

Knowledge of whelk dyes and pigments in Anglo-Saxon England

C. P. BIGGAM

ABSTRACT

This article aims to evaluate the likelihood that whelk dye was known in Anglo-Saxon England, either in the form of imported cloth and textile products, and/or as an activity carried out in England. The nature of whelk dye and the likely processing options available to early societies are considered in the light of extant records and modern experimentation in Israel and Britain. The currently available 'hard' evidence is then presented from archaeology, manuscript studies, and the chemical analysis of textiles. Finally, the semantic and literary evidence is considered, including three passages from texts by Bede and Aldhelm, and a new interpretation of OE *cornwurma*.

Anglo-Saxon texts in Latin, as well as glosses and glossaries, are peppered with words such as *purpura*, *purpureus*, *murex*, *ostrum* and others, which are usually found to have dictionary definitions involving the word 'purple'. In addition, some of the surviving manuscripts from the period have purple pages, and the 'vast textile wealth' of Anglo-Saxon churches and monasteries¹ is known to have included fabrics called *purpurae*. It has often been assumed, therefore, that religious communities, and the wealthier strata of secular society, would have been familiar with the extremely expensive and prestigious pigment and dye suggested by these words. The purpose of this article is to attempt to assess the likelihood and extent of this presumed familiarity with whelk-derived colouring in Anglo-Saxon England. Two possibilities will be explored: that whelk-dyed fabrics and garments were imported into England from the Mediterranean region, and, secondly, that whelk dyeing was carried out in Britain. The first step is to acquire some background information which will enable such assessments to be made.

WHELKS

Before the invention of the first fully synthetic dye in the mid-nineteenth century, colouring agents were obtained from natural sources such as plants, insects and shellfish. The shellfish involved were, to be more precise, various types of marine gastropods, commonly called whelks.²

¹ C. R. Dodwell, *Anglo-Saxon Art: a New Perspective*, Manchester Stud. in the Hist. of Art 3 (Manchester, 1982), p. 129. Dodwell's chapters on 'Textiles' and 'Costume and Vestments' are highly recommended for this subject.

² There appears to be no consensus over the use of the terms *whelk*, *tingle* and *whelk-tingle* in Present-Day English (PDE). In J. A. Simpson and E. S. C. Weiner, *The Oxford English*

Whelks are carnivorous marine molluscs which prey on other shellfish. They have the ability to bore through the shells of other molluscs with a rasping technique, which eventually enables them to eat the animal inside. A feature of their anatomy is the hypobranchial gland, which secretes a mucus. Malacologists are unsure about the purpose of the mucus. It has been suggested that it is a poison or paralyzing agent which helps to overcome prey, that it sexually attracts other animals of the same species, or that it is used to cement unwanted particles together before excreting them with other waste products.³ Whatever its purpose may be, this unpromising substance contains the chemical precursors of the famous dye and pigment, variously referred to as Tyrian, Imperial, Byzantine or Royal Purple.⁴

It should not be thought that whelk dyeing was an activity restricted to the eastern Mediterranean region. Whelks occur worldwide, and there are several traditions of these animals being used to create a fast purple-coloured dye. Such traditions provide useful comparative evidence, and one example occurs in Central America, where purple-bearing whelks can be found from northwest Mexico to northern Peru. Whelk dyeing in this region was first described in Costa Rica in 1529,⁵ but Thompson refers to the craft as one of ‘considerable

Dictionary, 2nd ed., 20 vols. (Oxford, 1989) (henceforth *OED*), the definition of *whelk* is restricted to the genus *Buccinum*, which includes the ‘common’ or ‘edible’ whelk, but excludes several other species which are often called whelks. The *OED*’s definition of *tingle*, an abbreviation of *whelk-tingle*, is more general: ‘Any of several marine molluscs . . .’, and it includes under this headword a species which it calls the ‘smooth tingle’. This animal is usually referred to as the ‘dog whelk’ by both non-experts and malacologists (mollusc specialists) (see, for example, V. Fretter and A. Graham, *British Prosobranch Molluscs: their Functional Anatomy and Ecology*, Ray Soc. 161 (London, 1994), pp. 717–23, or J. H. Crothers, ‘Dog-whelks: an Introduction to the Biology of *Nucella lapillus* (L.)’, *Field Stud.* 6 (1985), 291–360). The problems of the scientific classification of gastropods are considerable (see Fretter and Graham, *British Prosobranch Molluscs*, pp. 724–39), and there is no list of recommended English names with their scientific taxonomic equivalents, for use in academic discussion of these animals, as there is for the English flora (I would like to thank Daniel Suddaby, Harvey Tyler-Walters and Simon Brockington, all of English Nature, for their efforts to find me such a list). *Whelk* is, therefore, used quite loosely in this paper to indicate any species commonly referred to as *whelks*, *tingles* or *whelk-tingles*.

³ *Ibid.* p. 120, including references.

⁴ The policy in this article is to refer to whelks and their pigments by means of regional descriptors, as geographically specific as the evidence allows, such as ‘Northern whelks’, ‘British whelks’ or ‘Mediterranean whelks’. ‘Tyrian’ has been avoided, as some authors use it to refer to Levantine whelk dyes in general, whereas others use it only for certain types of whelk dye (see the section below on ‘Grades of Purple’).

⁵ L. C. A. Naegel, ‘The Effect of Periodically “Milking” to Obtain Tyrian Purple from *Plicopurpura pansa* (Gould, 1853) on the Frequency of Expulsion and Mortality’, *Jnl of Shellfish Research* 24.1 (2005), 85–90, at 85. This particular species of whelk can be ‘milked’, that is, squeezed until it expels the mucus, but, elsewhere, the whelks are usually killed. I am grateful to Andy Beaumont of the School of Ocean Sciences, University of Wales, Bangor, for kindly sending me a copy of Naegel’s article.

antiquity'.⁶ For Europeans, however, whelk dyes are closely associated with the most prestigious dye of Imperial Rome, produced in the Levant, especially in or near the city of Tyre, in modern Lebanon.

