait échouer; il s'imagine qu'en accumulant ainsi les matières, il saisira le point de perfection, tandis que c'est en les élaguant qu'on y parvient. L'art doit être, s'il est possible, comme la Nature; il doit faire beaucoup avec peu, & il doit le faire sans complication, sans efforts.
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> Jean-Félix Watin, *L'Art du peintre, doreur, vernisseur* (Paris, 1787), 230.

Mauclerc's and Watin's interpretations of the role of chemistry in artisan practice, and specifically their assumptions of what the reader must know about that convergence, mirrored their attitudes toward physics. Again, each man emphasized different aspects of practice and relevant sciences. Watin, convinced of a value to physics only when it could be based in the details of the workshop, had no place for chemistry as an isolated topic in his original treatise. Or rather, his nod to chemistry was implied only via statements about the need for simplicity in all varnish recipes. This was hardly a direct connection.

> J'ai développé dans ma Préface de ma seconde Edition la raison du changement de l'intitulé, du plan, de l'exposition & des détails de la premiere. Je n'avois pour but, lorsque je la donnai, que de réfuter tous les mauvais Ouvrages faits sur les vernis, d'arrêter les procès de l'erreur & de m'opposer au torrent de ceux qui sans aucune connoissance, s'avisoient d'en traiter: c'étoit beaucoup sans doute, mais l'accueil du Public m'a engagé à aller plus loin, à traiter les arts & à en développer les procédés, tels qu'ils se pratiquent dans les meilleurs atteliers; en conséquence toute la critique de la premiere édition a disparue, & il est sorti un nouvel Ouvrage de mes mains.
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> Jean-Félix Watin, *Supplément* (Paris, 1773), 70.

Chemistry entered Watin's book after the second edition, perhaps as a defensive response to the criticisms of Mauclerc and others. Even then, it was mostly operational, and he was adamant that these operations were the exclusive provenience of the artisan. It was as useless to explain painting through chemistry as it was to call on theories of optics and vision to explain colors. Mauclerc, who had rearranged some ideas attributed to Newton so that they would be aligned more clearly with his own practice-based comprehension, incorporated comparably familiar chemical interpretations into his explanation of color. There are no distinct theories of coloration in either book, but this is not

surprising. Although efforts to understand the chemistry of colormaking had been ongoing for several decades, mechanical descriptions worked well enough as an explanation. In the manufacture of colored textiles, for example, descriptions that emphasized the particulate nature of coloring materials served reasonably well for several more decades. Painting, a series of actions as mechanical as dyeing, did not require a better explanation either.

Chemistry in Painting

Descriptions of the chemistry of painting materials do appear in these books, if indirectly. Mauclerc, for example, demonstrated his concern for the chemistry of colors in a discussion of the deterioration of paintings. He was obsessed with the identification of substances that "dirty" pigments, a problem he catalogs as chemical. Deterioration occurs when there are excesses of salts and sulfurs, dirts or other adulterants present on the painting. Tainted materials lead to the damage characteristic of modern paintings. Better understanding and control of pigments, binders, grounds, and varnishes will save them. Mauclerc also advocated the use of special materials—some chemical colors he developed, and the addition of almond milk to oil or varnish recipes—to improve the quality of the painting, but he does not describe either in any detail.

> La peinture a 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 posteriré [sic]: c'est dommage que le choix et la manipulation des matieres qui la composent en aient esté si negligées de la pluspart des peintres; car nos voions presque tous les tableaux a l'huile se degrader insensiblement et même quelque fois de detruire entrez peu de temps: ce qui vient de plusieurs causes.
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> Arnaud Vincent de Montpetit, *Essais sur les moyens de conserver les portraits peints a l'huile, plusieurs siècles dans toute leur fraicheur,* 29 April, 1775, AdS *pochette*, p.1.

Why *did* modern paintings become dark, dirty, discolored, or otherwise unreadable while those of the old masters seem to retain their clarity and vivacity? Many eighteenth-century investigations into painting and art materials were driven by assumptions about the perfection of the materials and methods of the past. Eighteenth-century writers looked to paintings by the Van Eyck brothers especially as examples of perfection because they had seemingly unproblematic colors despite their age. Investigations that tied chemistry to the arts sought to identify the allegedly flawless materials used by the old masters, to determine their technique, and to identify new materials or techniques as good as those used in the past. Encaustic painting, enameling, and mosaic work were suggested as techniques more permanent than oil- or water-based painting; extant examples of each seemed to prove this point. Some eighteenth-century investigators believed that new colors could be found through diligent study of chemistry, and that the resulting colors could avoid known problems. Chemical or manufactured pigments such as Prussian blue often served as a model of the possibilities.

> Les couleurs minérales portent avec elles un soufre, un sel arsenical, qui, par las suite, noircit toutes les couleurs avec lesquelles elles sont mélangées, si elles ne sont pas homogenes; ces couleurs se salissent elles-mêmes si elles ne sont pas bien purgées de leurs sels.
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> Mauclerc, *Traité des couleurs et vernis* (Paris, 1773), 10.

Mauclerc also described the need for careful preparation, including special washing of pigments and other coloring materials before use. Without attention to these details, without the removal of the excess salts and sulfurs, paintings would deteriorate. Mauclerc's explanation of this problem, and his suggestions of ways to overcome it, relied on medical chemistry as much as on artisan practices. Mauclerc determined that contact with "bad airs" caused the decay of paintings, much as they could cause illness in people. Each layer of a painting—from the substrate to the primers, grounds, and other underlayers, even the very image on the surface—exudes some kind of air. These airs damage the layers above them as they escape to the surface of a painting. A painting is attacked from without as well as within, because bad airs in a room, for example, can also alter the surface. Watin didn't disagree that bad air deteriorates colors, but he disputed Mauclerc's definition of their source. He knew that it was the surrounding airs that instigated damage to painting; a well-made painting was not inherently problematic.

Mauclerc's insistence on his own chemical characterizations of coloring materials was further proof to Watin that his rival knew nothing of the discipline he professed to illuminate. Watin repeatedly rejected Mauclerc's recommendations to clean or purge all materials before use to remove the salts and sulfurs that damage paintings. Purity was an inherent quality of the best materials, something an able practitioner would always choose, Watin explained. Well-made materials, when used properly, cause no harm in any situation. Doctors were wrong to blame lead white for such illnesses as painter's colic, for example. Painter's colic was caused by improper use of the pigment in poorly ventilated areas. Inappropriate use of even the best materials would cause problems; this is why it was important to hire an able and trustworthy artisan.[17] As an aspect of quality, purity presents no real problem to the public and so one should not frighten them with these ideas as Mauclerc does.

