Significant Red: Watercolour and the Uses of Red Pigments in Military and Architectural Conventions

Bénédicte Miyamoto

Significant Red: Watercolour and the Uses of Red Pigments in Military and Architectural Conventions

Bénédicte Miyamoto

This text was automatically generated on 4 January 2019.

Significant Red: Watercolour and the Uses of Red Pigments in Military and Architectural Conventions

Bénédicte Miyamoto

Introduction

1   Red pigments of vermilion, carmine, minium or madder, when mixed with linseed or safflower oil become durable on many counts. The pigments' resistance to light or humidity is enhanced when mixed with oil, the amount of time the painter has to work them on the canvas is thus extended, and their hue once dried lasts longer. But the same red pigments, mixed with a gum-arabic and water medium, prove more fickle. To apply watercolour in the early modern and modern period, the artist used the flick of an ente – a stick composed of two brush ends with one side for pigment, and one side for water, and which permitted little more than one attempt to get the gesture right before the paint dried on the paper. Watercolours rubbed off, faded in light and were degraded by humidity. However, what proved durable was the set of conventions that framed the practise of watercolour, restrained experimentation, and reined in the rise of more creative and freer uses than those defined by its largely military and architectural uses. "Colour functions within semiotic codes that were developed by socio-cultural agents in response to the exigencies of specific times and places. Such exigencies – the Kairos of colour – make colour both a tremendous source of visual pleasure and of visual anxiety" (Feeser *et al.* 1). The tension between visual pleasure and visual anxiety influenced the development, dissemination and functions of watercolour practices. As a medium primarily directed towards paper, and often used to colour what came out of the printing press, the history of watercolour use is inextricably linked to the circulation of information and knowledge. Who got to "define [colour], give it its meaning, construct its codes and values, establish its use" also got to define the level of objectivity that was ascribed to the information circulated in watercolour (Pastoureau 10). The dizzying amount of shades available in the modern period meant that red was materially elusive.

But for all its semiotic rebelliousness, the perception of watercolour red was greatly constrained by the tightly-knit conventions that had been created for military and architectural drawing. However, as a recently established primary colour, red also gained recognition as the colour with the strongest claim to symbolize importance and strategic use. And even when all other colours were scorned, red often remained as the pulsating heart of architectural and military drawings [Fig. 1].[1]

Figure 1 - Manuscript copy of Jacques Guibert's 1770 *Manoeuvres et évolutions d'un bataillon de troupes*.

PEN, INK AND WATERCOLOUR, C. 1770-75. [MSS L2009F156 [BOUND]/FOLIO 2]. THE SOCIETY OF THE CINCINNATI, WASHINGTON, D.C.

Red – a primary but elusive colour

Scarlet Pimpernel pigments – carmine, minium, and vermilion

2   In his recent article on the vermilion trade, Jean-François Lozier suggests that "old biases are to blame for scholarly neglect" of vermilion compared to other red pigments, and that "whereas cochineal, brazilwood and madder are the stuff of textile production, industry and progress, cosmetics have a long tradition of being dismissed by intellectuals as superficial, frivolous, and primitive" (46). If one looks at the use of vermilion as an artist's pigment, rather than as a cosmetic, however, the field is more researched. It remains true nonetheless that vermilion, minium and carmine have not received the same attention in material culture when used as base for watercolour reds as when used for oil painting and textiles dyes (Phipps; Padilla *et al.*). One of the reasons for this is that changes do indeed attract scholarly interest more than continuities – and the use of watercolour reds until the end of the eighteenth century is very much the history of a standardized praxis, and of unchanged skills handed down from one artisanal generation to the next.

3   Both vermilion (or cinnabar) and minium (or red lead) were at an early date artificially produced, and their names used interchangeably for their manufactured version and their natural version, or often for each other, according to the frequent confusion of terminology in the early modern period (Harley 125-7). The Dutch "secret" of manufacture for both kept Europe sufficiently provided for, and its use in artists' recipes was not associated with the same anxiety relative to cost and availability as, for example, ultramarine (West Fitzhugh; Gettens, Feller & Chase). The use of carmine, lake, vermilion or minium on paper as watercolours demanded small quantities, as opposed to larger format oil paintings, or large-scale projects such as coach or house painting (Martin 462). Evidence also abounds that retailers of colours often mixed vermilion to carmine and red lake to offer cheaper products. The first attestation in print that cochineal-based carmine was being used for artist's pigments appears in Roger de Piles' 1684 *Les premiers elemens de la peinture pratique* (87).[2] By then, the production of the notoriously difficult carmine pigment had become more predictable and more stable thanks to precipitation of cochineal-based red lake with alum, and thanks to the inclusion of tin salt mordants (Merrifield 698–9; Kirby *et al*). In the field of watercolours, however, these discoveries were not the major technological advances they proved to be for the textile trade, which they revolutionized by their cost-effectiveness and holding power on fibre. Although still very expensive for large easel painting using oil-based paint, carmine remained affordable for miniature. In the case of watercolour painting, it could advantageously be used in a cost-effective thin wash, as an "even and very delicate carmine," as prescribed by Hubert Gautier in his 1687 *L'art de laver: ou la nouvelle manière de peindre sur le papier* (51) . It was a very welcome substitute for vermilion, which Alexander Browne deemed "too course and gritty to use in water colours" in his 1669 *Ars Pictoria* (78). But although carmine was "the most beautiful red one can find for watercolour wash," its simple replacement with the cheaper cochineal-based red lake or "Fine Lake, as a default," was still often advised (Gautier 51-2). Historians of eighteenth-century pigments thus write about a "carmine–cochineal lake continuum" in the preparation practices of both painters and colour-men (Kirby *et al*. 74).[3]

4   Furthermore, to become a workable pigment, the pulverized material was mixed with a substance that was both a vehicle and a thinner. These ensured the pigment went a long way – both covering more ground and adding fastness to light over time. The base preparation and use of these vehicles and thinners had long been identified, and as early as 1634, John Bates listed in *The Mysteryes of Nature, and Art* the use of alum water for red lead, gum water for cinnabar/vermilion, roman alum and alicant kali for lake (120-31). Overall, until the end of the eighteenth century, the basic recipes for vermilion, minium and red lake/carmine varied very little (Kirby *et al.*) and the use of red in its various shades on paper for an architectural draft, or a cartographic drawing was neither a novelty nor an extravagance.

Perfecting the recipe

5   The only novel part of much of the "Variety of Inventions: Unlock'd and open'd, for the Recreation of Ingenious Spirits," as John White entitled his 1668 book of secrets, resided in tweaks in the recipes of other seventeenth-century books of secrets. Analysing these variants yields information about what *did* cause anxiety around the use of red: durability, brightness, and trustworthy sourcing. Basic recipes of reds had solidified

across books of secrets and early artists' manuals by the end of the seventeenth century, but successive publications gave increasingly detailed description of the production steps, with prefaces and dedications advertised to justify re-edition and new publications. Authors did not identify why atmospheric conditions were of prime importance, but they did pinpoint the recurrent negative consequences and strove to put in place a series of tried and tested steps. Good practices obtained by experimentations were disseminated as well thanks to Academy lectures on the continent (La Hire 671). Authors were also anxious about the purity of the end product. They insisted on a hygienic process, such as letting the preparations dry in rooms with no dust, stirring with a hazel stick stripped of its bark, using for filter a clean cloth washed with lye and not soap, or again using perfectly clean china bowls, and preserving vermilion in aquavita or a child's urine. Revealing one's secret ingredient was also the key to a commercially successful publication. Bates instructed the reader to add "grains of autour," (the fruit of *Bixa Orellana*) in the cochineal boiling water, and "a drachm of terra merita" (Turmeric) to render the lake the redder (115-30). Alexander Browne in his 1669 *Ars Pictoria* recommended "a little powder of Sugar Candy, which will preserve from crackling" the Indian Lake, a variety of red lake newly produced in London (80). Nicolas Lemery in his 1709 *Nouveau recueil de secrets* advised adding saffron in vermilion's gum water to "make the colour the more beautiful and keep it from darkening" over time (136-7). These tips further evidenced the anxiety of painters, and their constant experimentation to remedy the fact that many of the red pigments faded in the light, lost in intensity, and had little hiding power once diluted and applied (Massing 57-96). This was especially true for watercolours that were used for map and print wash, and the use of Roset, a substitute for Lake, is a case in point. It had the advantage of not being grainy, of being easily prepared by simple wash without the need for time-consuming steeping in liquor or boiling, and it could be stored once prepared and was therefore portable. These were decided advantage when used as a wash – but surveyors and map makers found the fault that "it will soon fade and grow lighter" (Browne 77; Leybourn 116-8).