THE DYEING PROCESS

The whelk-dyeing industry of the Levant, after a long and successful history, began to wane in the seventh century, after the Muslim conquest of the area, and it is likely that the remaining whelk-dyers moved into Byzantine territory. Koren regards it as a 'safe conjecture' that whelk dyeing ceased in the Levant in the mid-seventh century.⁷ It is also likely that dye-works, previously established by the Phoenicians around the Mediterranean, began to close, as cheaper substitutes for this dye became more readily available.⁸ In areas ruled by Byzantium, the industry continued until the Turkish conquest of the city in 1453, and Pope Paul II's decree of 1464 that cardinals' robes should, henceforth, be dyed with kermes (an insect dye) rather than whelk dye, is usually considered to indicate a response to the final loss of the industry. In the years that followed, the knowledge of whelk-dyeing processes on an industrial scale was completely lost. In modern times, considerable research has been carried out to elucidate the processes involved in this type of vat dyeing, but, lacking a detailed ancient account, there can be no certainty.

The simplest method of whelk dyeing was never forgotten amongst coastal peoples. It usually involves breaking open the animal's shell to reveal the hypobranchial gland, and then smearing the mucus from the gland directly onto cloth, or fibres for weaving. The mucus is colourless or yellowish, but exposure to air and sunlight over a period of time, which may be less than a minute, causes a chemical reaction which prompts a succession of colour changes usually involving a sequence of yellow, green, blue and, finally, a colour which can range from blue-violet through violet to red-purple.⁹ It was the observation of fishermen and others 'painting' cloth with whelk mucus that provided

⁶ J. Thompson, 'Shellfish Purple: the Use of *Purpura patula pansa* on the Pacific Coast of Mexico', *Dyes in Hist. and Archaeol.* 13 (1995 for 1994), 3–6, at 3. See also G. Sandberg, *The Red Dyes, Cochineal, Madder and Murex Purple: a World Tour of Textile Techniques* (Asheville, NC, 1997), pp. 33–5, for illustrations of this particular dyeing process.

⁷ Z. C. Koren, 'The First Optimal All-murex All-natural Purple Dyeing in the Eastern Mediterranean in a Millennium and a Half', *Dyes in Hist. and Archaeol.* 20 (2005), 136–49, at 138–9.

⁸ R. H. Michel and P. E. McGovern, 'The Chemical Processing of Royal Purple Dye: Ancient Descriptions as Elucidated by Modern Science', *Archaeomaterials* 1 (1987), 135–43, at 137.

⁹ Examples of the colour changes obtained from Mediterranean whelks by Antonio and Giovanni de-Negri in 1875 have been conveniently republished in C. J. Cooksey and R. S. Sinclair, 'Colour Variations in Tyrian Purple Dyeing', *Dyes in Hist. and Archaeol.* 20 (2005), 127–35, at pl. 14.3.

the vital clue in modern times as to the origins of the ancient purple dye. The best-known case is probably that of Henri de Lacaze-Duthiers's observations in Minorca in 1858.¹⁰ Each whelk, however, produces only a very small amount of mucus, so, in Europe at least, this process was little more than entertainment.¹¹ The ancient world, on the other hand, was clearly whelk dyeing on an industrial scale by using a vat process,¹² and this is very difficult to reconstruct.

The best ancient description of vat dyeing with whelk dye occurs in Pliny the Elder's *Historia naturalis*, written in the first century AD.¹³ Pliny tells us that the animals were gathered from their marine habitat, and dealt with separately, according to size. The smaller ones were entirely crushed, while, in the case of larger whelks, the shells were broken open, and the hypobranchial glands removed. Salt was added to the resulting mass, and it was steeped for three days. Water was then added, and the mass was heated in a vessel of lead or tin for about nine days, kept at a uniform temperature.¹⁴ After this, the remaining fleshy parts of the whelks could be removed, and a fleece was then dipped into the vat to test for colour. This account has long irritated dye experts, since it clearly leaves a lot unexplained.¹⁵

Producing a vat dye from whelk glands is fraught with problems. The basic difficulty is that, on exposure to air and sunlight, the whelk mucus turns into a purple pigment which is not soluble in water. By definition, this means that it cannot be a dye, that is, a liquid which saturates cloth or unwoven fibres, enabling the colour to bond with the fibres on all sides.¹⁶ Evidently, however, there are chemical processes which can produce a dye from the pigment, and modern research has been concerned with establishing the chemistry of the

¹⁰ W. Born, 'Purpura Shell-fish', *Ciba Rev.* 4 (1937), 106–10.

¹¹ Friedländer experimentally processed the hypobranchial glands of 12,000 whelks, and obtained only 1.4 grams of pigment (see P. Friedländer, 'Über den Farbstoff des antiken Purpurs aus murex brandaris', *Berichte der Deutschen Chemischen Gesellschaft* 42 (1909), 765–70).

¹² Millions of whelks would have been required for the Phoenician dye-works: 'There are still mile-long stretches of beach around the cities of Tyre and Sidon in Lebanon that are covered several yards thick by layers of smashed shells . . .' (Sandberg, *Red Dyes*, p. 20).

¹³ Pliny, *Historia naturalis* IX.lx.125–IX.lxii.135 (H. Rackham, *Pliny: Natural History . . . libri VIII–XI*, Loeb Classical Lib. 353, 2nd ed. (Cambridge, MA, 1983)).

¹⁴ Michel and McGovern suggest that a tin or tin-lined vessel is more likely for a vat-dyeing process (R. H. Michel and P. E. McGovern, 'The Chemical Processing of Royal Purple Dye: Ancient Descriptions as Elucidated by Modern Science, Part II', *Archaeomaterials* 4 (1990), 97–104, at 102). The problem is Pliny's use of *plumbum* without qualification: *plumbum album* is lead, whereas *plumbum nigrum* is tin.

¹⁵ Edmonds writes 'Pliny's explanation is half right but incomplete and totally inadequate' (J. Edmonds, *The Mystery of Imperial Purple Dye*, *Historic Dyes* ser. 7 (Little Chalfont, Buckinghamshire, 2000), pp. 17–18. Cover title: *Tyrian or Imperial Purple Dye*).