Production details such as these formed the rallying points for both Mauclerc's and Watin's chemistry. What constitutes the proper combination of materials? How do you characterize those materials, and how do you explain the procedures in which they are best used? A considerable portion of the complaints of both men focused on the answers to these questions. Here, chemistry was not about affinity tables or the separation of "air" into "airs." It was practice-based techniques, expressed in a traditional language, which offered the possibility of improvement. Improvement would come about when the materials were better understood. This understanding, which could come only with experience, would indicate the best,

most simple, form for every substance used. Watin saw no use for the study of chemistry as undertaken in the academy, and he was consistent in his response to Mauclerc's suggestions that chemistry would explain and help eliminate dangerous substances in a painter's practice. Good quality materials, properly prepared and used, were already divested of their dangerous parts and presented no hazard. It was not the materials inherent in a pigment—the dirts, sulfurs, and salts identified by Mauclerc—that damaged paintings. Rather it was their exposure to air, especially to air charged with the exhalation of animal vapors. Using a dismissive approach similar to that in his presentation of physics, Watin suggested that readers of his treatise did not need to have much understanding of chemistry. A more thorough explanation would not improve consumer or amateur understanding of colormaking or color use. A reliable merchant, manufacturer, or artisan can be trusted to supply appropriate materials, and will know how to limit, if not remove, the risks.

Mauclerc's advice for controlling the damage he described included, in addition to careful washing all pigments before use, observance of sufficient drying time for each layer of a painting before applying the next one. This would give the bad airs a chance to escape. Recommendation of an extended drying time was not an unusual suggestion in eighteenth-century descriptions of painting practices. Several artists claimed to have examined the works of the old masters to determine how long each had allowed his works to "rest" between stages. Assessments were months or even years.[18] For the commercial markets of eighteenth-century fine- and decorative-arts painters, however long delays between stages of the painting process were impractical. Recommendations to improve the longevity of paintings often included suggestions to limit contact with the bad airs at all times.

Chemistry and Quality

> Nous ne conviendrons pas que la couleur employée à l'huile exhale plus long temps del'odeur que la couluer eployée à l'eau; qu'au contraire, nous avons démontré que l'huile fixe, *les soufres,* émousse *les sels* des couleurs, & par conséquent en arrête l'odeur; mais nous avouerons que l'eau n'a point d'odeur ou très peu, & que l'huile en a.
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> Mauclerc, *Traité des couleurs et vernis* (Paris, 1773), 66.

Mauclerc and Watin agreed that the best paintings were those that limited or controlled exposure to dangerous or harmful substances found in pigments or media separately or when combined. They also agreed that, for certain pigments, this control was impossible to achieve. The dangerous parts of lead-, arsenic-, and sulfur-based pigments could never be removed: those substances must be used in the best or safest method. For both men, this was determined by the medium, but which medium was preferable proved to be another source of dispute. Mauclerc recommended oil rather than water. Pigments ground in oil are enveloped by that substance, he explained, and it holds the bad parts in

suspension. Watin insisted that this again proves Mauclerc's lack of competent understanding. Water is the better medium. Watin used the example of ceruse, a lead-based pigment that absorbs water readily. All experienced artisans know that ceruse is not easily penetrated by oil, and one is often required to begin to grind it in water. If this is so, how can water be called dangerous?[19] Again, Watin argued that experience takes precedence over any theoretical determination.

Although Watin objected to Mauclerc's application of chemistry to color and varnishmaking, he recognized a value of chemistry or, more accurately, of chemists. He knew their familiarity with his work was a valuable promotional tool and ammunition against Mauclerc. Just as Watin proved his knowledge of relevant science through mention of the work of academicians, he suggested that scientists were familiar with his own work. Pierre-François Mitouard, a pharmacist affiliated with the Paris Academy of Sciences, presented the preface of Watin's book to that assembly in 1772 (as he would again in 1776).[20] Furthermore, Watin claimed, the delay of publication of his third, folio edition was due to the announcement of a similar book by Mitouard himself.[21] That manuscript, approved in August 1777, does not seem to have been published.[22]

Mauclerc also invoked chemistry to clarify the techniques he recommended, for example his call for direct heat in the varnishmaking process. A good varnish is one that will not separate, Mauclerc stated, because the ingredients have formed an indivisible union: his theory of varnishmaking is also a theory of chemical combination.[23] Complete joining of the materials is only certain when there has been effervesce. Without this visual evidence of combination, the varnish will not be good. Therefore, Mauclerc stated, he is opposed to varnishers' use of a *bain-marie*, which prevents the materials from boiling and is used by those who lack any notion of the need for fire in this process.

He continues, outlining that need. If the indivisible union of materials were not the ultimate goal of varnishmaking, and if the perfection of the result does not rest on this mixture, then it would suffice to grind the dry ingredients and mix them with the liquids. Without the effervescent stage, Mauclerc claimed, the ingredients in such mixtures retain their own natural state. Despite the level of combination they might obtain without heat, the result will be a liquid lacking the good qualities and the good effects of varnish. The action of fire makes the materials break up better. Warmth aids the combination of ingredients such as sandarac and spirit of wine; an even stronger heat is needed when adding turpentine. When effervescence has ceased and all is well liquefied each substance has passed through its fermentation stage and joined with the others in a way that makes them both indivisible and safe for use. Here again, Mauclerc establishes a connection between deterioration and fermentation. The application of heat removes the sources of damage as it ensures combination. The *bain-marie*

may allow a closer union of materials than mere grinding will, but direct heat is necessary to ensure quality.

Watin points to this statement as further proof of Mauclerc's ridiculous lack of experience. Varnishes are made with highly flammable ingredients. Direct heat is dangerous, especially if the pot boils over. Equally preposterous to Watin is Mauclerc's counter-suggestion that a competent artisan might try to make a varnish using no heat at all.

> Comme chaque Vernisseur a sa dose particuliere, & que cependant ils trouvent tous leurs Vernis meilleurs que celui des autres, l'Auteur ne hazardera pas de donner des doses fixes; il est d'ailleurs trop sincere pour le faire, ayant éprouvé, depuis trente quatre ans qu'il fait des Vernis, que l'action de feu plus ou moins violente, une matiere, la térébenthine, ou l'huile plus ou moins chargée d'eau ou de flegme, une gomme plus ou moins altérée, changent le rapport des doses, qui n'est jamais qu'entre la gomme & la térébenthine, ou entre l'huile & la gomme; l'esprit-de-vin, l'huile éthérée de térébenthine, s'y mêlent à la discrétion, pour rendre le Vernis plus ou moins brillant, & ne sont pas susceptibles de dose.
>
> Mauclerc, *Traité des couleurs et vernis* (Paris, 1773), 76–7.

The two men also disagreed over the proper way to write a recipe; this portion of their dispute also mirrors contemporary debates about the recording of chemical operations. Instead of listing absolute quantities of individual ingredients, Mauclerc presented his instructions with proportions assigned to each component. He chose this format in deference to the expertise of individual artisans. Every varnishmaker will believe his own varnishes must be better than all others and so each must determine for himself the quantities in the recipe.[24] If Mauclerc's gesture was intended to acknowledge the role of personal experience and observation in the varnishmakers' crafts, Watin nonetheless managed to turn his words against him. Proportions are easily converted into numbers, he pointed out. There is nothing mysterious or special about them and they are no more or less vague than pounds, ounces, and scruples. Here again, Watin implied that Mauclerc didn't comprehend the academic discussions he attached to his work. Measuring systems are independent of the artisan, even if the work produced by the artisan who uses them is not.