6   The tips on how to grind, powder, boil, dry and then wash watercolours did not assuage the anxiety over the quality of the initial raw product, however. Many writers, who were painters themselves, felt the need to find a common language between the sellers and the consumers that guaranteed quality standards. In the seventeenth and eighteenth centuries, the sourcing of pigments was haphazard, depended on the varying quality of the transport, and retail goods were rarely packaged in a way which guaranteed that they would not be tampered with or that they would be of standardized quality (Van Damme 77-9). This meant that the customers suffered from a disproportionate informational asymmetry, and some of the most precious pieces of information imparted by books of secrets were the shop addresses of credit-worthy colour-men. Reputation and cultural capital were indeed the strongest indicators of product quality on the early modern and modern market – however, these personal factors remained ephemeral, and the need for a colour-system was acutely felt, to ensure a common language, which would empower customers by legitimizing their expectations of quality.

The Hunt for the Red Octave

7   The painter's primaries – the elements out of which all colours may be compounded – had been accurately reduced to the three "colorants" of blue, red and yellow in 1609 by

Anselmus de Boodt and by Louis Savot, and in 1613 by D'Aiguilon. These subtractive primary colours were defined as "material colours" by Jacob Christoph Le Blon when he correctly differentiated them from the "impalpable" primary colours of Newton in his 1720 *Coloritto, or, The harmony of colouring in painting reduced to mechanical practice* (6). Like many practitioners and manual writers, Le Blon's objective was not optics. His goal was to facilitate the practical preparation of colour – especially the most difficult of them all, the mixed colours for the representation of the nude body. Figure V of his *Coloritto* presented the reader with the example of a prepared palette, showing a gradation of nude tints in "Mezzatinta, or Half shade" (16) which followed the Aristotelian idea that a colour's value was lightened or darkened by the additions of white or black. However, although the London-based painter wrote of a straightforward equivalence between the "Material colours or those used by painters" (6), the identification of the different shades of these three primary colours was a conundrum when one stepped inside the artist's studio, or the colour-men's shop. Savot had boldly asserted in 1609 that those who daily experimented with pigments in their profession could easily compile all the species and gradations of colours from his simple colours, but this was disingenuous (6v). Similarly, Le Blon's identification of simple colours, although correct, belied the complexities and tribulations of sourcing colours in the early eighteenth century. Shades of red were the most problematic, given that this primary colour comprised the most variations of original pigments. The customer looking to buy red was therefore faced at the colour-men's shop with the longest lists of names for various preparations, which Alexander Browne in his 1669 *Ars Pictoria* simplified with a handy "&c" in order to get his table of colours to fit the composition of the printer's page. [Fig. 2]

Figure 2 - Alexander Browne, *Ars pictoria: or, An academy treating of drawing, painting, limning and etching*.
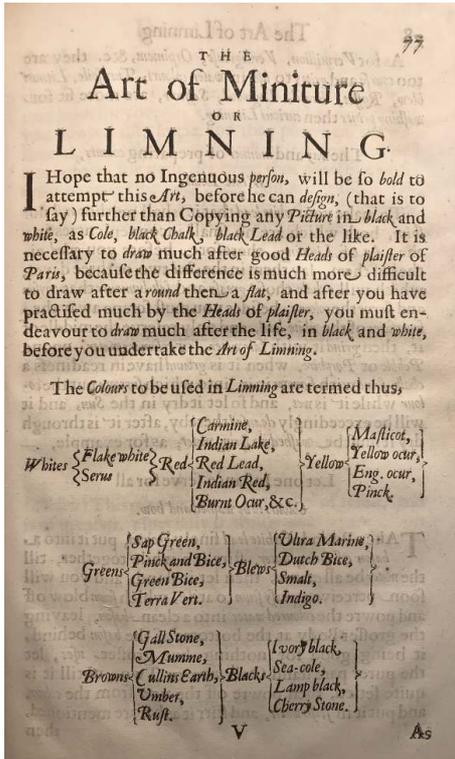
J. REDMAYNE, 1669. [B5097/P. 77].

8   Earlier attempts at classifying colours were thus often first and foremost attempts to agree on a nomenclature before even attempting to shop (Leybourn 116). Henry Peacham's 1612 *Gentleman's Exercise*, one of the earliest painters' manuals, is recognized for taking great care to be "informative about word derivations" (Eastaugh 286). It was an arduous task in the context of unreliable colour names. "The study of colour as we understand it becomes very much the study of colour language," write John Gage, as he underlines the tremendous anxiety triggered in the early modern and modern period by the "instability of colour-perception" (262). This unresolvedness led Richard Waller to present the Royal Society of London for the Improvement of Natural Knowledge with a "catalogue of simple and mixt colour" in the winter of 1686 (24) [Fig.3].

Figure 3 - Richard Waller, "A catalogue of simple and mixt colours, with a specimen of each colour prefixt to its proper name."

9   While the Royal Society Fellow William Aglionby, who would author *Painting Illustrated in Three Dialogues* (1685), questioned in one of the ordinary meetings the practicality of a single table of pigments for both oil and water-based colours, Waller's table was well received.[4] Meant to help "describing the Colours of Naturall Bodys, which may be represented more nearly to the Reader provided" (25) with the table, it was framed for reference in the Society's meeting room.[5] The commercial term "catalogue" used to label the table was a telling sign that both Waller's personal practical approach and the document he was elaborating on – Finnish miniaturist Elias Brenner's 1680 colour table for the Royal Academy of Sweden – relied on colour materials as they could be found in colour-men's shops (Brenner). Waller's list of twenty simple colours (all of them shades of the painter's primaries blue, yellow and red) was in point of fact a table of pigments to use in liquid form. Of Brenner's nomenclature of eight red colours, for example, Waller had not retained the Hematite/sanguine which was used raw without dilution. These "simple colours" were therefore a supply list scaled down to the most commonly used names of pigments, which in the trade went under a variety of "largely fanciful" and "surprisingly unspecific" names (Schweppe & Roosen-Runge 258; Hodacs, *Silk and Tea* 125). Earlier reduction to only three simple colours did in fact take into account the practical differentiation of shades and materials available on the market. Indeed, De Boodt split his simple red into two origins, Ruber (lake) and Miniatus (cinnabar/ vermilion) (25). Savot, in the meantime, divided red into "one of thick parts and another of thin parts," thus differentiating between the tinctures of yellows and the hiding power

of Ruffus (ochre), Rubinus (lake), Igneus (minium) and Ferrugineus (rubrica) for example. But when discussing shades of colour, he finds translation too irreducible a problem, peppering his Latin text with the French adjectives, which he deemed less confusing for his readers (Savot 8v). In truth, these scientific disquisitions struggled to equip their readers with a clear map to navigate the variety of reds on offer. Waller's effort was notable in identifying the organic and mineral originals under the "obsolete, archaic, or misrepresentative" names that proliferated through trade, and recalls similar efforts in the silk companies to promote a pan-European colour nomenclature, largely derived from the French terminology (Hodacs, "Cheap and Cheerful" 23-44, and *Silk and Tea* 122-5).[6] Most artists' manuals would generally specify at least an octave of red shades, one of the most common being: cinnabar/vermilion; minium; roset, lake; carmine; dracorubin; red brown and brazilwood (Gautier 35-39). Waller's goal in publicising his work in progress, "which the more skilful Reader may supply where wanting," was to spread this standardisation further by reader's response, especially to fill in the missing translations in his mixed colour columns. This was an archival practice typical of the exchange network in the early modern period, based on collective empiricism (Waller 24; Daston 161-65). The blank spaces in his table, ready for additions, can be compared to Le Blon's 18 blank leaves after the fold out of his nude palette, ready for other colour combinations trials and records.[7] As Le Blon acknowledged in his dedication, better colour practices were to be published "that it may not be kept as a Secret for the future, but in due time improv'd by more skilful hands" (n. pag.), and thus it participated in the Enlightenment project to foster a "sense of community of enquirers" (Daston 161). The ensuing table of mixed colours, or one-to-one combinations of simple colours, listed the different Aristotelian values of lightness and darkness – following for example the mix of gray to dark gray – but also favoured names linked to natural occurrences, such as "couleur d'azure," "couleur du poix," "couleur du sang" in the French column, and gold colour, clay colour, orange colour, fire colour, rust colour, soot colour, silver colour, brick colour, etc., in the English column.[8] The cataloguing of these simple and mixed colours was therefore geared first and foremost towards providing the painter with a path to mimetic representation.

Painting the town red

Middle-of-the-road red

10   For the first half of the eighteenth century, there was little innovation in the preparation and application of watercolours. The activity was often directed towards the colouring of prints or maps, and was, more often than not, an ancillary activity dependant on another profession. The fact that most artists' manuals gave priority to the preparation and use of oil colours rather than watercolours has been rightly analysed as a direct consequence of academic training that favoured large scale representation in oil on canvas, and fostered academic disdain for watercolour's perceived association with artisanal practices (Smith 14-17, 30-31). Thus, discussion of watercolour could often be found in books directed towards a less specialized audience than the apprentice painter.