¹⁶ *Ibid.* p. 10.

pigment, and deciding how, without such chemical knowledge, the dyeing process could have been carried out in the past.¹⁷

This is not the place to present the various suggestions as to how the pigment from whelks could have been persuaded to produce a dye, but one possibility is presented here. John Edmonds's suggestion is important for two reasons: firstly, because he carried out practical experiments, and, secondly, because his method involves the minimum of effort and expense. Edmonds found that the pigment could be redissolved in a mixture of alkaline water and molluscal soft tissue, after having been kept for some days at a suitable temperature in a sealed container. After ten days, the purple pigment changed to a pale green liquid, thus reversing the colour sequence it had passed through when the mucus was first exposed to the air and light. A piece of wool was placed in the vat and left there for several hours. When it was removed and exposed to the air, it turned 'a dark reddish purple'. In other words, the chemical process of the mucus becoming an insoluble purple pigment had been reversed to create a green-liquid dye, and then repeated to create colour-fast dyed purple fibres.¹⁸

Edmonds points out that the ancient dyers could have created alkaline water by adding wood-ash, easily available as a by-product of heating the vat. The required molluscan soft tissue was in the vat from the beginning from the crushing of the smaller whelks, and from the fleshy parts of the larger whelks, still attached to the hypobranchial glands. Edmonds surmises that the steeping in salt, mentioned by Pliny, would have suppressed unwelcome bacterial growth while not hampering the necessary bacterial fermentation.¹⁹ There was, no doubt, a degree of variation in the exact details of the dyeing process, and Vitruvius's mention of honey, apparently as a vat ingredient, may be evidence of this.²⁰

THE SEMANTICS OF PURPLE

Having acquired some background information on the source of the dye and pigment, and the means by which it could be obtained in pre-modern times, it

¹⁷ The chemical composition of the pigment was partly identified only in the early twentieth century, and two further components were identified in 1992. For a useful summary of the chemistry, see C. J. Cooksey, 'Tyrian Purple: 6,6'-dibromoindigo and Related Compounds', *Molecules* 6 (2001), 736–69. For the principal British dye-yielding whelk, see C. Cooksey and R. Withnall, 'Chemical Studies on *Nuccella lapillus*', *Dyes in Hist. and Archaeol.* 16/17 (2001), pp. 91–6. Needless to say, ancient dyers would have relied on their training, experience, and senses of sight and smell to produce the required results.

¹⁸ Edmonds, *Mystery of Imperial Purple Dye*, pp. 26–8 and pl. 2. ¹⁹ *Ibid.* pp. 28–9.

²⁰ Vitruvius, *De architectura* VII.xiii.3 (Vitruvius: *On Architecture, Books VI–X*, ed. and trans. F. Granger, Loeb Classical Lib. 280 (Cambridge, MA and London, 1934)). See also Michel and McGovern, 'Chemical Processing of Royal Purple Dye, Part II', p. 100, for a possible explanation of the use of honey.

is now essential to establish an appropriate terminology for the colour concepts involved in this study, in an effort to avoid ambiguity. In this paper, PDE *purple*, with no qualification, will be used in its popular sense of ‘a colour intermediate between red and blue’.²¹ Where greater precision is required, a distinction will be made between *red-purple* and *violet*. The former should be understood as indicating a mixture of red and blue in which the red element is perceived to be dominant, and the latter as indicating a mixture in which blue is perceived to be dominant.²²

The study of the colour purple in early sources is difficult, but it is often made worse by the ambiguous use of ModE *purple* in commentaries and reference sources. It is unfortunate that the Modern English noun and adjective have the same form, as this has led to unclear translations and dictionary definitions. Even when the noun is specified, however, there is ample scope for confusion, as it can indicate any of the following: a colour; any dye or pigment producing that colour; a whelk dye or pigment specifically; purple cloth or clothing; any species of mollusc producing, or believed to produce purple dye; a purplish spot or pustule; and a purple flower.²³ Medievalists must also cope with a specific type of cloth called *purpura* in Latin, often referred to as *purple* in Modern English translations, and a garment called *purpure* in Old English, not to mention the complications of the hue range denoted by adjectival forms in these languages. As can now be seen, Clark Hall’s definition of ‘purple, a purple garment’ for OE *purpure*, for example, cries out for further explanation of that first sense.²⁴ Is it the colour, a pigment, a dye, a shellfish, a textile, or, specifically, the exotic Mediterranean whelk dye or pigment?²⁵

Two matters must be considered at this early stage in the paper. First of all, it should not be assumed that any evidence of a purple colour in an early context must be from whelks. In Britain, for example, a purple dye could be obtained from plant sources such as the berries of the elder tree (*Sambucus nigra* L.),²⁶ the

²¹ *The Concise Oxford Dictionary*, ed. J. Pearsall, 10th ed. (Oxford, 1999). Henceforth cited as *COD*.

²² Colours may be expressed in hyphenated form elsewhere in this paper, e.g. *orange-red*. The second element of the compound should be understood as the principal classification, with the first element indicating a tendency or hint. Thus, *orange-red* indicates a red which is extremely close to the boundary with orange, and may, indeed, be denoted by *orange* by some native speakers.

²³ This list is based on that in the *OED*, but omits any use of the noun *purple* which requires the definite article, which must be in the plural, or which occurs in compound words or in slang.

²⁴ J. R. Clark Hall, *A Concise Anglo-Saxon Dictionary*, 4th ed, with a supplement by H. D. Meritt. (Cambridge, 1960).

²⁵ The original sources are frequently ambiguous, of course, so the use of ModE *purple* in this definition may have been intended to be imprecise, in which case, it is the intention which needs to be clear.

²⁶ S. Grierson, *The Colour Cauldron* (Tibbermore, Perthshire, 1986), p. 106.

roots of alkanet species (*Anchusa* spp.),²⁷ a mushroom (*Paxillus atrotomentosus* (Batsch) Fr.) using an alum mordant,²⁸ berries such as the bilberry (*Vaccinium myrtillus* L.),²⁹ and various lichens.³⁰ In addition, a purple colour could be obtained by using two dyes, such as woad (blue) and madder (red).³¹ Surviving examples of dyes and pigments need to be chemically analysed to identify their sources.

The second problem is linguistic, and concerns the words *purpura* and *pall*, which have often been assumed to involve a purple colour. Latin *purpura* has been discussed by Dodwell.³² He noted that it was said to have a gleaming quality, that it was silk, although it could not be confused with other silks, it was thick, and it was of more than one colour. It was regarded as being both distinctive and expensive. Dodwell concluded that *purpura* must indicate a shot-silk taffeta since this identification satisfies all the above requirements. This textile is made of silk, but with the warp threads in one colour, and the weft threads in another, which, combined with the glossy quality of silk, causes the light to emphasize one colour, while leaving the other as a background colour in the folds and creases. If the textile is moved relative to the light source, as happens, for example, when a person wears a garment made from it, the light catches first one colour and then the other, creating an almost kaleidoscopic effect of colours and gleams of light. The most important aspect of *purpura* for this paper is that it could be of any colour. Dodwell lists the various colours of this textile that he had found in the textual sources, namely, red, white, black and green,³³ these colours referring to the dominant colour of the cloth, that of the weft threads. *Purpura* could also, of course, have been purple. Indeed, a combination of red and blue threads would produce a red-purple or violet effect, depending on whether the weft threads were red or blue. Thus, the textile could be purple without any use of a purple dye. Even where purple-dyed threads were known to be involved, they need not have been whelk-dyed.