Watin brought his charges and complaints to a scientific and practical end in "Observations," a chapter of the *Supplément* that followed the interlinear discussion of Mauclerc's book.[25] His stated purpose for this section was twofold. First was a desire to prove that Mauclerc's rebuttal to his work was unjustified. This is a theme of his other comments, of course; here Watin reiterates that position. More specifically, Watin used this section to expose Mauclerc as a fake at all levels, from his prospectus, which promised an erudite and knowledgeable work, to the discussions and theories, which make no sense, to the recipes that prove his lack of experience. Furthermore, Watin suggests, his rival is fully aware of his own inadequacy. How else can one explain allowing one's work to rest on certification from the Académie de St.-Luc, a less discriminating institution than

the academies of sciences and painting to which Watin submitted his own?[26]

Proving Poor Quality

Watin claimed that, to support his statements, he obtained Mauclerc's special oils and colors purged of their salts and sulfurs, tested the techniques Mauclerc advocated, and brought the results to be verified by amateurs and chemists. From these experiments, Watin substantiated that Mauclerc knew very little about the substances of which he spoke. Terrestrial colors such as ochers never have an odor, and it is common knowledge that washing is essential to remove the dirts attached to them. Metallic colors—for example, ceruse, lead white, verdet—have no odor by themselves. It is their use in oil that creates one, as Watin had already discussed. As for the mineral colors, sulfur is an essential ingredient of such colors as orpiment and cinnabar, and it can never be removed. What is this almond milk that Mauclerc so often finds in the decomposition of oils? How dare Mauclerc claim knowledge through personal experience of materials and recipes! How could he have tested them himself? This is what happens when theorizing from the works of others overtakes experience. Mauclerc's discussions of physics and chemistry contribute nothing to greater understanding of varnishmaking, gilding, or painting practice; even his understanding of the sciences is irrelevant.

Questions of Experience and Observation

One stated purpose of many artisan manuals was to connect readers' understanding of quality to improved techniques in their own efforts to paint, draw, japan, study chemistry, or know the materia medica. Knowledge of materials and practices of true artisans allows the amateur to undertake her or his own amusements with greater effect. This same information also serves artisans or manufacturers for whom the validity of experience is confirmed through the objects created or sold. A good object made by an incompetent artisan would be an anomaly. By definition, a competent artisan, one who understands materials and their proper uses, produces good works. The purchase of objects confirms their goodness when it creates demand: discriminate purchasing acknowledges the proficiency of the artisan as it establishes the taste of the consumer. Within this framework, descriptions of practices offer a way to understand and ultimately judge experience. This is more important than their usefulness in replicating practices. Creating a group of buyers capable of recognizing quality was a stated goal for Watin, Mauclerc, and other artisan-authors in the eighteenth century. Each man claimed that his book would provide that knowledge, the means to recognize and understand quality for the object or objects in question. This assertion places their uses of and attitudes toward the sciences in a more specific context: What *is* science, to an artisan?

> The principal view in [*Handmaid to the Arts*] is to enable those, who have already learnt to draw,

> to make themselves easily masters of painting in any manner they may choose; by which assistance many persons of genius, who, from ignorance of the nature and use of colours, might be deterred from it, may be both induced & enabled to attempt painting successsfully, and bring those talents into practice, which would be otherwise lost to the public and themselves.
>
> Robert Dossie, *The Handmaid to the Arts* (London, 1764), 1:viii.

This attitude about the purpose of his publication—that it would aid identification of good work but not teach technique—explains Watin's insistence that it is unnecessary for readers of his book to understand chemical operations. Still, it was a somewhat strident position for the time, as other writers—Robert Dossie, William Lewis, George Palmer, Louis-Guillaume de la Follie—did try to combine chemical theories with practices, to explain the latter through the former and to advocate for their combined role in arts and sciences alike. For Watin, the principal requirement for those who wished to purchase colors and varnishes from him, or to hire him to decorate an apartment, was an ability to judge competency. Watin, so judged, should be trusted to know how to choose the best materials and to know which material to sell or use for each purpose. The demonstration of his experience allows his customers to trust his judgment. There is no need for further details.

Yet this objective for Watin's book—that he be declared the best authority on the subjects of his expertise—can appear at odds with the degree of detail contained in other sections of the publication, most notably his recipes. It raises the possibility that Watin had no opportunity to learn the chemical principles others touted or that his experiences with them were somehow unsatisfactory. Was it necessary to understand how to make ultramarine from lapis lazuli, for example, when it can be purchased, already prepared, from the color merchant? Prospecting for ochers might be an amusing pastime, but, if the same manuals that explain how to collect them insist that the best come from a specific region of Italy, Spain, or Germany, what is the purpose of that discussion in a volume intended for an English or a French audience?

What represents valid experience when an artisan presents his skills in print and the reader may be far away, or when proof, in the form of samples, is unavailable for examination? In these cases, validation is established through the same practical understanding that determines expertise in materials. Watin added the generalizations that formed the foundations of his ideas and through that addition demonstrated his familiarity with relevant scientific publications. The direct connection between practice and comprehension remains significant, even in print. If Mauclerc had no constant experience with colormaking, how can he know better than one for whom colormaking is a life's work? True understanding can be the result only of personal effort and, having this, Watin believed he could not be wrong. His accusations that Mauclerc's theories lacked originality also indicate how, in Watin's view, theories, and the sciences more generally, served art. For artists and artisans equipped with this kind of learning, it was acceptable, even

desirable, to build an explanation that coincided with their own observations and the world in which they worked. What they did was more important than the theories they—or anyone else—espoused.

In his own eyes, however, Mauclerc did not lack significant and qualifying experience. As a *marchand épicier*, he may have made pigments as well as judged the quality of those he sold: Exact information about his trade does not exist.[27] Furthermore, we know Mauclerc was familiar with contemporary scientific writing: Watin constantly accuses him of plagiarizing or paraphrasing other authors. Yet despite Watin's criticism that his understanding and skill was insufficient, Mauclerc insisted that relevant personal experiences supported his beliefs and that they had shaped his theories. He had studied with masters who proved that it was possible to combine practices with theory to the enhancement of both. He acquired the experience to judge and choose appropriate explanations for color when he worked at Jacob Christoph Le Blon's three-color printing workshop, and through Louis-Bertrand Castel's project to construct an ocular harpsichord.[28] While we recognize both efforts as severely compromised successes, for Mauclerc they were the keys to a more scientific and more useful explanation of color. Both Le Blon and Castel had produced beautiful objects through a close study of the nature of color and by applying in new ways the understanding they achieved. Mauclerc did not invent his own ideas, but through his work he developed the experience to recognize those that were good. In fact, his use of such terms as impalpable and luminous colors follows Le Blon's use of the same terms in his treatise *Coloritto*.[29]

Where Do Good Ideas Come From?