11   Watercolour preparation was a recurring subject in a raft of trade recipes published in books of secrets from the sixteenth-century onwards. Compiled and inserted between chapters on fireworks and husbandry, drawing was deemed to be of interest for a large

array of professionals, in these compendiums devised "to impart to each particular person what his Genius most affected" (Bates, "To the Reader" n. pag.). Shared, translated and collected, these inventions became public property in a "most heterogeneous collection, heterogeneously piled together" (Ferguson & Pober 10). Historians of science have long stressed that in the early modern and modern period, painting was, by any rate, a "widespread, ramified network [...] employed by craftsmen and scientists as a technical medium" (Weibel 445; Dijksterhuis). Examples also abound of recipes for colours carefully taken down and preserved in books that facilitated user-added content, such as commonplace books, or books with added blank end leaves. Jotted down in full on the end blank leaves of a 1688 almanac is for example a "Mutton Blood Red" recipe taken verbatim from Bates' 1634 *Mysteryes of Nature and Art*, which "says a Painter that told me for a special Experiment will make a Transparent and Excellent blood red colour which you may also dissolve in your Alum Water."[9] The pigment receipt is followed, as was often the case in books of secret, by the elementary introductory steps to the practice of watercolour – the recipe for the basic ingredient of Alum water, and directions on how to copy a picture. Although the actual use of these recipes can rarely be documented, and although the precise intentions of the recipes are hard to ascertain (Eikema Hommes), the sheer amount of pigment recipes present in both published books and manuscript records intimates not only that there was a large audience for an amateur use of watercolour, but that their users rarely, if at all, made a living from painting alone.[10] This was an important factor in the absence of innovative watercolour techniques until the last decades of the eighteenth century: in this later period, the free handling, texturing and layering of watercolours, which made the English watercolour school famous, was a radical departure from this former practice of wash drawing with a semi-transparent layer of diluted colour, "similar to mezzo-tinto prints thinly washed with colours" (Pyne 66).

12   Books of secrets, as most compendium ventures, were notorious for reusing and barely revising content from previous editions, which resulted in frequent iteration of recipes divorced from contemporary practices. These editions also reproduced and pirated rival, foreign and often much older editions, due to the printing trade's economic constraints. The publication dates alone are therefore not sufficient corroboration to assert that a recipe was current at a given period; and the seemingly monolithic approach to watercolour mix and use was in part influenced by these editorial constraints. But contemporary accounts, such as Roger de Piles', did often underline that the use of oil painting was a more liberal art than the use of watercolour. The latter was traditionally applied as a uniform wash, with a mechanical gesture, and thus lacked the experimentation possibilities and the versatility of oil paints. "Oil colours are superior to others in that their hue can easily be mixed by the motion of the brush [...] The painter must accustom himself to paint and mix his Colours with prompt and delicate a brushstroke" (Piles 70).[11] This academic hierarchy, repeated by artists' manuals, persisted well into the eighteenth century.

13   Another reason for the rarely varying set of skills and methods in watercolour was to be found in the ethos of one of the profession that was most closely linked to watercolour painters – that of the topographer-surveyor (Smith 14-17). Since "it is not convenient for a Surveyor [...] to repair to a Painter when he has finished his work," the architect and mathematician William Leybourn advised in the 1660s all apprentice surveyors and topographers to teach themselves the skills of washing their drafts (Leybourn 114).

Topographer-surveyors belonged to the corps of the Royal Engineers from 1716 onwards, originating from the fifteenth-century establishment of the Board of Ordnance; they were officers with no military ranks, and were increasingly called "military engineers" to differentiate them from "civil engineers" as the two professions became distinct through the establishment of separate societies and training institutions in the course of the eighteenth century (Collins & Frampton 185-97). And from this regimented position of surveyors and engineers, the draftsmen slowly trained themselves into the ranks of artists.

Seducing the jury and the chain of command

14   Research is currently reassessing the idea that the period of the hand-press print corresponded to an unchallenged monochrome reign of the black ink on the white page (Stijnman & Savage, *Printing Colour*).[12] Publications experimented more widely and successfully than acknowledged before with the use of colours, not only on grounds of decoration, but also for the express purpose of circulating knowledge, since coloured illustrations to support text corresponded to medieval reading habits that died hard (Stijnman & Savage, "Material Colours" 95, 112; McKitterick 63-68). The civic humanist discourse was still in many ways characterized by chromophobia and considered chromatic variety as "the province of the foreign, the impure and the deceitful" (Alayrac-Fielding 82). But this was a discourse that attached itself more specifically to items of luxury and non-necessary goods – the relationship between colour and impropriety was lessened when the colours expressly mimicked nature for the purpose of scientific or technical knowledge. Thus, far from deceitful, colour without artistic licence became a key element of objectivity (Daston & Galison 84–98; Kusukawa 73-96).[13]

15   This tension between colour as frivolous and colour as information is exemplified in the development of conventions in architectural and military plans and maps, which opposed the Roman school to the French school. Conventions in architectural drawing and drafting technics were the basis of an artistic *entente* across Europe, but as these fixed rules of representation circulated and endured, they also considerably restrained innovation and creativity (Harley *et al.* 65-6; Ackerman 294-317). Studying how colour was applied to maps and architectural drafts reveals these tensions and shows how the triumphant conventions of the French School came in turn to stultify watercolour practice in Britain, even as the eighteenth century progressively developed a less fraught moral relationship with luxury and colours (Trentmann 1-19; White, Jonathan 93-104). Under the pressure of engravers and the constraints of the printing process, the Italian school of architectural drawing was largely monochrome, and passed on these conventions to seventeenth-century British architects. The tendency was also influenced by naturalistic representation, in a period that tended to favour monochrome building exteriors. Plans were drawn up in brown ink and grey wash, a convention that was easily reproduced in print. Elsewhere on the continent, however, the vogue for "tinting" or "staining" architectural plans thanks to watercolour wash developed fast. Architectural drawings in France, under the competitive pressure of the *Ancien régime* academic training, increasingly favoured dazzling finished plans which in effect became architectural paintings (Baudez 43-58). In a lavish 40 cm folio of 60 intricate plates, the architect Louis Bretez, member of the Académie de Saint Luc, explicitly published his cartographic lessons for an audience of "present-day excellent painters who studiously

endeavour to decorate their drawings of architectural ordnance, [...] hoping that it would prove most useful and most profitable" to their careers (n. pag.). By the end of the eighteenth century, critics assessing the architectural submissions to the British Royal Academy's summer exhibition in the *Morning Post*'s "Architects Mirror" conceded that although colourful additions such as

> [...] trees, ground, and sky, [...] too apt to captivate the eye [...] are entirely extraneous to the design and only introduced to form a picture; it should however be observed that the best architectural designs should be expressed somewhat gracefully, and especially when exhibited to public view, otherwise they cannot among paintings be introduced with propriety. ("The Architect's Mirror")

16   This tension between legibility and beauty was assuaged by the use of colour-coding in military maps, which endorsed colour under the cover of conventions and mimetic representation. In 1684, Roger de Piles published his practical *Elemens de la peinture,* which functioned as a workshop companion to his more theoretical dialogue on colouring in oil painting. Two years later, the military engineer Hubert Gautier published, in the same vein, a detailed guideline of the use of wash colours that fine-tuned the standards in military coloured maps first suggested by Sébastien Le Prestre Vauban in his 1685 *Directeur général des fortifications* (Vauban 70-71). The transfer of technological innovations to another nation's pools of technicians, and to the pages of manuals in another language was fraught with difficulties and rarely homogeneous (Hilaire-Pérez & Verna 536-37). But one of the reasons for the rapid cross-border adoption of Gautier's guidelines rests notably in his detailed colour-coding that made it possible for the cartographer to articulate both the realistic and the geometrical perception of the space represented. The fate of a European-wide convention was sealed.

17   He first elaborated further on the convention of using carmine to indicate built structures and justified the choice of red as immediately legible specifically because it was naturalistic. Maps "must be coloured in a manner as closely approximating that of the structure itself as seen in its natural environment [...] blue for those portions that denote the place of a moat filled with water, red shows the position of a rampart of bricks," and this naturalistic vein followed Gautier's and Vauban's injunction that "the closer the building drawn nears to perfection, the more one shall give it the colours that corresponds to the perfected building" (Gautier 2, 53; Vauban 71). This was pursued to fine points of details by subsequent publications and copy-books, bearing specifications that cofferdams, locks, and bridges of masonry were to be noted in red, while a wood bridge was to be instantly recognisable by its black ink.[14] Some authors chose the dictionary form to accommodate the colour-coding of all possible map details, with entries to specify the use of carmine for terracotta tiles, and indigo for slate or clapboard (Ballard 58). By 1783, a very lavish manual on military map colour-coding, the *Idée d'un militaire pour la disposition des troupes [...] la défense et l'attaque des petits postes*, by Charles-Louis-François de Fossée, even recommended a hallucinatory level of details when it justified adding reddish-green soft touches to wooded areas as proper "to express heaps of dead leaves to be found scattered in the woods" (31). An illusory fidelity to natural colours was pursued, and the use of colours named after what was represented – such as the use of *vert-d'eau* colour (literally water green) for water expanses, or *couleur de sable* for dunes of sand (literally sand colour) – was welcomed as an opportune solution (Dupain de Montesson 148-50).[15]

18   The level of symbolisation in the keys of military maps was defined exhaustively in *Dessinateur au cabinet et à l'armée*, an appendix included in Dupain's 1751 *La science des*

ombres. It seems to have been entirely dependent on the time available to the map surveyor and draughtsman, and the ideal finished product thus tended towards a painstaking mimetic representation, answering an "urge simultaneously to achieve decoration and textual direction" (McKitterick 68). This tension between beautiful but therefore lengthy rendering was problematic if the goal was military reconnoitring – but it was strongly incentivised by the need to present dazzling finished products to the chain of command:

> Everyone strives to please at Court, by presenting some new drawing, which are judged more or less beautiful according to how closely they approximate the original by the means of wash [...]. So much so that all those employed [as surveyors-draughtsmen] are obliged to wash the drawings of their projects, to declare them finished (Gautier, "Préface" n. pag.).