²⁷ J. Cannon and M. Cannon, *Dye Plants and Dyeing* (London, 1994), pp. 44–5.

²⁸ G. W. Taylor, 'Reds and Purples: from the Classical World to Pre-Conquest Britain', *Textiles in Northern Archaeology, NESAT III: Textile Symposium in York, 6–9 May 1987*, ed. P. Walton and J. P. Wild, North European Symposium for Archaeol. Textiles Monograph 3 (London, 1990), 37–46, at 40.

²⁹ G. W. Taylor, 'Detection and Identification of Dyes on Anglo-Scandinavian Textiles', *Stud. in Conservation* 28 (1983), 153–60, at 154.

³⁰ Grierson, *Colour Cauldron*, pp. 175–6, 181–2 and 188–9. For a discussion of lichen-dyed purple textiles in general, see P. Walton, *Textiles, Cordage and Raw Fibre from 16–22 Coppergate*, Archaeol. of York 17/5 (London, 1989), pp. 402–3.

³¹ Unlike lichen dye, this last option produces a fast colour, if, for example, a red dye is top-dyed with woad (S. Grierson, 'Traditional Scottish Dyestuffs and their Possible Identification from Archaeological Deposits', *Experimentation and Reconstruction in Environmental Archaeology*, ed. D. E. Robinson, Symposia of the Assoc. for Environmental Archaeol. 9 (Oxford, 1990), 25–32, at 29. ³² Dodwell, *Anglo-Saxon Art*, pp. 145–50. ³³ *Ibid.* p. 146.

Because of the colour ambiguity, in particular, of *purpura* fabric, it cannot be considered, without corroboration, to provide evidence for whelk-dyed textiles.

It has also been decided to exclude OE *pall* and *pallen* from any assessments of colour, in contexts where they occur with no further colour description. Although the older dictionaries are agreed that this noun and adjective refer principally to a type of garment, they also tend to add senses which imply a specific colour, such as 'purple garment, purple'.³⁴ The Old English word derives from the Latin *pallium* which, in the context of early medieval ecclesiastical dress, was white in colour.³⁵ Some of these garments were made of *purpura*, but this has already been shown to occur in various colours. It is clear, therefore, that the use of ModE *purple* in the definition of OE *pall* or *pallen* is unsafe, whether it is intended to refer to the colour of the item, or to indicate that it was made of *purpura*.

EXPERIMENTAL EVIDENCE

It may seem unnecessary to ask what colour is obtained from whelks, but this section considers the results of modern experiments in order to provide an objective basis for the evaluation of historical terms for these colours. It is presumed that the colouring obtained from modern whelks is no different from that obtained from their ancestors, although it is recognized that unknown factors in the processing of the product could have affected the final result. Nonetheless, the photochemical reaction undergone by the whelk mucus has always occurred, and this suggests that such variations may have been slight.

There has been long-term research carried out in Israel on the dyes from Mediterranean whelks, since it is crucial to Jews to know the sources of the three sacramental colours mentioned in biblical passages such as the description of the priestly garb of Aaron's sons.³⁶ The Hebrew words for these colours are *tola'at-shani*, *argaman* and *tekebelet*, and they appear in the Authorized Version of the Bible as *scarlet*, *purple* and *blue*. *Tola'at-shani* was known to refer to a red colour obtained from kermes dye, and the other two colours were known to derive from molluscs. Guided by the evidence of the massive heaps of discarded shells still evident on the Israeli coast, researchers believe that *argaman* was obtained from the spiny dye-murex (*Bolinus brandaris* L.) and the rock-shell (*Stramonita haemastoma* L.),³⁷ and that the resulting fabric colour

³⁴ Clark Hall, *Concise Anglo-Saxon Dictionary*.

³⁵ J. Mayo, *A History of Ecclesiastical Dress* (London, 1984), pp. 23–4.

³⁶ Exod. XXVIII.6.

³⁷ Many shellfish species have alternative scientific names. Variants for dye-yielding shellfish worldwide can be seen in N. Eastaugh, V. Walsh, T. Chaplin and R. Siddall, *The Pigment*

was red-purple.³⁸ The nature and colour of *tekbelet* was more problematic, however.

Ziderman considered several earlier theories as to the source of *tekbelet*, some of which involved the ink of cuttlefish, indigo, and a chemical conversion of the *argaman* dye.³⁹ Suggestions as to the resulting colour had included blue, purple, turquoise, violet and yellow.⁴⁰ Ziderman studied documentary descriptions of the dye and came to the conclusion that they implied a violet colour, but it was not clear how that colour was obtained from shellfish. The archaeological surveys of coastal dye-sites, however, revealed that discarded shells of the spiny dye-murex and the rock-shell had accumulated separately from another species of whelk, the banded dye-murex (*Hexaplex trunculus* L.), and this was taken to represent separate operations for the production of *argaman* and of *tekbelet*.⁴¹ Years of experimental work followed, involving chemical analysis of the banded dye-murex mucus and of archaeological textiles, and the conclusion was that *tekbelet* was, indeed, manufactured from the banded dye-murex, and was violet in colour, although red-purple and blue can also be produced in certain circumstances.⁴² For the purposes of this paper, it is interesting to note that the red colour of *tola'at-shani* was not obtained from whelks, and that the preferred whelk colours of the Levantine dyers were red-purple and violet.

It was mentioned earlier that whelks occur around the world, and this includes north-western Europe, in places such as Britain and Ireland. Concerning British whelk dyes, some of the results of experimental work will now be briefly presented. Grierson, using dog whelks from the west coast of Scotland, obtained a violet colour on cotton.⁴³ In 1995, a group of researchers joined Grierson for further experiments with dog whelks from Arisaig, Highland Region, obtaining a 'deep purple'.⁴⁴ Cooksey and Withnall, using dog whelks from Hastings, Sussex, obtained 'purple' on filter paper,⁴⁵

Compendium: a Dictionary of Historical Pigments (Amsterdam, 2004), p. 373. Errata and updates can be viewed on 'Pigmentum', the website of The Pigmentum Project, at www.pigmentum.org

³⁸ I. I. Ziderman, 'Purple Dyes Made from Shellfish in Antiquity', *Rev. of Progress in Coloration* 16 (1986), 46–52, at 46. ³⁹ *Ibid.* p. 48.