Up to this point, the disagreement between Mauclerc and Watin adheres to standard descriptions of eighteenth-century relationships between communities of artisans and those of amateurs. Within this framework, it seems easy to calculate the sources of information or inspiration, and to build assumptions about each man that explain his attitudes. Personal statements and public arguments—including each man's beliefs about the beliefs and concerns of his rival—reflect some well-cataloged differences. Despite his work experience, Mauclerc's attitudes and behavior were typical of the amateur. His background and understanding of production techniques seem weaker than Watin's, and he has no close alliance to any academy of science or of art. His affiliation with the painter's guild—the Académie de St-Luc—that led him to ask for their approval may have been an expedient enabling him to sell painters' materials. Watin was, foremost, a practitioner. His work was based in his own experience and he was threatened by an outsider with claims to a fully equivalent knowledge from a very different source. Watin added a veneer of scientific knowledge to his treatise by suggesting a familiarity with the work of academicians and their institutions. He

was also careful to insist that this familiarity was not one-sided, that academicians knew of and had considered his work.

Mauclerc claimed a similar special role for practice within his own understanding, but he aligns his presentation with the skills of others, skills he learned through reading and observation as well as through personal experience. Watin limited himself (at least in the early editions of his book) to the subjects he knows, while Mauclerc includes broad statements about many things—the history of painting, physics, and chemical operations as well as varnishing. This allowed Watin to suggest that Mauclerc indulged himself with superficial learning and, on that basis, to make pronouncements about the true nature of practices. No wonder there is a tension here: Watin invents theories for the practices that form his livelihood; Mauclerc applies practices to the ideas he has encountered. A closer look at their sources of information and at their intellectual and practical supports complicates these perceptions, however. The simple divisions are not so simple.

Mauclerc Against Watin

> N'attribuons point au Manipulateur les raisonnemens erronés de cet article; il a prévenu le Public qu'il n'étoit pas Physicien, ses Collégues connoissent ses lumieres & ses talens: mais ce grand homme, qui par état se livre aux importantes fonctions du Barreau, qui par goût chérit cultive les Arts & qui a bien voulu quelquefois se dérober aux regards de Thémis, pour rendre en secret, son hommage à Minerve, …
>
> Mauclerc, *Traité des couleurs et vernis* (Paris, 1773), 52–53.

Mauclerc concurred with Watin's self-effacing statements that he was unschooled in physics: Watin's presentation proved as much. Mauclerc also noted that Watin had a collaborator and advisor, and that man was no scientist either. Roch-Henri Prévost de Saint-Lucien, a lawyer-turned-writer with no discoverable connection to any scientific community in Paris, served some undefined function in the production of several editions of Watin's book. He may have provided a publishing connection, as Prévost de Saint-Lucien was involved in other publishing ventures, including one undertaken by Watin's son some years later. Mauclerc used the existence of this outsider to question Watin's authorship and, indirectly, Watin's claims that the book derived only from his experience and his expertise. Watin is not responsible for errors in his section on colors, Mauclerc suggested, because someone unaware of their true nature wrote that part. Watin's experience may be his own, but the ideas that connect his practices to the theories he offers are not; he tries to fool the public he claims to enlighten. Through the combination of practice, experience, and the expertise of savants, Mauclerc hinted, Watin advocates the creation of a personal theory, but his is a false enlightenment.

Watin Against Mauclerc

Mauclerc often attacked Watin's capabilities and personal understanding, but he did not challenge his claims to sources or the way he used them. Those references, scattered throughout the book, imply a familiarity with the work of

contemporary scientists and classical authorities that is typical of this genre of publications. Mauclerc's restraint was not reciprocated. Watin continually reminded readers of the *Supplément* that an inferior foundation cannot support that which is built upon it, as he highlighted the weakness of Mauclerc's underpinnings. Mauclerc had noted in his preface that he would not discuss works by earlier authorities who write only about where to find a substance and not what it is. In this regard, he mentioned books on pharmacy, just as Watin had called attention to his knowledge of physics by announcing he would not discuss certain branches of it. Watin challenged Mauclerc's statement, reworking it into a blanket exclusion of all chemical writing and suggesting that Mauclerc was not sufficiently familiar with the work of Pomet, Lemery, or Bomar [sic]. If Mauclerc were a better artisan he'd know the value of their work. His lack of experience means he cannot tell good work from mediocre or even bad.

Watin reserved his deepest disgust for Mauclerc's claims to experience based on work with Louis-Bertrand Castel and Jacob Christoph Le Blon. To underscore the absurdity and irrelevance of Mauclerc's assertions of their value, Watin turned to a more qualified expert, the engraver and publisher Jacques-Fabien Gautier d'Agoty. In a letter to Watin included in the *Supplément,* Gautier denounced the work and ideas of both men and, because Mauclerc had called on them, further questioned Mauclerc's credibility.

By this time, Gautier d'Agoty's public disagreement with Le Blon was more than thirty years old, but even here he took advantage of the situation to pronounce against his long-dead rival. Gautier d'Agoty also questioned the level of Mauclerc's involvement at Le Blon's three-color printing workshop, suggesting that he was not the associate he implies but rather one of the workers who operated a press and performed manual labor. At another point, Gautier d'Agoty suggests Mauclerc was merely an observer—not any kind of participant—in Le Blon's workshop. Gautier d'Agoty mentions Castel's color theories with disapproval, interpreting them as antecedents to his own: Gautier d'Agoty's improvements mean that Castel's work should be set aside, ignored or forgotten. Gautier d'Agoty also remarked on a contradiction: How is it that Mauclerc claims expertise based on the theories of the Newtonian Le Blon when the color theory he describes is nothing more than that of the anti-Newtonian Castel? How can these experiences, undertaken more than thirty years earlier, support Mauclerc's ideas in the modern world of practice? Has no progress been made during this time? Mauclerc's sources invalidate each other and, because Mauclerc has inadequate theories and no real experience, his work and his publication cannot be good.

These discontinuities make it difficult to interpret the dispute between Mauclerc and Watin within a strict construction of artisan-versus-amateur or theorist-versus-practitioner. Watin made regular use of a range of printed resources, confirming that his knowledge of the sciences matched that of any

amateur. He further supported this engagement by remarking on the value of information contained in these printed works, and by hinting at personal acquaintances with members of the Paris Academy of Sciences. Watin makes no comments about his own training: The reader must assume that it is good enough and rely on Watin's reputation or his claims for it. Mauclerc, an amateur or perhaps a dealer, makes no claims to participation in a community of colorists, experimenters, or other likeminded people. He highlights his practical experiences working with two long-dead savants, but the extent of that experience is unclear. Even in his discussion of the significance of fire in the creation of varnishes, Mauclerc does not challenge established ideas in the sciences. His work is dedicated to (and approved by) the Académie de St-Luc, an institution that was not nearly as prestigious as those to which Watin refers. Are Mauclerc's ideas completely his own? Could it be that his discussion of color painting and varnishing is based on personal experiment and experience that comes without either the foundation of practical tradition or academic interest? Is it then an expression of a personal, internal debate made public? Does this make him the greater innovator or the greater fool? Is Watin the interloper, misunderstanding or misconstruing scientific ideas to further his own glory or pocketbook? Or is it Mauclerc who intrudes, suggesting improbable ideas lacking a basis in practical realities? Consideration of sources at the base of the disagreement makes the division between theorist and practitioner less useful here.