19 Washing a military map seems to have tended, *in fine*, towards the same principles as oil paintings – a mimetic rendering of nature and a seductive colouring to please the eye. The subject of such "beautified" maps were more often regional topographical maps, maps of existing, idealized, or envisaged fortifications, as well as planned or recorded battle maps, rather than long and thin route maps, and maps elaborated for immediate internal use in strategic and logistical support of troop movements and castrametation. Some of the more elaborate topographical and fortification maps sent by the Board of Ordnance to representatives of the British monarch were never actually returned, and they later integrated King George III's collection, thus becoming a collectible decoration (Anderson, "Military Mapping" 279). These dazzling images did however retain effective technical use, since their show of power was not just a matter of memorializing. Their argument was also to convince rulers to plan for developments in the army and to fund an increasingly sophisticated army and navy, thus participating in the advent of the fiscal-military state (Buisseret 57-123, Mukerji 655-76).

20 A scrutiny of military maps and architectural drafts shows that the informational value of the colour red was more complex and varied, however, than the mere naturalistic rendering of brick structures. In Rome and in Madrid, red was actually the one colour salvaged from the Academies' chromophobia. These Academies adopted the convention in place in the rest of Europe: section plane views, which literally cut into the building's structure and lay bare its inner organisation of rooms, would use a wash in a very light red tint to indicate the load bearing walls exposed to view. All brick or wood timbers cut by the section plane were shown in red, which the eighteenth century would later call "colour of rose," but which here was symbolic of blood red. [Fig. 4]

Figure 4 - Louis de Traux, Collection of 46 drawings for plates prepared to accompany Georg von Hauser's *Abhandlung über die Befestigungskunst*.

21   In turn, military surveyors used the colour red – a stronger shade of carmine, more reminiscent of life and the rush of blood in the veins – as a convention to represent those buildings in the surveyed landscapes which were actually standing, while yellow was used for projected buildings.[16] Carmine wash was also used to highlight the strategic import of "buildings of note, such as churches, hospitals, town halls, arsenals, gunpowder magazines, garrison buildings, and other such" (Gautier 104). A century later, the conventional list of buildings of note and the recommendation to mark them out in burnt carmine still prevailed (Fossée 37). As such, red's value to flag strategic importance was a relic of rubrication. This medieval practice of setting off directions in red, and embellishing first letters, titles and headings of statutes helped the reader navigate the text. Red ink had remained the other major print colour for text apart from black and in military publication, red and black ink became a staple for the schematisation of artillery exercises, infantry drill and tactics diagrams. [Fig. 5]

**Figure 5 - Thomas Sunderland, Light infantry exercise & c. selected by Thomas Sunderland, lieut. Col. commanding the Ulverston Volunteer Light Infantry.**
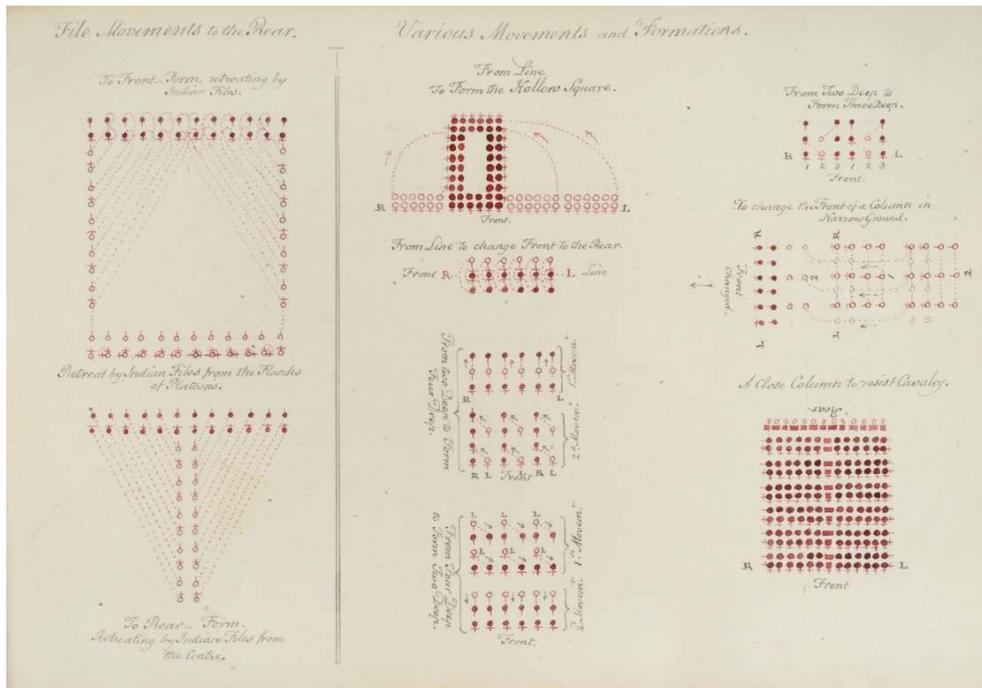
INK, 1804. [MSS L1992.1.81 [BOUND]/ F. 7]. THE SOCIETY OF THE CINCINNATI, WASHINGTON, D.C.
© 2018 -THE SOCIETY OF THE CINCINNATI.

22   The schematic representations of troops followed the conventions of geometry sketches and presented on one plane the asynchronous stages of line formation and manoeuvre. Here again, red was used conventionally, either to pinpoint the front line or the count of heads. When battalions or squadrons were represented without head counts, they were schematized as rectangles, divided diagonally to indicate the colour of the corps, and the colour of the uniform (Dupain de Montesson 130-161). With the development of military manuals, red was ascribed yet another signification in military maps, that of the direction lines for deployment of troops (Rodari 105, 142). It is when such military manoeuvres were represented in campaign march that the mimetic and the schematic cartographic representations merged perplexingly. This made the meaning of red more complex, since the colour now operated on many registers, as both conventional symbols and as illusionistic details. Loaded with dramatic meaning – such as the troops' firing range in red dashed lines – the colour was also used to artistically enhance the maps with details that were to be understood as entirely imaginary. By the end of the eighteenth century, Louis-Marin Bonnet had invented a method to colour print in the style of pastel and watercolour tints – the first publication this new talent was called on for was the publication of de Fossée's 1783 military topography manual, *Idées d'un militaire* (Raux & Delapierre).[17] The plates complemented an exhaustive text on the choice and conventions of wash colours, and the 11 fold-out coloured engravings were highly finished examples of the range of information red could impart to the viewer. Red highlighted the tension between the perspectival grid of Leon Battista Alberti's realistic mode of representation, and the geodetic coordinates of a flattened bird's-eye view which produced the specific "cartographic gaze" of military maps (Weibel 444). Red foundation outlines as seen from above indicated standing buildings of tactical importance, visible in one sweeping

military "coup d'œil," which corresponded to the perspective methods of land-surveying transferred to picture-making (Pansini 128, Godlewska 192-213, Edney 14-20). In parallel, dramatic red flames could be added to cartouches or to three-dimensional cityscapes etched in the map's corners, an embellishment practice devoid of any topographical information [Fig. 6].

Figure 6 – Louis Marin Bonnet, in Charles-Louis-François de Fossée, *Idées d'un militaire pour la disposition des troupes*.
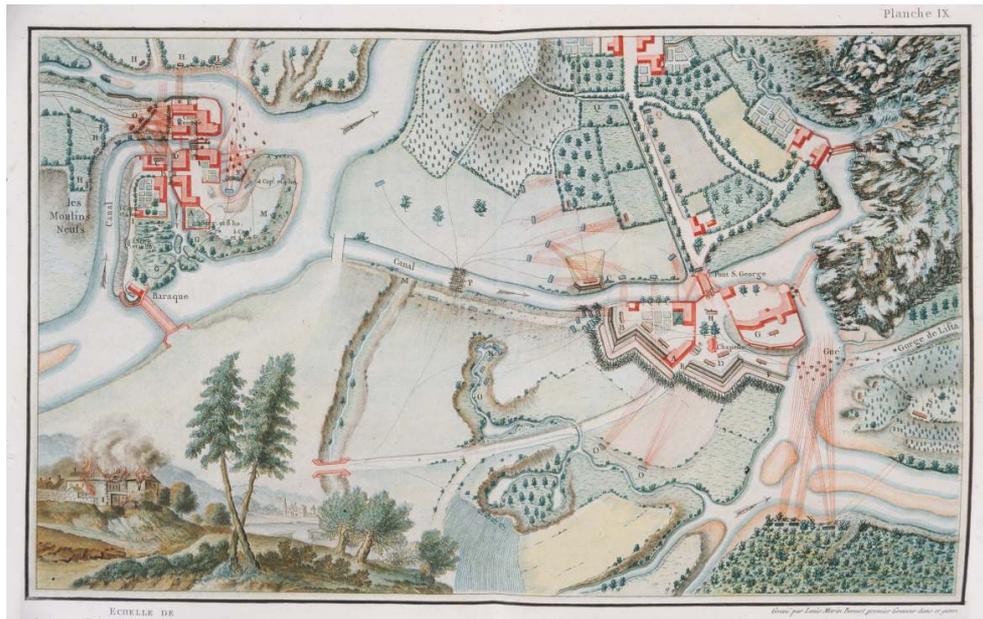
LONDON: JOMBERT, 1783. COLOUR-PRINTED ENGRAVING. [355.44 F752, 1783/PLATE IX]. THE SOCIETY OF THE CINCINNATI, WASHINGTON, D.C.

