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BY ANNE MAHEUX

Attention has only recently been paid to the technical analysis of Blake's art materials. William Blake was a wise craftsman, undoubtedly familiar with contemporary accounts of artists' materials and techniques. Formal analysis of Blake's watercolor materials and techniques, however, is almost nonexistent.¹ That Blake employed unconventional materials for watercolor painting is asserted by his biographers. A number of Blake's contemporaries also experimented with the medium, but none pursued his particular methods. The current study provides an overview of the methods and materials employed by Blake, comparing them with traditional methods of early nineteenth-century watercolor painting. Using paintings from the Fogg Art Museum's collection, technical analysis of the pigments included on Blake's palette was undertaken. Selection of the paintings was based on the availability of pigment for sampling, and on providing a cross section of work that represents the majority of the colors used by Blake in both early and late works in the Fogg's collection.

TECHNIQUE AND MATERIALS

Frederick Tatham, one of Blake's earliest biographers, reports that Blake executed his first watercolors in 1777.² At this time in England, the watercolor medium was not credited with the same esteem as oil painting. In view of this, earlier and contemporary watercolorists endeavored to imitate the effect of oil painting to gain a more respectable reputation for the medium.³

Prepared watercolor paints became available as early as 1780, when soluble cakes of machine-ground pigments were marketed by Reeves. Despite their quick acceptance by artists, the dry color cakes were criticized for being hard and gritty,⁴ and washes were difficult to work up without damaging brushes. It was possible to remove color from the cakes by agitating them in a saucer of water, but

this was found to be unsuitable for rich coloring, and only good for executing thin washes.⁵

Traditionally, the finely ground pigments were mixed with water to which a fixative had been added. At least one eighteenth century artist's manual, the *Handmaid to the Arts*, notes the tendency of gum arabic to crack and peel after drying. Another binder, gum senegal, had a tendency to retain moisture, so it was sometimes mixed with gum arabic to attain a binder of desirable consistency.⁶ Similarly, honey or candy sugar was also added to gum arabic to prevent the paint film from cracking.

Blake worked mostly in watercolor, although he experimented with a few other techniques. He dabbled briefly with oils, and rejected them early on in his artistic career. Tatham reported that Blake never got the hang of using oils, complaining that "the colours sunk so much that they ceased to retain the brilliancy and luxury that he intended. No definite line, no positive end to the form could even with the greatest of Ingenuity be obtained, all his lines dwindled and the clearness melted, and from these circumstances it harassed him . . ."⁷ According to Gilchrist, Blake was "vehemently opposed to oils—they did not please him or comport with his style."⁸ Aside from these somewhat emotional outbursts recorded by his biographers, Blake no doubt probably found oils an exceedingly difficult medium to master purely from technical limitations such as handling and drying properties.

With most of his watercolors, Blake started with a preliminary drawing in graphite or pen and ink. This provided the foundation for the finished watercolor. In all of the watercolors examined, the preliminary drawing is still visible to varying degrees.

One of the earliest watercolors by Blake in the Fogg's collection is *Cain Fleeing from the Wrath of God*, c. 1799–1809 (illus. 1). *Cain* is one of the most highly finished works of those studied and analysed. The ap-

plication of watercolor in a broad wash is followed by a series of smaller, delicate brushstrokes in transparent layers, building up landscape and figural elements. The effect is not unlike oil glazing technique, and this is as close to the watercolor conventions of the early nineteenth century as Blake comes. Finally, black pen and ink lines further define elements in the composition (illus. 2). Blake sometimes added preliminary washes of thinned india ink just inside of outlines, and wherever he wanted to add volume or depth to designs by painting watercolor tints over them.