Publications, the Disagreement, and Personal Enlightenment

Pamphlets and treatises by artisans explaining their areas of expertise were common in the eighteenth century; one obvious purpose was to support or enhance sales. With or without a novelty such as Watin's *peinture d'impression* technique or the special gold boxes he promoted, the rhetoric of the front matter of these publications often links artisan-driven manuals to some common goals of public life, even when the works have a very personal view of improved consumerism and the betterment of trade. A nod toward scientific ideas was common in these works. Inclusion of such information established that the author, even if an unknown artisan, believed this kind of rationalized understanding was a factor in improvement. Statements to this effect appeared to enhance the value of the publication. For some writers, including both Mauclerc and Watin, the incorporation of generally recognizable theories validated personal practice. Presentation to or approval by a scientific institution (or an entity with close ties to one) showed that the author of the treatise knew all aspects of the subject. In this sense, the inclusion of scientific ideas in treatises on practice reflects the spirit of public participation. Their authors may speak of simplification and improvement. Educated people accept a role in improving the public good; an educated practitioner recognizes ideas underlying operations.[30] The same pair of sentiments stands behind the statements that call attention to the author's long

years of careful research and experiment, that are a common feature to accompaniment of new techniques or information.

> Je fus étonné que dans un siècle éclairé, où la lumière du rasonnement commence à faire pénetrer ses rayons dans les plus sombres atteliers, dans ce siècle, où l'Artist abandonnant la routine, combine et perfectionne son Art, on osât présenter pour élémens de l'Art du vernisseur, les plus grands absurdités, indiquer pour excellens procédés les plus poitoyables résultat; et qu'ainsi on attestât à la postérité par ce ridicule monument, que telle étoit en 1772 la somme de nos connoissances sur les Vernis.
>
> Jean-Félix Watin, *L'Art du peintre, doreur, vernisseur* (Paris, 1773), vi.

Advertisement and commercial aggrandizement are objectives easily ascribed to both Mauclerc's and Watin's publications. Watin is straightforward about these goals, and later editions build on prior successes. In the first edition, he notes that his book will correct the inaccuracies of prior publications and introduce the public to the techniques he knows and understands best. According to Watin, *L'Art de faire et d'employer le vernis* and its later editions will lead intelligent consumers to make purchases more intelligently. Other artisans might learn from him too, so his book will raise the standards of practice. These different audiences deserve access to the best information, and Watin, with his shop, his clientele, and his innovative painting techniques, could best supply this, if not in person then through his publication.[31] Watin was in his own eyes one of the best *vernisseurs* in Paris, perhaps as good as or even better than the Martin family. His book would prove this to the world.

> Qu'un savant animé par la gloire, qui, sûr de trouver dans la générosité du Gouvernement des ressources contre l'infortune, sacrifie ses jours à des découvertes utiles, les publie sans réserve, la gloire, le couronne, la postérité se charge du tribut de la reconnoissance; son nom répété par l'écho des siècles, se trouve gravé avec distinction au Temple de Mémoire: il est récompensé; il fait bien sans doute: mais qu'un Négociant, obligé de soutenir son crédit, sa famille, détruise le nerf de son commerce pour courir après un pareil espoir, il est blâmable, & je ne veux pas l'être.
>
> Jean-Félix Watin, *L'Art du peintre, doreur, vernisseur* (Paris, 1773), xi.

Like Watin, Mauclerc admitted an interest in presenting true knowledge, and he claimed a desire to educate the public and his brother artisans. Libraries are full of books discussing varnish or colors, he pointed out. However, when you come across one by an (artisan) author who truly knows about varnishmaking, you will find he is more interested in keeping this special knowledge secret than he is in honoring his own claims to educate the public. In this context, Mauclerc makes much of a special odorless varnish and a special gilder's mordant that Watin promoted as his own inventions but never clearly described. How can Watin claim to be an enlightened practitioner if this is so? How can he claim to have improved on all prior works and advanced further understanding if he refuses public examination of his own allegedly superlative inventions? Is rivalry over these instructions at the heart of the disagreement? It is impossible to know, but not likely. Watin in his reply, included in the second and later editions, called the absence obligatory. Because he ran a workshop, because he was a practitioner

with a family to support, he could not give away his secrets.

Watin's interest in presenting himself as a dedicated and knowledgeable artisan, like his references to scientific authorities, was probably part of a campaign to improve his authority and his clientele.[32] A clue to his motivation comes from his repetitious announcements that a portion of his work was read at the Academy of Sciences. Institutional approval, with or without an accompanying monetary award, was a coveted promotional tool. Understanding Watin's treatise within the context of promotion and self-promotion, and relating that to Academy activities and to the use of science by practitioners and tradespeople, suggests a more complex interpretation for the treatise's initial publication and subsequent defense.

> Watin a annoncé par ses Prospectus, qu'il donneroit au premier Novembre prochain 1773, une édition *in-fol.* de son Ouvrage, avec planches & gravures, pour servir de suite aux Arts de l'Académie des Sciences: il se disposoit à remplir ses engagemens, lorsqu'on lui a fait observer que le sieur Mitouard, Apothicaire, étant sur le point d'offrir à cette Académie la description des mêmes Arts; cette concurrence lui seroit sûrement préjudiciable, puisque le suffrage académique dont cette description sera revêtue, inspirera en sa faveur une confiance que, tous les efforts d'un Artiste ne peuvent jamais balancer.
>
> Jean-Félix Watin, "Avis à MM. les souscripteurs de l'in folio de *L'Art du peintre, doreur, vernisseur*. . ." in *Supplément* (Paris, 1773), 77.

It is also possible that Watin was aiming higher, trying to encourage consideration of his publication as an addition to the *Descriptions des arts et métiers*. In a monograph about that series, Arthur Cole included Watin among a group of authors who were inspired by this project to publish treatises on the arts and trades of France but whose work had no direct or indirect connection to the series.[33] Yet the history of Watin's book, together with other information about its publication and about him, suggest that one of Watin's intentions was official adoption or at least formal approval. Cole notes that an *Art de vernisseur*, by a "M. Mittoire" (almost certainly Pierre-François Mitouard), which was listed in the publisher's catalog of 1773, never appeared. He concluded that fear of poor reception led to its suppression: Perhaps the relationship between Watin and Mitouard also played a part. Pierre Tingry, editor of a later edition of Watin's book, who assigned responsibility for the academy-sponsored work to de Machy, stated that Watin's publication was the reason it was never issued.[34] Watin, for his part, declared in his fourth edition that his treatise was such a success that a similar work, proposed by an unnamed chemist affiliated with the Paris Academy of Sciences had been abandoned, and the articles on painting, varnishing, and gilding that had appeared in the *Encyclopédie* were dropped from the *Encyclopédie méthodique* in favor of Watin's own. Perhaps this explains what happened to Mitouard's effort.[35] Watin's desire for official acceptance of *L'Art du vernisseur* might explain his rapid response to Mauclerc's criticisms. They challenged his expertise in front of those he sought to impress, and they called on direct experience with masters who had established, if old, academic connections

of their own.