23   Already, the earliest wash manual writers broke convention to recommend that, whatever the strategic worth of a village, if it appeared close to the eye at the bottom of the map, it "should in my opinion rather be red than any other colour in this instance [...] it would be the most important ornament of the drawing, one must admire these parts over all others and the eye must be led to them" (Gautier 123). This interplay between "picture making as rational mapping" and "narrative adventure story rendered with hallucinatory clarity" was a struggle even the earliest writers on map washing had experienced (Locke Siegfried 236). This can be seen in Gautier's hesitation between representing trees on maps by the time-saving symbolic solution of "the letter o, or some bold dot," and the more satisfying three-dimensional endeavour of "making the trees rise, which will have a much more beautiful appearance" (89). This interplay transformed the maps from tools to showcase displays, and typically reinforced proprietorial control over the landscape.

Trooping the colour

24   The military corps and the artistic professions have a long history of shared ethos and practices. The skills of draughtsmanship and of military knowledge were already linked

and considered befitting a nobleman's education in Baldassar Castiglione's 1528 *Book of the Courtier*, first published in England in 1561:

> In fact, from painting, which is in itself a most worthy and noble art, many useful skills can be derived and not least from military purposes: thus a knowledge of the art gives one the facility to sketch towns, rivers, bridges and citadels, fortresses and similar things, which otherwise cannot be shown even if, with a great deal of effort, the details are mentioned. (96-98)

25   The two professions were not connected only by an opportunistic change of tack in time of peace. Europeans engineers and draftsman commonly sought military employment as a career track, and even crossed borders to do so (Virol 35-45). The two were complementary specialities, which rested on the mastery of geometry and perspective drawing, as well as on expertise in the use of colour as an applied science in the engineering culture of the time. "A well educated Military man is necessarily an engineer on occasion," commented the architect Charles-François Dupuis in his 1773 *Cours de géométrie pratique, d'architecture militaire, de perspective et de paysage* (v). The structuring of a formal education for British military engineers meant that the practice of drawing and colouring was increasingly regarded as a professional requirement (Marshall 67-130; Pansini). Drawing was made part of the curriculum when the Royal Military Academy was founded at Woolwich in 1741. The opening of a Drawing Room to train the military corps of draftsmen and surveyors at the Tower of London in 1800 participated in the same push for technical training and was under the supervision of the Board of Ordnance. These formal educational reforms had been anticipated by the "Rules Orders and Instructions for the future Government of the Office of the Ordnance" established in 1683, which already underlined the need for good draughtsmanship for military engineers who "ought to be perfect in Architecture, Civil and Military, [...] to draw and design the situation of any place in their true prospects upright and perspectives, [...] to keep perfect draughts of every fortification."[18] British officers from the middle of the eighteenth century onwards engrossed themselves in the study, translation and reworking of continental military literature (Gruber 30-5). Likewise, the training of draftsman and surveyors to cartography followed the continental manuals of artillery and fortification from the continent, and particularly reinforced the standardisation of graphic representation and of use of colours put in place by French military map-making (Anderson, "Military intelligence" 159-65). When John Muller, the head-master of the Royal Military Academy of Woolwich, published in 1747 his *Attack and defence of fortify'd places [...] for the use of the Royal Academy of Artillery at Woolwich,* its 25 folded leaves of plate representing maps and plans became staples of copy-practice, washed according to the conventional colours [Fig. 7 et 8].

Figure 7 - John Muller, *The attack and defence of fortify'd places (…) for the use of the Royal Academy of Artillery at Woolwich*.
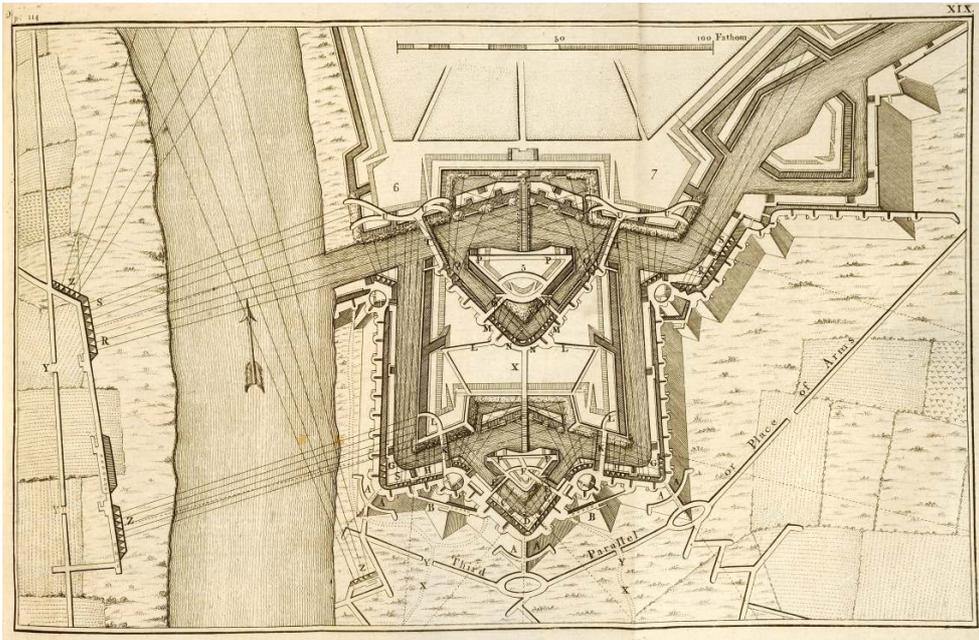
J. MILLAN, 1747. [L2006F10 1747/ FOLD-OUT PLATE XIX]. THE SOCIETY OF THE CINCINNATI, WASHINGTON, D.C.

Figure 8 - Fortification exercises largely drawn from Muller's 1747 *A treatise containing the elementary part of fortification.*
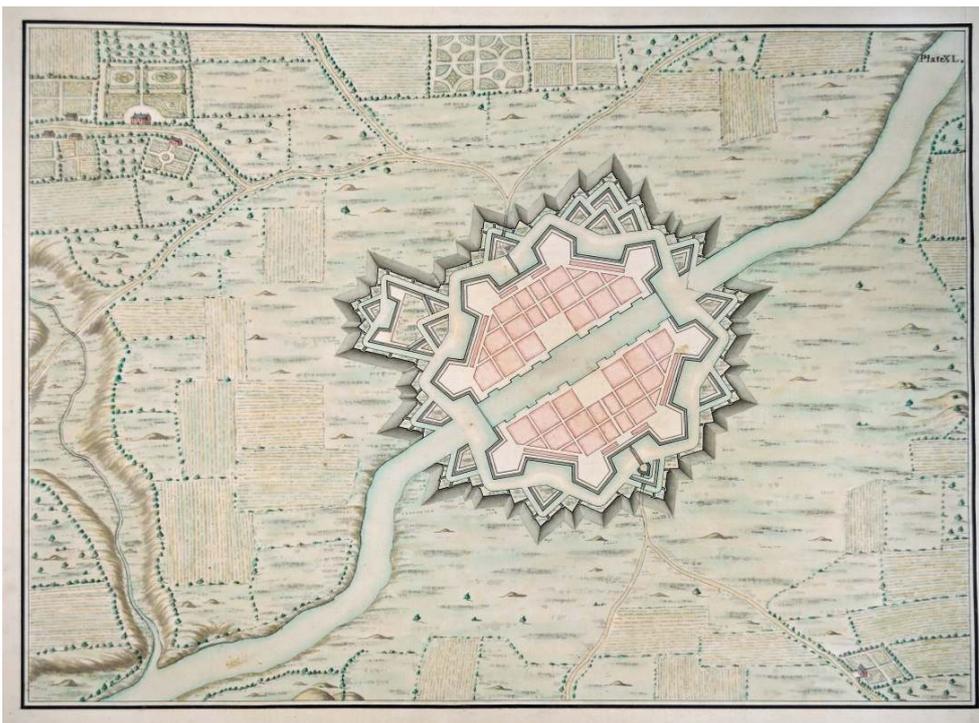
[MSS L2001F401 [BOUND]/PLATE XL]. THE SOCIETY OF THE CINCINNATI, WASHINGTON, D.C.