⁴⁰ I. I. Ziderman, 'Purple Dyeing in the Mediterranean World: Characterisation of Biblical *Tekbelet*', *Colour in the Ancient Mediterranean World*, ed. L. Cleland and K. Stears with G. Davies, BAR International Ser. 1267 (Oxford, 2004), pp. 40–5, at 40. ⁴¹ *Ibid.* p. 42.

⁴² Ziderman believes that *tekbelet* was violet (he sometimes expresses the colour as 'violet-blue'), not (pure) blue, as is sometimes claimed (I. I. Ziderman, 'Addenda, 12', *Dyes in Hist. and Archaeol.* 16/17 (2001), xvii).

⁴³ Grierson, *Colour Cauldron*, p. 162. Grierson records the colour as matching 15 C 5/6, in A. Kornerup and J. H. Wanscher, *Methuen Handbook of Colour*, 3rd ed. revised by D. Pavey (London, 1978).

⁴⁴ C. J. Cooksey, 'TLC of the Indigoid Colorants in Shellfish Purple', *Dyes in Hist. and Archaeol.* 14 (1996), 70–7, at 75. ⁴⁵ Cooksey and Withnall, 'Chemical Studies', p. 93.

and Henderson, using dog whelks from western Scotland and from Thanet, Kent obtained 'amethyst' on cloth.⁴⁶ The amethyst gemstone is described in the *COD* as being violet or purple. From this selection of experimental results, it is clear that the colours obtainable from British whelks are no different from those obtained from Mediterranean whelks, and they can be summarized as red-purple and violet. Blue is also possible, but it seems unlikely that results were so much better than those obtainable from the much cheaper woad or indigo.

Finally, and in anticipation of the manuscript evidence discussed below, it is interesting to report recent experimentation with the dyeing and painting of parchment and paper. In 2001, following experiments with fermentation vats and the use of salt to preserve murex glands, Inge Kanold, an artist, began to experiment with producing purple parchment. Initial attempts found the colour did not adhere and the parchment shrank badly, but, after discovering that the vat should be cold, that the parchment should first be soaked in water with a drop of detergent, and that it needed to be stretched on removal from the vat to avoid translucency, Kanold produced highly successful results. She found that wet parchment could be coloured with various tints of purple and blue by immersing it in water, in darkness, together with some whelk glands. Finally, she sieved this liquid, added some talcum powder to act as a binder, and then applied the liquid evenly onto the wet parchment with a large brush. Several layers were applied, each one having dried before the next was applied, and some beautiful violet and purple colours resulted. Kanold writes 'the brush marks were clearly visible, reminiscent of illuminated manuscripts'.⁴⁷

ARCHAEOLOGICAL EVIDENCE

In this and the next two sections, the search begins for 'hard' evidence of whelk dyeing in Britain, either from archaeological excavation, or from the scientific analysis of manuscripts and textiles. There is now plenty of archaeological evidence of the whelk dyeing industry in southern Europe and the Levant, but such evidence for this activity in Britain is more elusive.

Zoology shows that the raw materials for whelk dyeing were, and are, available in Britain. There are two British marine gastropods which are known to yield a dye: the dog whelk (*Nucella lapillus* L.) and the oyster drill (*Ocenebra*

⁴⁶ G. Henderson, 'The Colour Purple: a Late Antique Phenomenon and its Anglo-Saxon Reflexes', *Vision and Image in Early Christian England*, by G. Henderson (Cambridge, 1999), pp. 122–35, at 128.

⁴⁷ I. B. Kanold, 'The Purple Fermentation Vat: Dyeing or Painting Parchment with *Murex trunculus*', *Dyes in Hist. and Archaeol.* 20 (2005), 150–4, at 153. Some of Kanold's results can be seen in pls. 16.1 and 16.2.

erinacea L.). In the literature, it is usually only the dog whelk which is considered as a source for whelk dyeing, and Cooksey is not aware of any chemical analysis of the pigment from the oyster drill.⁴⁸ Dog whelks like rocky shores, where they can find a good supply of their prey, so they are common on the western coasts of Britain and Ireland, but they can also be found all around the British coast.⁴⁹ The best evidence so far for early medieval whelk dyeing comes, however, from Ireland, and this will now be considered, since it provides important comparative evidence, indicating the scale of operations which, given the necessary knowledge, could have been found in contemporary Britain.

At a number of archaeological sites in the Irish counties of Galway, Mayo, Sligo and Donegal, piles of broken-open dog-whelk shells have been found. Wherever radiocarbon dates have been obtained from these sites, they have always indicated the early Christian period.⁵⁰ Of particular interest is a dye workshop excavated by Françoise Henry on the island of Inishkea North, Co. Mayo, and dated by her to, approximately, the late seventh century.⁵¹ This roughly oval structure was probably walled with wattle, standing on a stone base, and had an entrance at one end and an 'annexe' at the other. The annexe was walled with upright stone slabs, and contained a pit which was about one foot in depth, and partly covered by a large flat stone. The part not covered by the flat stone was lined with other, tight-fitting, stones, creating the shape of an inverted cone. Close by was a pile of broken dog-whelk shells, mixed with stones which had been cracked by heat. The latter are pot-boilers, dropped into containers of liquid after having been heated in a fire. Henry writes '... there can be little doubt that this pit was used for the manufacturing of purple dye'.⁵² There was a larger pit outside the workshop, 'extremely well built' with seventeen very close-fitting stone slabs.⁵³ In the middle of the main floor-space of the building was a large, strongly-built hearth. Of great interest is the fact that this workshop appears to be one of several, and Henry describes the site as 'a sort of factory of purple dye'.⁵⁴

⁴⁸ Personal communication, dated 20 June 2005.

⁴⁹ Crothers, 'Dog-whelks', fig. 33 (p. 337).

⁵⁰ E. Murray, 'Marine Molluscan Remains from Rathgurreen Ringfort', *Proc. of the R. Irish Acad.* 102C (2002), 194–7, at 195. Murray's report is Appendix III in M. Comber, 'M. V. Duignan's Excavations at the Ringfort of Rathgurreen, Co. Galway, 1948–9', *Proc. of the R. Irish Acad.* 102C (2002), 137–97. Emily Murray has kindly supplied information on the ongoing research into Irish whelk-dyeing sites.