What Is Science, for an Artisan?

What is science, for an artisan? Is it a way to order practice so as to expose its essential nature, as the community of scientists believed? Is it a supplement, something interesting to think about but without any direct connection to daily work? Do artisans take up science in a public manner—through publishing, for example—to assure their clientele (or potential clientele) that, although artisans, they are educated and intelligent? Watin and Mauclerc offer answers based in experiences and experiments but clearly tempered by different ideas of what science was. The two men agree that there is a value to incorporating scientific information in books about techniques. Yet the difficulty of applying philosophical ideas to workshop practice is obvious. Both men establish their familiarity with theories based on optics and natural history, but both give less direct attention to the theories that we know might affect the subjects of their daily operations. Watin implies that he chose the concepts he advocated as a result of his own thought. That thinking-through was securely based in his practice and observation as well as in his reading of related work of savants. Still, he never makes a direct connection between those theories and the techniques he describes. In many respects his scientific observations relate more to painting practices than they do to color production or varnishmaking. Watin's assertions that Mauclerc's ideas lacked originality indicate how Watin believed science (or theories) should be used in practice. Learn the work of savants before "speaking." Once thus equipped, it was acceptable, even desirable, to build an explanation that coincided with personal observations and the world in which one worked.

Mauclerc did not believe that only knowledge derived from theories of physics could explain color- and varnishmaking. He called on a chemical explanation to explore the visual changes to colors after their use, and used some then-common terminology to suggest both explanations and improvements. Mauclerc identified excesses of sulfurs and salts as the destructive elements of pigments, and insisted on the use of chemist's terminology in his recipes. His pronouncements about the chemical colors he sold highlighted what he saw as the practical application of scientific knowledge. His familiarity with philosophical terminology and his own concern for preservation were equally parts of his valid experience. Watin was unwilling or unable to recognize Mauclerc's attempt at a chemical theory of varnishing as anything but a demonstration of poor practice.

If the dispute between Mauclerc and Watin was personal and professional in specific and very local ways, how much of an example can it be? What aspects of these interpretations of the meaning of science for artisans can be universalized? How do we consider these relationships without relying on assumptions that are based in more-modern experiences and understanding? We know that, despite its

complexities, the effort to incorporate science into practice is constant in eighteenth-century works.[36] Tests of that relationship are recognizable in the incorporation of geometry into guild-sponsored drawing classes and in the regular attempts to teach chemistry to dyehouse apprentices.[37] Examples exist in the premium lists of improvement societies and in the comments—or complaints—lodged in their reports and in other reports to award-granting bodies. These incantations were not only a part of the formal presentation of the time: There is considerable evidence that supports acceptance of a relationship among the sciences and belief in the usefulness of this connection by artisans.

> Les arts n'ont jamais eté florissant que lorsqu'ils ont eté eclairé par la physique, et la Physique n'a jamais donné de raisonnements plus certains que lorsqu'elle a penetré tous les ressorts des arts.
>
> Jacques Neilson, "Cours Général pour la Teinture en Laines" ([22 May 1775]) ANF O/1/2047, 1.

The nature of connections between the sciences and practice was articulated by other European artisans, in other situations. In 1775, Jacques Neilson, the *entrepreneur* at the Gobelins tapestry works who oversaw dye operations, proposed a general course on wool dyeing as a way to improve the sources available to the manufacture.[38] The journeyman dyers affiliated with the manufacture would take this course: They were good practitioners, Neilson noted, but they knew only the processes of their own experiences and out of habit worked within them, without understanding how to reason based on the sciences.[39] The course would complement the work at the manufacture undertaken by the chemist Quemiset, and also the publication of Quemiset's proposed treatise on dyeing. Earlier in the century, John Hoofnail had reexamined and reinterpreted color studies described in Boyle's *Experiments and Considerations Touching Colours.*[40] The preface as well as the title of Hoofnail's *New Practical Improvements* promised a strong process-oriented focus to the book, an effort to make a philosophical treatise useful to a public searching for instructions in colormaking.

> … I have offered nothing in the following Sheets, but what I have myself experienced. And as I don't remember to have seen any Thing herein contained, in the many Authors I have read on this Subject; I thought my Labours might not be altogether useless, unprofitable, or unacceptable to the curious as well as the Artist, to whose Patience and Favour I recommend them, and whose Approbation I shall be very proud of.
>
> John Hoofnail, *New Practical Improvements, and Observations, on Some of the Experiments and Considerations Touching Colours* (London, 1738), v.

Hoofnail's own experiments and their publication resulted from a concern about the practical value of Boyle's research, and the foundations of the resulting work are not so far from those of other artisan-authors. Hoofnail accepted that there is a place for sciences in artisan practice, that experiment and experience are closely connected but not the same, and that practices or operations must come first. One searches through practices, with an awareness of theory and on the

lookout for how it and practice might be joined.

> I can assure Mr. *Delaval*, that the Art of dying Cotton has for some Years past, fallen into such Hands here, as have spared no Pains to bring it to great Perfection. The Persons I mean are well versed in Natural and Experimental Philosophy, in Chymistry and Optics, so far as relates to their own Business: And Dying is now as well understood by those Persons, as it is in any part of *Europe*.
>
> John Wilson, *Essay on Light and Colours* (Manchester, 1786), 6.

John Wilson's *Essay on Light and Colours* is another example of personal adoption of theories in practical endeavors.[41] Like Hoofnail and, Watin, we know Wilson as a practical man who challenged philosophical explanations based on his own experience. His experience led him to suggest that Edward Hussey Delaval's explanation of light and color was wrong.[42] Wilson's explanation challenged Delaval's—and Joseph Priestley's—comments about the role of science in factories were more than a generation outdated. If sciences are to inform artisan practice, accurate information must be used.

Wilson, like Mauclerc, Watin, Nielson, Hoofnail, and others, knew the place of science for artisans. Science aided understanding, but it did not control practical matters. It might inform, but could never replace, experience. On occasion it seemed irrelevant, but that could change with more experiment, better understanding, further work. The addition of the sciences to practical activities was almost inextricable from hopes for improved outcomes. It was the responsibility of enlightened people, including colormakers and other artisans, to investigate all potentially relevant wisdom. That included the sciences, but the principles by which processes were directed and illustrated could come only from practice. For these men, specific personal experiences inspired the desire to correct and improve their profession. That science was an adjunct to this pursuit was obvious, even if the manner in which they were joined remained a source of controversy.