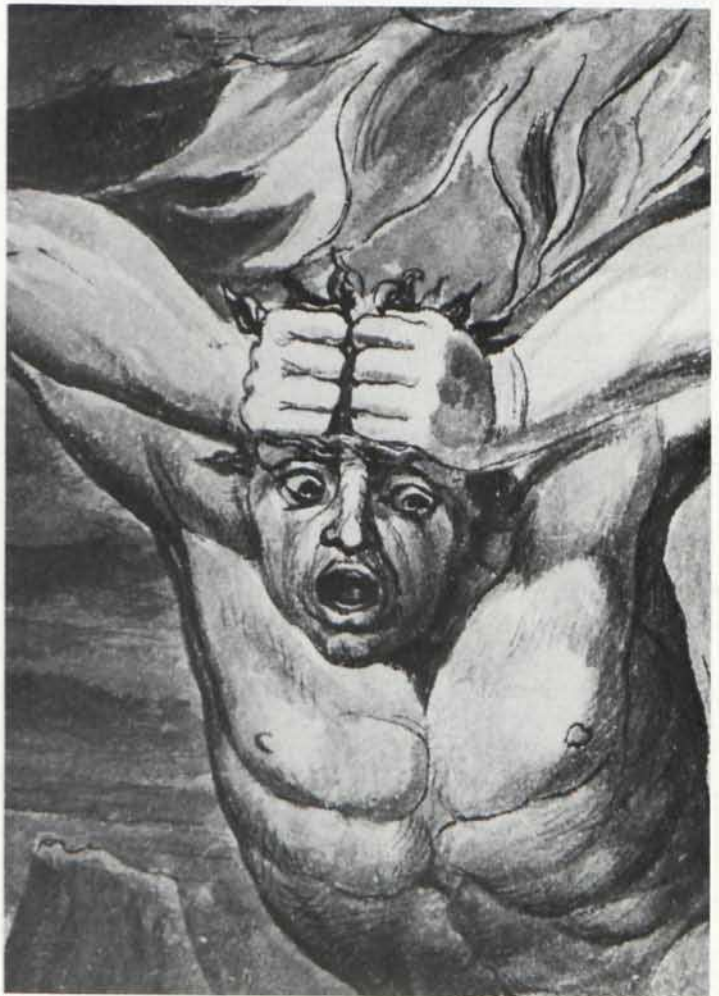
Blake rejected the formal and descriptive formulae of early nineteenth-century painting. "Let a Man who has made a drawing go on & on & he will produce a Picture or Painting, but if he chooses to leave it before he has spoil'd it, he will do a Better Thing."⁹ Accordingly, Blake preferred camel's hair brushes to sable. As Marjorie B. Cohn has pointed out in *Wash and Gouache*,¹⁰ camel¹¹ is a finer hair, softer and less resilient than sable. It is preferred for shading with single strokes. "An even tint is not in nature—it produces heaviness. Nature's shadows are ever varying . . . its spots are its beauties."¹²

The series of watercolor studies for the Book of Job were executed c. 1821. Blake uses the same watercolor technique, and gray washes are applied to a greater extent to fill out the forms before further coloring. There is a greater proportion of broad brushstrokes, with more complicated and brighter coloring. Pen and ink outlines are more spontaneous in this particular group of works (illus. 3).

The latest works considered in this study are the large watercolor illustrations to Dante's *Divine Comedy*. As before, the coloring is added to the graphite drawing and gray washes are sometimes used to build up the forms before color is applied. Instead of small brushstrokes, a broad premier coup wash technique is used to apply color. In some instances, retouchings and highlights were afterwards added in watercolor and in pen and ink (illus. 4).

The Dante watercolors vary considerably in execution. Towards the end of the series, some of the works are little more than preliminary outlines, probably because they were left unfinished at Blake's death. The two paintings sampled from the Dante series, *Donati Transformed into a Serpent* and *Agnello de Brunelleschi Transformed* are typical of Blake's premier coup wash technique, and are markedly different from the earlier more elaborately finished and retouched work.

The series of watercolors for the *Divine Comedy* especially illustrates Blake's lack of concern for exacting



1. William Blake, *Cain Fleeing from the Wrath of God*, c. 1799–1809. Courtesy of the Fogg Art Museum, Harvard University.

2. William Blake, detail from *Cain Fleeing from the Wrath of God*. Courtesy of the Fogg Art Museum, Harvard University.

technique. There is no attempt to execute uniform washes (illus. 5) and this in part stems from the nature of Blake's materials. Blake did not deliberately favor one type of watercolor paper over another; examples in the Fogg's collection are painted on both laid and wove paper. The presence of laid and chain lines showing through broad washes further support Blake's indifference to the desirability of a uniform wash, although there are many examples of these in other works.