26   There has been an increased interest in the field of book history for the circulation of knowledge between individuals across media, from print to manuscript and back. Studies have shown that as late as the eighteenth century, making manuscript copies was still a customary method to disseminate knowledge (McKitterick 53-96), and this was an especially widespread practice in the field of military information, where manuscript copies were largely superior in precision to printed ones. As the master of the Military Academy in Little Chelsea, Lewis Lochée, wrote in his 1773 *Essay on military education*, the basic skill of drawing and cartographical representation was "the finishing to all these studies. Without this, the student will be retarded in his own progress, and unable to impart his own knowledge to others" (54). The originals were often of sensitive military nature, and some of the major continental treatises, circulated only in manuscript form. Vauban's fortification treaty *De l'attaque et de la défense des places*, was commissioned by Louis XIV for the education of the Dauphin's son, the Duke of Bourgogne, second in line to the throne. Completed in 1704, it was only published in 1737 in a major printing venture by Pierre de Hondt. By that time, however, its fame was already well publicized by manuscript circulation – copies ranged from complete version to partial or plates only. Translated, interleaved with other military treatises, or skimmed down to one of its three parts, Vauban's treaty was circulated as lavishly faithful records, as draftsmen's workbooks or as teaching tools for officers, thanks to manuscript and hand-coloured copies mostly made by mathematicians, engineers and draftsmen from the military corps. Most of these copyists had been trained to ensure a durable and reliable form of transmission up the chain of command. Reproduction of teaching manuals, and the copying of castrametation, fortification, and famous battle plans was a large part of the training of military draftsmen and officers, outweighing considerably the practice of on-the-spot sketching in nature or during military manoeuvre (Gruber 3-63; Guthorn 25; Lynn 118-20, 125-29). In time, the conventions of the military cartographic training proved an impediment not only to the development of artistic watercolour, but also to the outputs of military engineering. Military engineers drawing up the plans of fortifications in the American colonies, for example, remained stifled by their conventional and vicarious training. With their hands trained on Vauban's fortification exercises, and their eyes fixed on historical battle plans, they were guilty of a gigantism ill-adapted to their new environments (Marshall 20-25).

27   The copying practice engrained in military map training, however, was vital to the military profession. The cost of map engraving was high and time-consuming, the many steps of the printing process made errors likely, and the results were disappointing. In truth, the process of print could not yet compete with the high precision scale of the manuscript map, and the high rendering of details that the wash conventions imparted to military maps. Since 1717, *The Young Surveyor's Guide: Or, a New Introduction to the Whole Art of Surveying Land* recommended the practice of outlining the washed details with a black lead pencil and then following it by an added layer of stronger wash contour inside that black lead outline, and these enduring conventions ensured an outstanding readability of modern maps (Laurence 225; Fossée 36). But these standardized "drawings with penned outlines, shadowed with Indian ink and washed with thin colour" would precisely be the ones criticized by William Henry Pyne in his dismissive review of eighteenth-century watercolour practices (66).

28   The standardisation of colour conventions, use and preparation ensured that this mostly manuscript transfer of knowledge yielded a critical mass of correct copies in circulation.

On the other hand, it also ensured a vicarious and orthodox practice of cartography and fortification drawing, which went hand-in-hand with an un-innovative use of watercolour technics and a strongly bookish and fossilized culture of warfare. The conventions of military cartography and architecture kept a stronghold on the practice of watercolour, as did the practice of colouring prints. The received procedure was to use watercolours as a transparent wash. Notwithstanding its many shades and informational content, even the colour red was thus established in watercolour as subservient to design.

BIBLIOGRAPHY

PRIMARY SOURCES

"The Architect's Mirror: Observations on the several Architectural Designs, now exhibiting at the Royal Academy' in Pall-Mall." *Morning Post and Daily Advertiser* 3 May 1776: 4.

BALLARD, Christophe. *L'art de dessiner proprement les plans, profils, élévations géométrales, & perspectives.* Paris: Christophe Ballrrd [i.e. Ballard], 1697.

BATES, John. *The Mysteryes of Nature, and Art: Conteined in Foure Severall Tretises.* London: Thomas Harper, For Ralph Mab, 1634.

BRENNER, Elias. *Nomenclatura et species colorum miniatæ picturæ: Thet Är: Förteckning Och Proff På Miniatur Färgår; Nomenclatura Trilinguis.* Stockholm, 1680.

BRETEZ, Louis. "Préface". *La perspective pratique de l'architecture.* Paris: Jombert, 1751. N. pag.

BROWNE, Alexander. *Ars pictoria: or, An Academy Treating of Drawing, Painting, Limning and Etching.* London: J. Redmayne, 1669.

DE BOODT, Anselmus B. *Gemmarum et lapidum historia, qua non solum ortus, natura, vis et precium.* vol. 1. Lugduni Batavorum [Leiden]: Joannis Maire, 1609. 2 vols.

DUPAIN DE MONTESSON, Louis Charles. *La science des ombres, par rapport au dessein.* Paris: Jombert, 1750.

DUPUIS, Charles-François. *Cours de géométrie pratique, d'architecture militaire, de perspective et de paysage.* Paris: Jombert, 1773.

FOSSÉE, Charles-Louis-François de. *Idée d'un militaire pour la disposition des troupes [...] la défense et l'attaque des petits postes.* Paris: Jombert, 1783.

GAUTIER, Hubert. *L'art de laver: ou la nouvelle manière de peindre sur le papier: suivant le coloris des desseins qu'on envoye a la cour.* Lyon: Thomas Amaulry, 1687.

LA HIRE, Philippe de. "Traité de la pratique de la peinture". *Mémoires de l'Académie Royale des Sciences depuis 1666 jusqu'à 1699.* vol. 9. Paris, Jean-Baptiste Coignard fils, 1730. 21 vols. 635-730.

LAURENCE, Edward. *The Young Surveyor's Guide: Or, a New Introduction to the Whole Art of Surveying Land.* London: James Knapton, 1717.

LE BLON, Jacob Christoph. *Coloritto, Or, the Harmony of Colouring 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.* N.p., 1720.

LEMERY, Nicolas. *Nouveau recueil de secrets et curiositez les plus rares et admirables de tous les effets que l'art et la nature sont capables de produire.* Amsterdam: Estienne Roger, 1709.

LEYBOURN, William. *The Compleat Surveyor: Containing the Whole Art of Surveying of Land.* London: E. Flesher, 1674.

MARTIN, Thomas. *The Circle of the Mechanical Arts: Containing Practical Treatises on the Various Manual Arts, Trades, and Manufactures.* London: R. Rees, 1815.

MERRIFIELD, Mary P. *Original Treatises, Dating from the xii^th to the xvii^th Centuries, [o]n the Arts of Painting: [...] in Two Volumes.* 1849. New York: Dover, 1967.

MULLER, John. *The Attack and Defence of Fortify'd Places [...] for the Use of the Royal Academy of Artillery at Woolwich.* London: J. Millan, 1747.

PILES, Roger de. *Les premiers elemens de la peinture pratique: enrichis de figures de proportion mesurées sur l'antique.* Paris: Nicolas Langlois, 1684.

SAVOT, Louis. *Nova, seu verius nova-antiqua de causis colorum sententia, Auctore Ludovico Savotio.* Paris: Plantin, 1609.

VAUBAN, Sébastien Le Prestre. *Le Directeur général des fortifications, par Monsieur de Vauban, Ingénieur Général de France.* [La Haye]: Van Bulderen, 1685.

WALLER, Richard. "A Catalogue of Simple and Mixt Colours, with a Specimen of Each Colour Prefixt to Its Proper Name." *Philosophical Transactions* 16.179 (1686): 24-8.

WHITE, John. *A Rich Cabinet, with Variety of Inventions: Unlock'd and Open'd, for the Recreation of Ingenious Spirits at their Vacant Hours.* London: William Whitwood, 1668.

SECONDARY SOURCES

ACKERMAN, James S. "The Conventions and Rhetoric of Architectural Drawings." *Origins, Imitation, Conventions.* Cambridge, Mass.: MIT, 2002. 294-317

ALEYRAC-FIELDING, Vanessa. "'Luscious Colors and Glossy paint': the taste for China and the consumption of color in Eighteenth-century England." *The Materiality of Color: The Production, Circulation, and Application of Dyes and Pigments, 1400-1800.* Ed. Andrea Feeser, Maureen Daly Goggin & Beth Fowkes Tobin. Aldershot: Ashgate, 2012. 81-97.

ALPERS, Svetlana. "The Mapping Impulse in Dutch Art." *The Art of Describing: Dutch Art in the Seventeenth Century.* Chicago: Uof Chicago P, 1983. 119-68.