Conclusion

Does science support artisan activity? How should an artisan use it? What is the best combination of science and practice? What do artisans *need* to know about science? How much information do artisans require, in order to validate claims of novelty and goodness? The exhortations to observe and experiment so as to understand and further the goals of colormaking—how far must one take them? How does one employ in colormaking practice the established theories of physics and chemistry? There was no single and unambiguous answer to any of these questions, yet no one questioned that the answers did exist. There were many ways sciences might aid practice.

The argument between Mauclerc and Watin highlights several key issues that

were advancing and retarding the combination of ideas and practices in the eighteenth century. Mauclerc hoped that his presentation describing impalpable and luminous colors as ideas of established masters, combined with his commentary on the art of printing pictures, would inspire an "able painter" to give the public a true theory of coloring and of the harmony of colors.[43] It was the same challenge that led Hoofnail to take up Boyle's *Experiments and Considerations Touching Colours*. Watin and Wilson believed they did something equivalent: Neilson believed this of Quemiset. It was the duty of people like Mauclerc and Watin to teach others to recognize and expose false instructions and false reasoning.[44] That required an understanding of sciences as well as a knowledge of arts.

A Final Word

Mauclerc. *Traité des couleurs et vernis.* à Paris 1773.

Die Farbenkörper haben gegeneinander nicht gleichen Gehalt, und das Gelbe sei ausgiebiger als das Blaue, sodaß, wenn man ihre Wirkung miteinander ins Gleichgewicht zu einem Grün setzen wolle, man drei Teile Blau gegen zwei Teile Gelb nehmen müsse. So sei auch das hohe Rot stärker als das Blaue, und man müsse fünfe Teile Blau gegen vier Teile Rot nehmen, wenn das Gemisch gerade in die Mitte von beiden fallen solle.

Johann W. von Goethe, *Zur Farbenlehre* (Stuttgart, 1997), 5: 457.

This disagreement between Mauclerc and Watin had a clear winner—if outlasting a rival constitutes victory for one's techniques and theories. Watin's *L'Art du peintre, doreur, vernisseur* was translated and reworked into German, English, and Italian editions. It was incorporated into the *Encyclopédie méthodique* in 1782. Watin's treatise became a volume of two other nineteenth-century encyclopedic series similar to the *Descriptions des arts et métiers*. A fourteenth edition, still attributed to Watin though heavily edited and augmented, appeared in 1906. A 1975 reprint of the second edition is a modern source for information about eighteenth-century varnishes, color, and related decorative arts.[45] In contrast, Mauclerc's treatise was never reissued in any form. With the exception of a paragraph in Goethe's *Farbenlehre* and of the physical copies in a few libraries, Mauclerc's book, like Mauclerc himself, disappeared.[46]

Notes:

Note 1: Jean-Félix Watin, *L'Art de fair et d'employer le vernis, ou l'art du vernisseur, auquel on a joint ceux du peintre et du doreur . . .* (Paris, 1772).

Note 2: Jean-Félix Watin, *L'Art du peintre, doreur, vernisseur: Ouvrage util aux artistes & aux amateurs que veulent entreprendre de peindre, dorer & vernir toutes sortes de sujets en batiments, meubles, bijoux, equipages, etc. . . .* (Paris, 1773).

Note 3: Mauclerc, *marchand épicier, Traité des couleurs et vernis* (Paris, 1773).

Note 4: "Nouvelles Litteraires," *Observations et mémoires sur la physique, sur l'histoire naturelle et sur les arts et métiers* [*Journal de physique*], n.s. 2 (1773): 168.

Note 5: Jean-Félix Watin, *Supplément á "L'Art du peintre, doreur, vernisseur. . . en réponse à la réfutation du sieur Mauclerc & de ses Prospectus, . . ."* (Paris, 1773).

Note 6: See, for example, "A Monsieur le Redacteur du Courrier de l'Europe," included in the fourth edition of Watin's *L'Art du peintre doreur vernisseur* (Paris, 1787), 323–25.

Note 7: Andrew McClellan, *Inventing the Louvre: Art, Politics, and the Origins of the ModernMuseum in Eighteenth-Century Paris* (Cambridge, 1994); Thomas E. Crow, *Painters and Public Life in Eighteenth-Century Paris* (New Haven, 1985); Katie Scott, "Hierarchy, Liberty, and Order: Languages of Art and Institutional Conflict in Paris 1766–1776," *Oxford Art Journal* 12 (1989): 59–70.

Note 8: E. H. Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (New York, 1965), 15.

Note 9: John Gage's *Color and Culture: Practice and Meaning from Antiquity to Abstraction* (Boston, 1993) and *Color and Meaning: Art, Science, and Symbolism* (Berkeley, Calif., 1999) are essential volumes on the subject of color within the history of painting and its practice. Martin Kemp's work, especially *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven, 1990), is also important for his expression of these connections. See also J. V. Field, *The Invention of Infinity: Mathematics and Art in the Renaissance* (New York, 1997).

Note 10: Pamela H. Smith, "Science and Taste: Painting, Passions, and the New Philosophy in Seventeenth-Century Leiden," *Isis* 90 (1999): 421–61. Although not about art per se, *Wonders and the Order of Nature*, *1150–1750* (New York, 1998), by Lorraine Daston and Katharine Park, offers a related examination of the combination of words and images in the transmission of explanations for wonders natural and unnatural.

Note 11: Alan E. Shapiro, "Artists' Colors and Newton's Colors," *Isis* 85 (1994): 600–30; see also Alan E. Shapiro, "The Gradual Acceptance of Newton's Theory of Light and Color, 1672–1727," *Perspectives on Science* 4 (1996): 59–140. Shapiro's *Fits, Passions, and Paroxysms: Physics, Method, and Chemistry and Newton's Theories of Colored Bodies and Fits of Easy Reflection* (Cambridge, 1993) is also necessary reading on the subject of color arts and sciences in the eighteenth century.

Note 12: Michel Blay, "Quelques réflexions sur le Nombre des Couleurs et la Composition du Blanc aux XVIIe et XVIIIe Siècles," *Histoire de l'art* 39 (October 1997): 3–11; Michel Blay, "Les Couleurs du Prism ou Quelques Remarques et Réflexions sur les Expériences de Newton," in "La couleur et ses pigments," ed. Jean-Pierre Mohen, *Techne*, no. 4 (1996): 9–16; Michel Blay, "Le Rejet au Dix-huitième Siècle de la Classification Traditionnelle des Couleurs: Les Réelles et les Apparentes," *Dix-septième siècle* 34, no. 3 (1982): 317–30; Michel Blay, "Castel Critique de la Théorie Newtonienne des Couleurs," in "Autour du père Castel et du clavecin oculaire," eds. Roland Mortier and Hervé Hasquin, *Etudes sur le XVIIIe siècle* 23 (1995): 43–57.

Note 13: Watin, *Supplément*, 17, note 1. Francesco Algarotti, *Newtonianismo per le dame, ovvero dialoghi sopra la luce, i colori, e l'attrazione.*(Naples, 1737). A French translation (*Le Newtonianisme pour les dames, ou, Entretiens sur la lumiere, sur les couleurs, et sur l'attraction*) was available by 1739.