Blake is documented as having ground his own colors from powder, rather than using soluble cakes. According to Gilchrist, "Blake ground and mixed his watercolours himself on a piece of statuary marble, after a method of his own, with common carpenter's glue diluted, which he had found out, as the early Italians before him, to be a good binder. Joseph, the sacred carpenter, appeared in a vision and revealed *that* secret to him."¹³ According to another Blake biographer, J.T. Smith, Blake favored carpenter's glue over gum arabic as a binder because of the gum's tendency to crack and become moist in humid weather. As Essick has pointed out, Blake may have chosen to use carpenter's glue as his medium because of his affinity for the work of the Italian masters and his conscientious attempts to return to antique methods. Blake owned a copy of Cennino Cennini's *Trattato della Pittura*, given to him by Linnell in 1822, and he recorded that he was gratified to have been using the same methods and materials as the Italian masters. Cennini does not mention carpenter's glue per se, but he does recommend a "colla di caravella" (glue made from goat-skins) as ideal for both mending wood and tempering colors. It is unlikely that Blake actually used Cennini's formula (especially since it was not familiar to him until rather late in his painting career), so this passage in the treatise would probably have merely reinforced his preference for carpenter's glue over gum.

Blake might also have preferred using dilute animal size instead of gum because size colors, unlike gum water, cannot be redissolved easily nor can corrections be made once they have dried. This permitted Blake to add subsequent layers of size colors, or pen and ink work without smearing the underlying areas.

It is interesting to note that one chemical analysis has been performed to date on the medium in one of Blake's color printed drawings, which are a genre distinct from his watercolors.¹⁴ In this case it was found that Blake employed a vegetable exudate gum rather than a glue made from animal parts. This particular medium turns out to be as insoluble in water as animal glues, and like such glues, it must generally be heated and agitated before it can be used as a binder for watercolors. Unlike gum arabic, it is most receptive to subsequent application of watercolor or pen and ink work without disturbing the lower layers. For Blake, it would seem that the desired physical characteristics of the binding media for ex-

ecuting color prints, and maybe watercolors, were identical: viscosity when warm, permitting easy handling with a brush, the ability to hold pigments in a suspension, and a high level of insolubility. If Blake acquired his vehicle commercially, he may not have known or cared that he was using a gum instead of a glue. If the gum was chosen purposely, it was probably because of its resistance to water, like animal glue.

Unfortunately it was not possible to take enough sample to do a technical analysis of the binding medium of the pigments on the Fogg's Blake watercolors, but by merely looking at the way that Blake applied color in various layers, one can perhaps reason that it would have been a lot more difficult for him to execute these paintings if the colors had been ground with a binder that would have redissolved with subsequent application of color. The patchiness of some of Blake's washes is of a specific character which suggests that the wash liquid became more viscous before drying by evaporation. This is characteristic of a wash that was fully liquid only when warm, and that congealed upon cooling before drying. Lister states that Blake must have allowed the original washes to thoroughly dry before adding more layers of color with a fairly dry brush in order to avoid mixing colors.¹⁵ He cites that Blake may also have added glair or gum arabic to his colors. Blake may have indeed used gum arabic as a binder for his watercolor drawings on



paper, as it is certainly easier than painting with a liquid that must be kept warm for fluidity. What we know about Blake's watercolor binder, as far as his works on paper are concerned, must remain only speculation until a more exacting method of analysis is found.

It is only through Gilchrist that we have a description of the colors that Blake included on his palette: "The colours he used were few and simple: indigo, cobalt, gamboge, vermilion, frankfort black—freely, ultramarine rarely, chrome not at all."¹⁶ The other direct reference to Blake's palette occurs in Redgrave's *Watercolour Painting in England*. He claims that Blake colored his sheets for making prints "roughly with the commonest of pigments, which he most probably prepared himself—Dutch pink, ochre, and Gamboge."¹⁷

METHODS OF ANALYSIS

The methods of analysis chosen to determine the composition of Blake's pigments were limited by the size of the sample that could be safely taken from the watercolor paintings. The amount of pigment laid down in thin watercolor washes is minimal when compared to other painting media and techniques; therefore only analytical methods requiring very small sample size could be employed.

All samples were examined with a polarizing microscope in the Fogg Art Museum analytical laboratory, and

with a scanning electron microscope with an energy dispersive x-ray spectrometer. All the watercolor paintings were examined under ultraviolet light for fluorescence of pigments. Microchemical tests were also employed in a few isolated instances.

Identification of organic pigments presents the most difficult problem, as analytical methods such as gas chromatography and mass spectroscopy, which are typically used for organics, require larger samples than those obtained from the watercolors. These methods were not used.

RESULTS

Analysis of the pigment samples by the methods described above indicated the presence, or in some cases, the absence of certain elements leading to the identification of the pigment. Some samples displayed identifiable characteristics when examined with the microscope, with ultraviolet light, or when tested microchemically.