⁵¹ F. Henry, 'A Wooden Hut on Inishkea North, Co. Mayo (Site 3, House A)', *Jnl of the R. Soc. of Antiquaries of Ireland* 82 (1952), 163–78. ⁵² *Ibid.* p. 167. ⁵³ *Ibid.* p. 168.

⁵⁴ *Ibid.* p. 173. Fiona J. Crone re-assessed the site at Inishkea North for her dissertation in 1987. She writes: 'I do not dispute François[e] Henry's interpretation of the wooden house as a workshop for the fabrication of purple dye from purpura shells, merely describe it as one of

Even though the dog whelk is not the same species as the edible whelk, it has been queried whether the broken shells could represent a food resource, but this seems unlikely at this site. Henry describes the shells at Inishkea North as broken ‘or even nearly crushed’, and regards this as evidence that they were not the remains of meals, since the meat can be picked out of the shell with a pin-like instrument. She points out that this was clearly done in the case of the barnacles, whose shells were found, always unbroken, in the Inishkea middens.⁵⁵ The same could be said for Rathgurreen, Co. Galway, since Murray lists sixteen molluscan species found on the site, but only dog whelks and oyster drills (she calls the latter ‘sting winkles’) had their shells broken open.⁵⁶ Although the possibility should always be borne in mind that dog whelks could represent a food source in times of scarcity, or even bait for fishermen, it seems reasonable to assume that these Irish sites show evidence of whelk dyeing, and that Inishkea North, at least, represents a small vat-dyeing process.

Very recently, evidence for the exploitation of whelks for dye has been found in another close neighbour of Britain, namely, Brittany. At Le Yaudet, an ancient site near Lannion on the north coast, a shell tip has been found which includes a large number of dog whelks, all but the smallest of them broken open. A radiocarbon date of 666 to 775 AD (95 per cent probability, calibrated) has been obtained, and the site was probably an ecclesiastical community at this date. The number of shells found is insufficient to suggest a vat-dyeing process, but is likely to represent the use of whelk dye in manuscript illustration.⁵⁷

Archaeological evidence for whelk dyeing in the island of Britain, however, is sparse. The site of Duckpool, Cornwall has produced evidence from Romano-British contexts, but not from the early medieval period,⁵⁸ and I know of no evidence at present for this period from any other part of Britain.

Hearsay is not evidence, but it may provide some clues to the archaeological potential of this subject. For this reason, I mention various traditions of local whelk dyeing activities. The first known experiments with whelk dye in modern

the industrial pursuits on the island for the writing of manuscripts, or for the dy[e]ing of wool’ (personal communication, 11 November 2005). See F. J. Crone, ‘Inishkea North: an Island Settlement’ (unpubl. BA dissertation, Queen’s Univ. of Belfast, 1987). I am also grateful to Finbar McCormick of the School of Geography, Archaeology and Palaeoecology, Queen’s University Belfast, for discussing Inishkea North with me.

⁵⁵ Henry, ‘Wooden Hut’, p. 163. ⁵⁶ Murray, ‘Marine Molluscan Remains’, p. 195.

⁵⁷ I am most grateful to Greg Campbell for this information, which will be published as G. Campbell, ‘The Marine Invertebrate Remains from Le Yaudet’, *Les Fouilles du Yaudet en Ploulec’h, Côtes-d’Armor*, vol. 3 (forthcoming).

⁵⁸ J. Ratcliffe, ‘Duckpool, Morwenstow: a Romano-British and Early Medieval Industrial Site and Harbour’, *Cornish Archaeol.* 34 (1995), 81–171, at 113–14. This includes a specialist report, ‘Marine Molluscs’, by J. Light, pp. 142–52, who kindly communicated with me on this subject. Thanks are also due to Janet Ridout Sharpe, the editor of the *Archaeomalacology Group Newsletter*, for helping me with information and contacts.

times were those of William Cole of Minehead, Somerset, in the late seventeenth century. He was inspired to carry out these experiments after talking to two ladies who told him that a person in Ireland marked fine linen items for ladies and gentlemen with a substance taken from shellfish.⁵⁹ My second reference is to a reported statement by Joseph C. Walker in 1818 that the production of purple from a species of shellfish 'is still practised in the counties of Wicklow, Wexford and other counties on the eastern parts and also in Wales'.⁶⁰ Cole's story makes it clear that whelk dyeing on a small scale, similar to that found in Central America today, existed in Ireland in the seventeenth century, and it would not be fanciful to suggest that it had been practised there since the early Christian period at least. Walker's witness not only adds to the number of Irish counties where whelk dyeing was probably practised, but also adds to the sparse evidence for the island of Britain, by his mention of Wales.⁶¹

In conclusion, the references to small-scale activities in north-west Europe, and to local traditions worldwide suggest that many individuals throughout the centuries and in various locations practised whelk dyeing for their own amusement, or small commercial benefit. This occupation would leave scant archaeological trace, since the numbers of shells would be few, and they could have been disposed of in the sea after use. Finally, there is a further possibility which would certainly leave no archaeological trace at all, except on textile fragments, and that is the obtaining of a dye from whelk eggs. The eggs certainly produce a colour identical to that obtained from the hypobranchial gland, but they produce even less of the dye than does the gland.⁶²

MANUSCRIPT EVIDENCE

It is already obvious that we are unlikely to discover a large-scale vat-dyeing industry exploiting whelks in Britain or Ireland, but it has been shown above, particularly in the section on experimental evidence, that a minimum of knowledge is required for some processes, and that it is possible to dye or paint

⁵⁹ W. Cole, 'A Letter from W. Cole of Bristol to the Philosophical Society of Oxford Containing his Observations on the Purple Fish', *Philosophical Trans. of the R. Soc. of London* 15.178 (1685), 1278–86. (Reference taken from Grierson, *Colour Cauldron*, p. 228).

⁶⁰ J. C. Walker, 'Materials Used by the Ancient Irish', *Historical Memoirs of the Irish Bards; an Historical Essay on the Dress of the Ancient and Modern Irish; and a Memoir on the Armour and Weapons of the Irish*, by J. C. Walker (Dublin, 1818), pp. 161–6. (Quotation taken from B. Mahon, 'Traditional Dyestuffs in Ireland', *Gold Under the Furze: Studies in Folk Tradition Presented to Caoimhín Ó Danachair*, ed. A. Gailey and Dáithí Ó hÓgáin (Dublin, [c. 1982]), p. 127).

⁶¹ Also of interest, but presently uncorroborated, is Sandberg's assertion that whelk dyeing survived into the nineteenth century in Norway and The Netherlands. See Sandberg, *Red Dyes*, p. 31.