ANDERSON, Carolyn J. "Military Intelligence: the Board of Ordnance Maps and Plans of Scotland, 1689-c.1760." *Ordnance: War + Architecture & Space.* Ed. edited by Gary A. Boyd & Denis Linehan. London & New York: Routledge, 2016. 157-78.

ANDERSON, Carolyn J. "Military Mapping of Scotland, c.1689-1760." *Imago Mundi* 61.2 (2009): 278-80.

BAUDEZ, Basile. "L'Europe architecturale du second XVIIIe siècle: analyse des dessins." *Livraisons de l'histoire de l'architecture* 30 (2015): 43-58.

BUISSERET, David. *Monarchs, Ministers and Maps: The Emergence of Cartography as a Tool of Government in Early Modern Europe.* Chicago: U. of Chicago P, 1992.

CASTIGLIONE, Baldassare. *The Book of the Courtier.* Tr. George Bull. London: Penguin, 1976.

COLLINS, Peter, & Kenneth FRAMPTON. *Changing Ideals in Modern Architecture, 1750-1950.* Montreal: McGill-Queens UP, 1998.

DASTON, Lorraine. "The Sciences of the Archive." *Osiris* 27 (2012): 156-87.

DASTON, Lorraine, & Peter GALISON. *Objectivity.* New York: Zone books, 2007.

DIJKSTERHUIS, Eduard J. *The Mechanization of the World Picture: Pythagoras to Newton.* Princeton: Princeton UP, 1986.

EASTAUGH, Nicholas, Valentine WALSH, Tracey CHAPLIN, & Ruth SIDDALL. *Pigment Compendium: A Dictionary and Optical Microscopy of Historical Pigments.* London and New York: Routledge, 2013.

EDNEY, M. H. "British Military Education, Mapmaking, and Military 'Map-Mindedness' in the later Enlightenment." *The Cartographic Journal* 31 (1994):14-20.

EIKEMA HOMMES, Margriet van. *Changing Pictures: Discoloration in 15th-17th-Century Oil Paintings.* London: Archetype, 2004.

FEESER, Andrea, Maureen Daly GOGGIN, & Beth Fowkes TOBIN. "Introduction: The Value of Color." *The Materiality of Color: The Production, Circulation, and Application of Dyes and Pigments, 1400-1800.* Ed. Andrea Feeser, Maureen Daly Goggin & Beth Fowkes Tobin. London and New York: Routledge, 2016. 1-10

FERGUSON, John, & Stephen E. POBER. *Bibliographical Notes on Histories of Inventions & Books of Secrets.* 1895. Vol. 1. New York: Pober Publishing, 1998. 6 vols.

GAGE, John. *Colour and Meaning: Art, Science and Symbolism.* Berkeley and Los Angeles: U. of California P., 1999.

GETTENS, Rutherford J, Robert L. FELLER, & W. T. CHASE. "Vermilion and Cinnabar." *Artists' Pigments: A Handbook of Their History and Characteristics.* Ed. Ashok Roy. Washington: National Gallery of Art, 2012. 159-82.

GODLEWSKA, Anne. "Traditions, Crisis, and New Paradigms in the Rise of the Modern French Discipline of Geography 1760-1850." *Annals of the Association of American Geographers* 79. 2 (1989): 192-213.

GRUBER, Ira D. *Books and the British Army in the Age of the American Revolution.* Chapel Hill: U of North Carolina P, 2014.

GUTHORN, Peter J. *John Hills, Assistant Engineer.* Brielle: Portolan, 1976.

HARLEY, J. B., Barbara B. PETCHENIK, & Lawrence W. TOWNER. *Mapping the American Revolutionary War.* Chicago: U of Chicago P, 1978.

HARLEY, Rosamond D. *Artists' Pigments C.1600-1835: A Study in English Documentary Sources.* London: Archetype, 2001.

HERMENS, Erma. "Technical Art History: A Synergy of Art, Conservation and Science." *Art History and Visual Studies in Europe: Transnational Discourses and National Frameworks.* Ed. Matthew Rampley, *et al.* Leiden and Boston: Brill, 2012. 151-66.

HILAIRE-PÉREZ, Liliane & Catherine VERNA. "Dissemination of Technical Knowledge in the Middle Ages and the Early Modern Era: New Approaches and Methodological Issues." *Technology and Culture* 47. 3 (2006): 536-65.

HODACS, Hannah. "Cheap and Cheerful: Chinese Silks in Scandinavia, 1731-1761." *Eighteenth-Century Studies* 51.1 (2017): 23-44.

HODACS, Hannah. *Silk and Tea in the North: Scandinavian Trade and the Market for Asian Goods in Eighteenth-Century Europe.* London: Springer, 2016.

KIRBY, Jo, Marika SPRING, & Catherine HIGGITT. "The Technology of Eighteenth- and Nineteenth-Century Red Lake Pigments." *National Gallery Technical Bulletin* 28 (2007): 69-95.

KUSUKAWA, Sachiko. "The Uses of Pictures in the Formation of Learned Knowledge: The Cases of Leonhard Fuchs and Andreas Vesalius." *Transmitting Knowledge: Words, Images, and Instruments in Early Modern Europe.* Ed. Sachiko Kusukawa & Ian Maclean. Oxford: Oxford UP, 2006. 73-96.

LOCKE SIEGFRIED, Susan. "The Rhetoric of Military Painting in Postrevolutionary France." *The Art Bulletin* 75. 2 (1993): 235-258.

LOWENGARD, Sarah. *The Creation of Color in Eighteenth-Century Europe. Figs., Tables, Exhibits.* New York: Columbia UP, 2006. [Open access electronic book: http://www.gutenberg-e.org/lowengard/]

LOZIER, Jean-François. "A Nicer Red: The Exchange and Use of Vermilion in Early America." *Eighteenth-Century Studies* 51.1 (2017): 45-61.

LYNN, John A. *Battle: A History of Combat and Culture.* Boulder, Colo.: Westview, 2003.

MARSHALL, Douglas W. *The British Military Engineers, 1741-1783: A Study of Organization, Social Origin, and Cartography.* Ph. D. University of Michigan. Ann Arbor, Mich.: University Microfilms International, 1976.

MASSING, Ann. "Painting Materials and Techniques: Towards a Bibliography of the French Literature Before 1800." *Kunst Und Ihre Erhaltung: Rolf E. Straub Zum 70. Geburtstag.* Worm: Wernersche Verlagsgesellschaft, 1990. 57-96.

MCKITTERICK, David. *Print, Manuscript and the Search for Order, 1450-1830.* Cambridge: CUP. 2006.

MUKERJI, Chandra. "Intelligent Uses of Engineering and the Legitimacy of State Power." *Technology and Culture* 44.4 (2003): 655-76.

PADILLA, Carmella, Barbara C. ANDERSON, & Blair CLARK. *A Red Like No Other: How Cochineal Coloured the World: An Epic Story of Art, Culture, Science, and Trade.* New York: Skira Rizzoli, 2015.

PANSINI, Valeria. "Le Cartographe militaire entre guerre et science." *Artistes de la carte: de la Renaissance au XXIᵉ siècle: l'explorateur, le stratège, le géographe.* Ed. Catherine Hofman. Paris: Autrement, 2012. 106-137.

PASTOUREAU, Michel. *Blue: The History of a Color.* 2000. Trans. Marc Cruse. Princeton: Princeton UP, 2001.

PHIPPS, Elena. *Cochineal Red: the Art History of a Color.* New York: The Metropolitan Museum of Art, 2010.

PYNE, William Henry. "The Rise and Progress of Watercolour Painting in England, N° 1." *Somerset House Gazette, and Literary Museum: Or Weekly Miscellany of Fine Arts, Antiquities and Literary Chit-Chat* November 8, 1823: 65-7.

RAUX, Sophie, & Emmanuelle DELAPIERRE. *Quand la gravure fait illusion: Autour de Watteau et Boucher. Le dessin gravé au XVIIIᵉ siècle.* Montreuil: Gourcuff Gradenigo, 2006.

RODARI, Florian. *Anatomie de la couleur: L'invention de l'estampe en couleurs.* Paris & Lausanne: Bibliothèque nationale de France/Musée Olympique Lausanne, 1996.

SCHWEPPE, Helmut & Heinz ROOSEN-RUNGE. "Carmine." *Artists' Pigments: A Handbook of Their History and Characteristics*. Ed. Robert L. Feller, Ashok Roy, & Elisabeth W. Fitzhugh. Washington: National Gallery of Art, 2012. 255-84.

SLOAN, Kim. *A Noble Art: Amateur Artists and Drawing Masters, C.1600-1800.* London: British Museum Press, 2000.

SMITH, Greg. *The Emergence of the Professional Watercolourist: Contentions and Alliances in the Artistic Domain, 1760-1824.* Aldershot: Ashgate, 2002.

STIJNMAN, Ad, & Elizabeth SAVAGE. "'Material Colours': The Heritage of Colour Knowledge in Seventeenth- and Eighteenth-Century Printshops." *Colour Histories: Science, Art, and Technology in the 17th and 18th Centuries*. Ed. Magdalena Bushart & Friedrich Steinle. Berlin: De Gruyter, 2015. 95-113.