3. William Blake, detail from *Behold Now Behemoth Which I made with Thee* c. 1821. Courtesy of the Fogg Art Museum, Harvard University.

4. Detail of the lower left corner of *Agnello de Brunelleschi Transformed*, 1824–1827. Courtesy of the Fogg Art Museum, Harvard University.

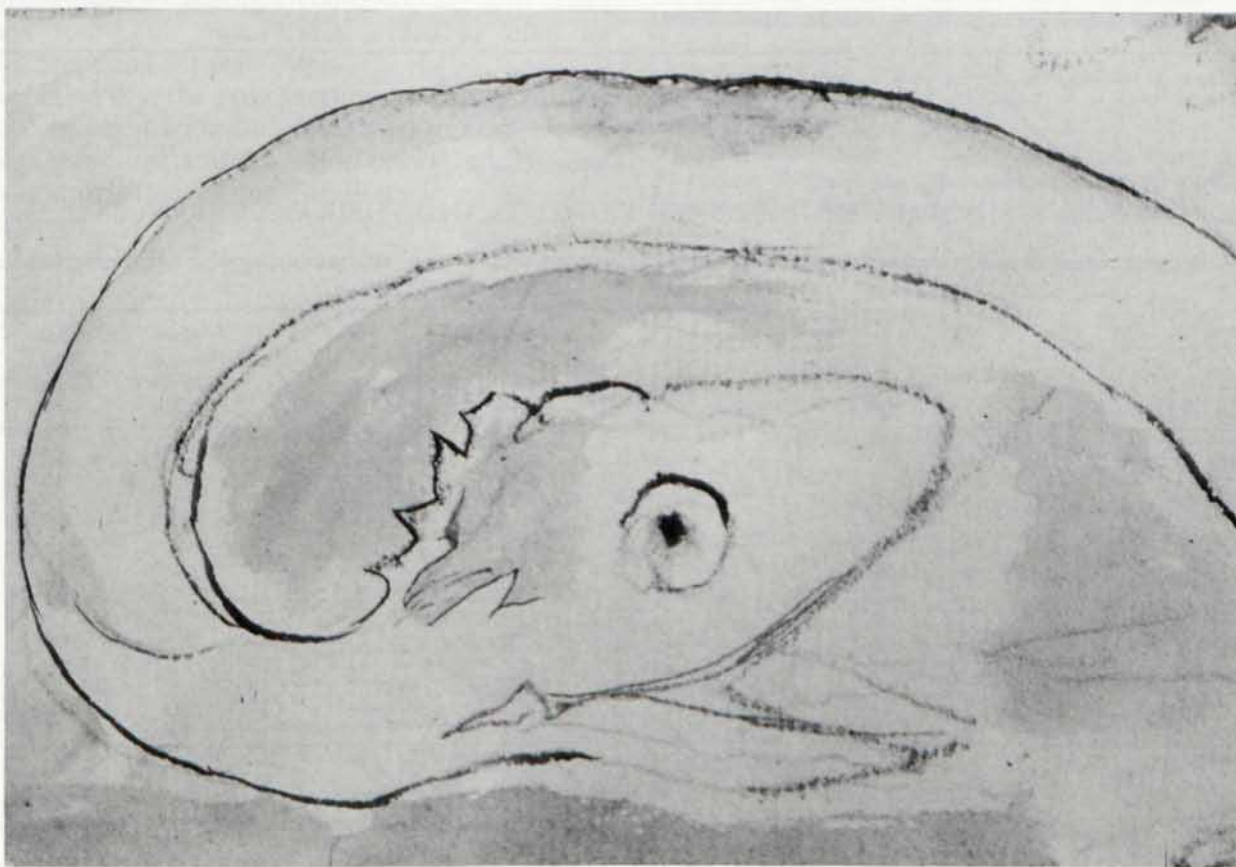




Table 1. SUMMARY OF IDENTIFIED PIGMENTS AND THEIR OCCURRENCES

PAINTINGS	COLORS								
	Prussian Blue	Gamboge	Vermilion	Red Lake	Madder Lake	Red Ochre	Blue Verditer, Organic Yellow	Prussian Blue, Organic Yellow	Charcoal Black
Cain Fleeing (1799-1809)	—	X	X	X	—	—	—	X	X
Babylon (1806)	—	—	X	—	—	X	—	—	—
Job: Judgement (1821)	X	X	X	X	—	—	X	X	X
Job: Behemoth (1821)	X	X	X	X	—	—	—	X	X
Lucia Carrying Dante (1824-27)	X	—	—	X	—	X	—	X	X
Donati (1824-27)	X	X	X	X	X	—	—	—	X
Brunelleschi (1824-27)	X	X	X	X	—	—	—	X	X
Rusticucci (1824-27)	X	X	X	X	—	—	—	X	X

The results of analysis are summarized in Table 1. All pigments that were identified are listed, along with their occurrences in each of the watercolor paintings sampled.