⁶² I am grateful to Su Grierson for information on the dye from whelk eggs, and also for discussing other dye matters with me. She proved the presence of dye in whelk eggs by experimentation after reading of an eighteenth-century account of this phenomenon (Grierson, *Colour Cauldron*, p. 161).

parchment purple with a surprisingly small number of whelk glands. Kanold carried out her successful experiments on dyeing parchment, in glass containers of water of 125 ml capacity, containing only thirty murex glands.⁶³ Such small numbers of whelks may explain the rarity of the archaeological evidence, and also makes mollusc-dyed manuscript illustration a practical prospect. In this context, it should be remembered that there was a monastery on Inishkea North,⁶⁴ and probably also at Le Yaudet.

The obvious next step is to investigate the pigments of surviving manuscripts, concentrating on Anglo-Saxon evidence. There has been little scientific analysis of manuscript pigments in the past, mainly because of the fragile nature of many manuscripts, the need for samples of the pigments for analysis, and the lack of portable equipment.⁶⁵ Recently, however, some portable and non-destructive technologies have become available: Raman spectroscopy, and X-ray fluorescence (XRF). Using the latter, Porter, Chiari and Cavallo analysed several manuscripts in the British Library and the Vatican Library, with the aim of investigating the purple pigments. XRF cannot detect the lighter chemical elements, but whelk dye contains two bromine atoms which have a relatively high atomic number, and are easily detected. Porter, Chiari and Cavallo explain that the presence of bromine is not absolute proof of whelk dye, since bromine contamination can take place, but they regard this as very unlikely for a manuscript, since it implies exposure to sea salt, or specific chemical products which are not normally in contact with treasured manuscripts.⁶⁶ They conclude ‘One can therefore feel confident in identifying the presence of bromine on a purple manuscript as a sure indication of the use of Tyrian purple.’⁶⁷

⁶³ Kanold, ‘Purple Fermentation Vat’, p. 152.

⁶⁴ A monastery which flourished between the sixth and tenth centuries is indicated by the number of cross-slabs on the island, and a grave-marker with a stylized crucifixion scene. See the *Museums of Mayo* website at www.museumsofmayo.com/deirbhile3.htm

⁶⁵ The scientific study of the materials used in manuscript illustration is said to be ‘still in its infancy’ (K. L. Brown and R. J. H. Clark, ‘Analysis of Key Anglo-Saxon Manuscripts (8–11th Centuries) in the British Library: Pigment Identification by Raman Microscopy’, *Jnl of Raman Spectroscopy* 35 (2004), 181–9, at 181). A good summary of the procedures and problems can be found in M. Clarke, ‘The Analysis of Medieval European Manuscripts’, *Reviews in Conservation* 2 (2001), 3–17. I am grateful to Mark Clarke for his help with this section.

⁶⁶ The story of the Lindisfarne Gospels being lost at sea and later recovered is considered by Brown to be a hagiographical device. See M. Brown, *The Lindisfarne Gospels: Society, Spirituality and the Scribe* (London, 2003), pp. 111–12.

⁶⁷ C. A. Porter, G. Chiari and A. Cavallo, ‘The Analysis of Eight Manuscripts and Fragments from the Fifth/Sixth Century to the Twelfth Century, with Particular Reference to the Use of and Identification of “Real Purple” in Manuscripts’, *Art 2002: 7th International Conference on Non-Destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, 2–6 June 2002, Congress Centre Elzenveld, Antwerp, Belgium, Proceedings*, ed. R. Van Grieken, K. Janssens, L. Van’t dack and G. Meersman (Antwerp, 2002), p. 2.

Porter, Chiari and Cavallo explain that purple manuscripts with gold and silver text were produced in Byzantine territory for presentation to members of the imperial family, and these magnificent books were imitated in the west, especially by the Carolingians and Ottonians. Many art historians have suggested or assumed that whelk dye was used for these productions, in both the Byzantine territories and in western Europe.⁶⁸ The three researchers analysed the purple pages or design elements of several early medieval manuscripts produced in both northern and southern Europe.⁶⁹ In spite of the fact that these manuscripts were all clearly luxury products, including a gospel book made for Emperor Henry II of Germany, bromine was found in only one case, about which the researchers say ‘Of all the manuscripts examined, this was the least likely candidate for the use of real purple . . .’⁷⁰

The manuscript in which bromine was traced was the Barberini Gospels (Rome, Vatican City, Biblioteca Apostolica Vaticana, Barberini lat. 570, Mercia or Northumbria?, s. viii² or viii^{ex} or ixⁱⁿ). Unfortunately, it has proved impossible as yet to assign a place of origin to this manuscript: two scribes have been identified as Northumbrian, while one was Mercian, and the art of this book has affinities with both the Southumbrian ‘Tiberius’ Group, and with Northumbrian work. Current opinion lies with either a Mercian centre or York.⁷¹ Porter, Chiari and Cavallo investigated five pages of this gospel book, but found bromine traces in only one place: the background (which they describe as ‘pink-red’) to the laceratine script at the opening of the gospel of St John (125r). This is an exciting but tantalizing discovery, as Cheryl Porter advises caution. She points out that, of all the manuscripts she has analysed, only one page in this one manuscript produced a positive result after a second analysis. Other places in the manuscript produced bromine-positive results at the first analysis, but not the second.⁷²

Further attempts to identify the pigments of purple areas on Anglo-Saxon manuscripts have recently been made. Brown and Clark, using Raman microscopy, investigated the pigments of the Lindisfarne Gospels (London, British Library, Cotton Nero D. iv, Lindisfarne, 710–25).⁷³ They could not obtain spectra from some of the purple and dark red areas (and others), which

⁶⁸ *Ibid.* p. 3, including references. ⁶⁹ *Ibid.* pp. 4–7. ⁷⁰ *Ibid.* p. 7.

⁷¹ J. J. G. Alexander, *Insular Manuscripts 6th to the 9th Century*, A Survey of Manuscripts Illuminated in the British Isles 1 (London, 1978), 61–2; M. P. Brown, ‘Barberini Gospels’, *The Blackwell Encyclopaedia of Anglo-Saxon England*, ed. M. Lapidge, J. Blair, S. Keynes and D. Scragg (Oxford, 1999), p. 53.