Note 14: Watin, *Supplément*, 39.

Note 15: Antoine Lavoisier, "Prémier Mémoire sur la Destruction du Diamant par le Feu" and "Second Mémoire sur la Destruction du Diamant au Grand Verre Brûlant de Tschirnausen, Connu Sous le Nom de Lentile du Palais Royal," *Mémoires de l'Académie Royale des Sciences année 1772, seconde partie: . .* (Paris, 1776): 564–91, 591–616; Pierre-Joseph-Macquer, Claude-Louis Cadet de Gassicourt, and Antoine-Laurent Lavoisier, *Expériences et observations chymiques sur le diamant sur le diamant par MM. Macquer, Cadet et Lavoisier,... et par M. Mitouart* (Paris, 1772).

Note 16: Mauclerc, *Traité des couleurs et vernis*, 14.

Note 17: Watin, 75–77. See also Watin, *Lettre du sieur Watin, auteur de l'ouvrage intitulé "L'Art du peintre, doreur, vernisseur", à M. Seruzier, ancien chirurgien—major de la Marine royale à Paris, sur l'assertion de M. Gardanne, médecin, qui pretend que la colique qu'éprouvent les marins est occasionnée par la peinture dont on décore quelques chambers des navires* (Paris, n.d. [1784]).

Note 18: Arnaud Vincent de Montpetit, "Rapport pour Conserver Portraits Peints à l'Huile," AdS *pochette*, 29 April 1775, n.p.

Note 19: Watin, 43.

Note 20: Meeting Minutes for 28 March 1772, *Procès-verbaux de l'Académie royale des Sciences* 91 (1772).

Note 21: Watin, *Supplément*, 77.

Note 22: Meeting Minutes for 7 February 1776, *Procès-verbaux de l'Académie royale des Sciences* 95 (1776); Meeting Minutes for 19 July 1777, *Procès-verbaux de l'Académie royale des Sciences* 96 (1777); Meeting Minutes for 23 August 1777, *Procès-verbaux de l'Académie royale des Sciences* 96 (1777).

Note 23: Mauclerc, "Avertissement" *Traité des couleurs et vernis*, 83–86.

Note 24: Mauclerc, *Traité des couleurs et vernis*, 71–72; Watin, *Supplément*, 45–46.

Note 25: Watin, *Supplément,* 66–70.

Note 26: Watin, *Supplément,* 66.

Note 27: Alfred Franklin, *Dictionnaire historique des arts, métiers et professions exercés dans Paris depuis le treizième siècle* . . . (Paris, 1905–6) s.v. "Couleurs (Marchands de)."

Note 28: Mauclerc, "L'Art de Iimprimer des Tableaux, Traité par Rapport aux Couleurs" and "L'Harmonie des Couleurs, ou le Clavessin [sic] Oculaire," *Traité des couleurs et vernis,* 16–28.

Note 29: Jacob Christoph Le Blon, *Coloritto, or the Harmony of Coloring in Painting: Reduced to Mechanical Practice Under Easy Precepts and Infallible Rules, Together with Some Colour'd Figures in Order to Render the said Precepts and Rules Intelligible Not Only to Painters But Even to All Lovers of Painting* (London, [1725]).

Note 30: Watin, *L'Art du peintre, doreur, vernisseur*, 4th ed., vi.

Note 31: Natascha Coquery, *L'Hôtel aristocratique: Le marché du luxe à Paris au XVIIIe siècle* (Paris, 1998), 93–105.

Note 32: Watin, *L'Art du peintre, doreur, vernisseur*, 4th ed., xii.

Note 33: Arthur H. Cole, *The Handicrafts of France as Recorded in the "Description des Arts et Métiers 1761–1788*," Kress Library of Business and Economics Publication 8 (Cambridge, Mass., 1952). REgarding this, see "[Review of] *L'Art de faire & 'employer le Vernis . . .*" *Année Littéraire* 4, no. 8 (1772):156-70.

Note 34: Cole, *The Handicrafts of France*, 22; Pierre-François Tingry, *Traité théorique et practique sur l'art de faire et d'appliquer les vernis* (Geneva, an XI [1803]), 2.

Note 35: Watin, *L'Art du peintre*, *doreur, vernisseur,* 4th ed., xxvi.

Note 36: See, for example, Thomas Barnes, "On the Affinity Subsisting Between the Arts: With a Plan for Promoting and Extending Manufactures, by Encouraging Those Arts on Which Manufactures Principally Depend,"*Memoirs of the Literary and Philosophical Society of Manchester* 1 (1785): 72–79.

Note 37: Anne Puetz, “Design Instruction for Artisans in Eighteenth Century Britain," *Journal of Design History* 12, no. 3 (1999): 217–39.

Note 38: Maurice Fenaille and Jules Guiffrey, *État général des tapisseries de la manufacture des Gobelins depuis son origine jusqu'à nos jours, 1600–1900* (5 vols., Paris, 1903–23); volume 4 is especially useful. See also Lucien Reverd, “La Manufacture des Gobelins et les Colorants Naturels," Parts 1–3 *Hyphé* 1, no. 2 (March–April 1946): 91–104, and *Hyphé* 1, no. 3 (May–June 1946): 141–93.

Note 39: Jacques Neilson, letter accompanying [Quemiset] “Cours Général pour la Teinture en Laines," [22 May 1775], AN O/1/ 2047.

Note 40: John Hoofnail, *New Practical Improvements, and Observations on Some of the Experiments and Considerations Touching Colours, of the Honourable and Judicious Robert Boyle, Esq., So Far as They Relate to Tinctures and Pigments, Intended for the Use of Gentlemen and Ladies That Amuse Themselves with Painting in Water Colours, as well as Designers and Limners, Etc.* (London, 1738).

Note 41: John Wilson, *An Essay on Light and Colours, and What Colouring Matters Are That Dye Cotton and Linen* (Manchester, 1786).

Note 42: Edward Hussey Delaval, *An Experimental Inquiry Into the Cause of the Changes of Colours in Opake and Coloured Bodies with an Historical Preface Relative to the Parts of Philosophy Therein Examined, and to the Several Arts* (London, 1777).

Note 43: Mauclerc, *Traité des couleurs et vernis,* 114.

Note 44: Mauclerc, *Traité des couleurs et vernis,* 113–14.

Note 45: Robert L. Feller, Nathan Stolow, and Elizabeth H. Jones, *On Picture Varnishes and Their Solvents*, rev. ed. (Cleveland, Ohio, 1971), 48; X. Folville, "Conception Generale du Décor Polychrome au 18e Siècle," *Bulletin de la Commission royale des Monuments et des Sites* (Brussels) 9 (1980): 327–40.

Note 46: Johann Wolfgang von Goethe, “Mauclerc," in “Achtzehntes Jahrhundert: Zweite Epoche, Von Dollond bis auf unsere Zeit," *Farbenlehre: Historischer Teil*, ed. Rudolf Steiner (Stuttgart, Germany, 1997), 5: 457.