STIJNMAN, Ad, & Elizabeth SAVAGE. *Printing Colour 1400-1700: History, Techniques, Functions and Reception*s. Leiden: Brill, 2015.

TRENTMANN, Franck. "Introduction." *The Oxford Handbook of Consumption*. Ed. Frank Trentmann. Oxford: OUP, 2012. 1-19.

VAN DAMME, Ilja. "From a 'Knowledgeable' Salesman Towards a 'Recognizable' Product? Questioning Branding Strategies before Industrialization (Antwerp, Seventeenth to Nineteenth Centuries)." *Concepts of Value in European Material Culture, 1500-1900*. Ed. Bert De Munck & Dries Lyna. London: Routledge, 2016. 75-101.

VIROL, Michèle. "Savoirs d'ingénieur acquis auprès de Vauban, savoirs prisés par les Anglais?" *Les techniques et la technologie entre la France et la Grande-Bretagne, XVIe- XIXe Siècles.* Ed. Patrice Bret, Irina D. Guzevič, & Liliane Pérez. Paris: Centre de documentation d'histoire des techniques, 2011. 35-45.

WEIBEL, Peter. "Media, Mapping and Painting." *Mapping Spaces: Networks of Knowledge in 17th-Century Landscape Painting*. Ed. Ulrike Gehring & Peter Weibel. Munich: ZKM/Hirmer, 2014. 440-59.

WEST FITZHUGH, Elisabeth. "Red Lead and Minium." *Artists' Pigments: A Handbook of Their History and Characteristics*. Ed. Robert L. Feller, Ashok Roy, & Elisabeth W. Fitzhugh. Washington: National Gallery of Art, 2012. 109-140.

WHITE, Jonathan. "A World of Goods? The Consumption 'Turn' and Eighteenth-Century British History." *Cultural and Social History* 3.1 (2006): 93-104.

NOTES

1. I would like to thank Ellen McCallister Clark, Library Director at the Society of Cincinnati, and Michele Lee Silverman, Research Librarian at the Society of Cincinnati, for their kind assistance in my research, and for calling my attention to the manuscript military manuals in the collection.

2. This artists' manual is not by Jean-Baptiste Corneille, but by Roger de Piles. The publication was published with prints of Jean-Baptiste Corneille and reused prints from Sebastien Leclerc from Charles-Alphonse Du Fresnoy's 1673 *L'art de peinture*. The common error in bibliographies of artists's pigments comes from the misleading advertisement frontispiece for the Corneille prints and a second reused frontispiece extracted from Sebastien Leclerc's earlier venture, that appear in many copies of the *Elements* in lieu seemingly of title page.

3. Original quotation: "Le carmin est un des plus beau rouge pour laver, qu'on sache trouver (...) & c'est du Carmin dont on se servira, de Laque fine a défaut du Carmin [...] un carmin uni très tendre" (Gautier 51-2).

4. See the manuscript *Journal Book at the Royal Society Library*, JBO/8, May 2 1686: 62.

5. See the manuscript *Register Book at the Royal Society Library*, RBO/6/91: 296; and JBO/8, February 17, 1686: 30. My thanks to Louisiane Ferlier, in charge of the *Royal Society Journal Collections: Science in the Making*, for calling my attention to these documents.

6. The National Gallery's 3 volume authoritative edition of *Artists' Pigments: A Handbook of Their History and Characteristics,* 1986-1997, has made it a standard to include the exhaustive lists of these varied names in each pigment article.

7. See Smithsonian copy of Le Blon's *Coloritto, Or, the Harmony of Painting,* s.n, 1720, Call number: 39088003601184.

8. The « Tabula Colorum Physiologica » is a folded leaf of plate mounted at beginning of *Philosophical Transactions* 16.179 (1686).

9. See the end pages of the Folger Library copy of John Gadbury, *Ephēmeris, or, A diary astronomical, astrological, meteorological, for the year of our Lord, 1688*. J.D. for the Company of Stationers, 1688. Call number: Bd.w. A1767.

10. The rest of the 13 manuscript pages deal with arithmetical problems and their solutions.

11. "Les Couleurs à huile ont cela pardessus les autres, que les Teintes s'en peuvent mêler facilement par le manîment du Pinceau [...]. [Il faut] s'accoutumer à peindre et à mêler ses Couleurs avec promptitude et legereté de Pinceau."

12. Ad Stijnman and Elizabeth Upper-Savage's *Printing Colour 1400-1700* project, reassessing colour-prints and the long-alleged early-modern Western chromophobia in learned publication has now extended its scrutiny to Western colour printmaking in the long eighteenth century, 1700-1830 : http://www.printingcolourproject.com/conferences/eighteenth-century-colour-print-cultures/

13. My thanks to Katherine Reinghart, of the Royal Society Making Visible Project, for discussion of Sachiko Kusukawa's article.

14. See the c. 1750 manuscript, compiled as a chrestomathy of military manuals, *Porte-feuille militaire : contenant les parties les plus nécéssaires à un officier d'infanterie*, Society of Cincinnati Library, MSS L2007F122 [Bound]. 268.

15. "Sable," both in French and English, was the name for the colour black in heraldry, coming from the marten's dark brown fur. It is not to be mistaken for the naturalistic indication of "couleur de sable" in Dupain's text: "Les Dunes se font [...] plus ordinairement avec une couleur de sable, qui leur convient beaucoup mieux, parce que ces levées sont de sable [...]. Si on prend le parti de les pointiller, elles paraissent encore plus de resemblance" (112).

16. This had the added practicality of keeping a record of ongoing projects: "Les ouvrages tous lavez de jaune de cette manière marque que l'ouvrage est a faire et ainsi on se souviendra [...] exactement pour ne pecher pas contre l'ordre qu'on garde dans les desseins qu'on envoie en Cour, qui ne sont point commencez." (Dupain de Montesson 51-2)

17. Ad Stijnman and Elisabeth Savage remind us, when discussing J. C. Le Blon's breakthrough in colour printing technology, published later in *Coloritto,* 1725, that colour-knowledge and technical knowledge was shared, "repeatedly and independently re-invented and deeply embedded within the print trade," and that "many techniques of colour printmaking were used across Europe for centuries before the invention of trichromatic (blue-yellow-red) colour printmaking shortly after 1700. These technologies generally developed from much older ones, have to be understood in that context rather than as breakthroughs in isolation from their historical precedents" ("Material Colours" 95, 112).

18. British Library, King's MS 70, 1683-1760. "Additions and amendments to the foregoing instructions."

ABSTRACTS

The use of watercolour red proved especially disconcerting for seventeenth- and eighteenth-century artists: it came in a wide range of costs, and with a dizzying list of names and shades according to the pigments used. On the economic and aesthetic choice the painter made also depended the staying power of the finished product. The cause of significant anxieties, it was nonetheless the reigning colour, not only because of the modern discovery of its primary status, but also because of traditional significance attached to it in the book industry, as well as in conventional architectural and military representations. This paper investigates what red signified, how its elusive powers were slowly tamed by modern standardization, and what its conventional uses meant for the European-wide dissemination of uninventive watercolour practices.

L'utilisation de la couleur rouge en aquarelle s'est révélée particulièrement déconcertante pour les artistes des XVIIᵉ et XVIIIᵉ siècles. L'éventail des prix était large, et longue était la liste des différentes appellations et des nuances respectives de pigments produisant le rouge. Du choix du peintre, qu'il se soit agi d'une stratégie économique ou d'une décision esthétique, dépendait également l'endurance du produit fini. Pourtant, bien que cause d'incertitudes significatives, la couleur rouge n'en était pas moins une couleur de prime importance. Non seulement l'époque moderne scella-t-elle son statut de couleur primaire, mais la couleur rouge avait déjà acquis de longue date une signification prépondérante, au cœur de l'industrie du livre tout d'abord, et dans les représentations architecturales et militaires conventionnelles ensuite. Cet article examine ce que signifiait le rouge dans tous ses pigments, comment la codification à l'époque moderne en apprivoisa l'emploi, et pourquoi les emplois conventionnels du rouge, se diffusant à l'échelle européenne, entravèrent une pratique plus inventive de l'aquarelle.

AUTHOR

BÉNÉDICTE MIYAMOTO

Bénédicte Miyamoto (PhD, Université Paris Diderot) is an Associate Professor in British History at Université Sorbonne Nouvelle – Paris 3. Her research in British Art Market Studies has been published in *Marketing Art in the British Isles, 1700 to the Present*, edited by Gould and Mesplède, Ashgate, 2012; in *Moving Pictures: Intra-European Trade in Images, 16th-18th Centuries*, edited by De Marchi and Raux, Brepols, 2014; and in *London and the Emergence of a European Art Market*, 1780-1820, edited by Huemer and Avery-Quash, Getty, 2019. Her recent research on artists' manuals and draughtsmanship will be published in *Fancy-Fantaisie-Capriccio*, edited by Adrien and Percival, Oxford University Studies in the Enlightenment (forthcoming). Email : benedicte.miyamoto@sorbonne-nouvelle.fr