CONCLUSION

The following pigments were identified on the Blake watercolors sampled: Prussian blue, gamboge, vermilion, madder lake, unidentified red lakes, red ochre, blue verditer, and charcoal black. It is virtually impossible to reach any firm conclusions regarding the colors that Blake included on his watercolor palette, based on the modest number of works sampled in this study. The inability to take sufficiently large samples to carry out more thorough analysis poses the biggest handicap. Comparison to contemporary references to Blake's palette is fair; Blake may well have used all the colors mentioned by Gilchrist, but not all of them happen to be represented in the works analysed. Given the large variety of red lakes that were used in the manufacture of pigments in Blake's time, it is encouraging to have been able to identify madder lake more or less specifically. This is due to the particular color that madder lake fluoresces, which was observed in *Donati Transformed into a Serpent*.

The only exception to the general assortment of pigments in use in the early nineteenth century that was identified by analysis is blue verditer. Its use during Blake's time is not entirely improbable. It was not typically used by colormen of the nineteenth century, but Blake may have found his own supply which he used for manually preparing his own colors.

It is hoped that the present study marks a beginning to the task of identifying the colors used in both Blake's watercolor paintings and his color prints, and further research is anticipated in this direction.

I would like to thank the following people at the Center for Conservation and Technical Studies, Fogg Art Museum, for their help with this research project: Marjorie B. Cohn, for suggesting the project; Eugene Farrell and Richard Newman for their aid with technical analysis and editing.

¹ A technical analysis of Blake's art is included in *William Blake, Printmaker* by Robert Essick (Princeton: Princeton University Press, 1980) which deals specifically with Blake's printmaking materials.

Mr. Bo Ossian Lindberg has done some work on Blake's materials: "Chariots of Genius: Blake's Binders and Pigments," paper delivered at the Blake Symposium in Toronto, January 1983. In his review of Jack Lindsay's *William Blake: His Life and Work* (1979) which appears in *Blake/An Illustrated Quarterly*, 14 (1980-81), 164-67, Lindberg discusses some aspects of Blake's materials.

² G.E. Bentley, ed., *Blake Records* (Oxford: Clarendon Press, 1969), p. 514.

³ M.B. Cohn, *Wash and Gouache* (Cambridge: The Center for Conservation and Technical Studies, 1977), p. 11.

⁴ Cohn, p. 54.

⁵ Raymond Lister, *Infernal Methods* (London: G. Bell and Sons, Ltd., 1975), p. 39.

⁶ It should be noted that "gum arabic" has subsequently come to be used as more of a generic term: differentiation between arabic and senegal gums is no longer acknowledged in contemporary artists' materials.

⁷ Bentley, 1969, p. 515.

⁸ Alexander Gilchrist, *The Life of William Blake* (London: MacMillan and Co., 1863), Vol. 1, p. 369.

⁹ Geoffrey Keynes, *The Complete Writings of William Blake* (London: Oxford University Press, 1966), p. 603.

¹⁰ Cohn, 1977, p. 32.

¹¹ Camel hair brushes are actually made from Russian squirrel hairs.

¹² Keynes, p. 603.

¹³ Gilchrist, Vol. 1, pp. 69-70.

¹⁴ Robert N. Essick, *William Blake, Printmaker* (Princeton: Princeton University Press, 1980), pp. 131-32.

¹⁵ Lister, p. 41.

¹⁶ Gilchrist, Vol. 1, p. 69.

¹⁷ Gilbert R. Redgrave, *Watercolour Painting in England* (London: Sampson Low, Marston and Co., Ltd., 1892), p. 51.

5. Detail of upper left corner of *Agnello de Brunelleschi Transformed*, 1824-1827. Courtesy of the Fogg Art Museum, Harvard University.

6. TABLE 1. Summary of identified Pigments and Their Occurrences.