⁷² C. Porter, personal communication, 22 June 2005. Porter will publish a paper on this subject in *Dyes in Hist. and Archaeol.* 21 (2006). I would like to thank her for providing valuable information for this section. See also M. Clarke, ‘Anglo-Saxon Manuscript Pigments’, *Stud. in Conservation* 49.4 (2004), 231–44.

⁷³ The revised date for the production of the Lindisfarne Gospels is taken from Brown, *Lindisfarne Gospels*, p. 397.

suggests that organic pigments were used. This could mean plant or animal sources, but the authors believe that plant dyes are more likely.⁷⁴ Brown and Clark also investigated the purple pages of the Royal Bible (London, British Library, Royal 1. E. vi, S England, s. ix¹ or ix^{2/4} or ix^{med}).⁷⁵ The purple pigment, however, turned out to be fluorescent, thus preventing its identification by Raman microscopy. The authors conclude ‘it is likely to be an organic extract, either plant (e.g. folium) or animal (Tyrian purple)’.⁷⁶

TEXTILE EVIDENCE

Another material with the potential to provide hard evidence of the use of whelk dye is, of course, textiles. In recent years, considerable attention has been paid to the textiles and textile fragments surviving from Anglo-Saxon England, and many traces of dye have now been chemically analysed. Much of this work has been carried out by Penelope Rogers and George Taylor of The Anglo-Saxon Laboratory (formerly Textile Research) in York. Unfortunately, no example of whelk dye has yet been found on Anglo-Saxon textiles.⁷⁷

COLOUR SEMANTICS

Before considering the linguistic evidence, it is necessary to present some features of the modern study of colour semantics to enable readers to evaluate the arguments later presented. In colour semantics, it has long been recognized that, although our own use of basic colour words (Modern English examples are *blue, green, red*) seems obvious and beyond discussion, other languages often sub-divide and label the colour space in different ways. In spite of the powerful globalizing influence of major world languages like English and Spanish, there are still languages spoken today which operate systems of colour categorization which are alien to those of most European languages. The English-language division of the colour space into eight chromatic basic categories, each denoted by a single basic term (*red, green, yellow, blue, brown, purple, orange* and *pink*), and three achromatic basic categories, also with a single basic term each (*white, black* and *grey*), is a system which has to be learnt in childhood, is not shared by all modern languages, and was not found in the

⁷⁴ K. L. Brown and R. J. H. Clark, ‘The Lindisfarne Gospels and Two Other 8th Century Anglo-Saxon/Insular Manuscripts: Pigment Identification by Raman Microscopy’, *Jnl of Raman Spectroscopy* 35 (2004), 4–12, at 9.

⁷⁵ Brown and Clark, ‘Analysis of Key Anglo-Saxon Manuscripts’, pp. 183–4.

⁷⁶ *Ibid.* p. 184.

⁷⁷ P. Rogers, personal communication, June 2005. I am most grateful to Penelope Rogers for sending me information which will appear in her forthcoming book *Cloth and Clothing in Early Anglo-Saxon England, A.D. 450–700*, to be published by the Council for British Archaeology in 2006. At the same date, a database of 3,800 textile finds from 162 sites will be published on the Archaeology Data Service website at ads.ahds.ac.uk.

pre-modern stages of languages which conform to it today, including Old English.

Probably the most surprising feature of such languages for speakers of Present Day English, and other languages with similar colour systems, is the use of a single basic colour term for what English speakers would consider to be two or more categories. Thus, a language may have one basic colour term denoting both GREEN and BLUE, because that language considers GREEN + BLUE to constitute a single basic (cognitive) category.⁷⁸ Such a category has been called a macro-category, or a composite category, and its designation, a macro-colour term. It is important to understand that speakers of a language with one or more macro-categories are not insensitive to colour distinctions. Their vocabulary will contain many non-basic colour words (English examples include *burgundy* and *beige*), words denoting pigments and dyes (for example, *ochre* and *madder*), and various descriptive phrases and similes (for example, *the colour of ripe corn* and *poppy-red*) which enable them to refer to any colour they wish. Such vocabulary is not basic, however, and the number of basic colour terms in a language results from the number of significant divisions of the colour space accepted by its speakers.

A basic colour term has been defined in slightly varying ways by different authors,⁷⁹ but certain of the suggested features are widely agreed. One of the crucial tests is that a potential basic term must be a hyperonym, that is, a superordinate term for a category. Thus, the word *crimson* can be defined by Modern English speakers as a type of red, showing that it is a hyponym (subordinate term) of the hyperonym *red*. In contrast with words like *crimson*, *red* cannot be defined as a type of any other colour, for example, *red* is not a type of green. In Modern English, we have the basic colour term *purple*, which denotes a basic colour category conceived of as a mixture of red and blue. All colour categories gradually shade into their neighbours at their boundaries, and, at these areas, the opinions of native speakers, as to which category a particular colour belongs, often differ. A category also has a prototypical or focal area, considered by native speakers to be most typical of that category, and to constitute the core meaning of its basic term. Thus, in Modern English, prototypical PURPLE would not normally be referred to as either *red* or *blue*: it has its own category.

⁷⁸ Words in small capitals indicate a concept, which may be common to the speakers of many languages, e.g. SKY, or may be unique to the speakers of a single language. Because of the differences in conception of basic colour categories between modern and medieval languages, I shall henceforth refer to such categories as follows: Brit. RED (the concept of RED for modern Britons); AS RED (the concept of RED for Anglo-Saxons).

⁷⁹ For example: B. Berlin and P. Kay, *Basic Color Terms: their Universality and Evolution* (Berkeley, 1969), pp. 5–7; T. D. Crawford, 'Defining "Basic Color Term"', *Anthropological Ling.* 24.3 (1982), 338–43.

Speakers of *Old English*, however, had no basic category for PURPLE in their minds, and, therefore, no basic term. When faced with, for example, a red-purple garment, the immediately occurring and obvious (psychologically salient) choice of basic word to convey such a colour would have been OE *read*. This is because the red-purple area, although recognized and admired, was conceived of as a region of the Anglo-Saxon RED category, just as Modern English speakers can recognize and admire an impressive crimson colour, but they still regard it as a type of red.⁸⁰

LITERARY AND LINGUISTIC EVIDENCE

Grades of purple

It is taken for granted in this paper that literate Anglo-Saxons, at least, knew there was a dye used in the Mediterranean region which was extracted from some type or types of shellfish, and which was both extremely expensive and highly regarded in that area. The cases discussed in the following sections are considered to be those which offer some indication, however slim, that Mediterranean whelk-dyed textiles were actually seen in England, and/or that whelk-dyeing was carried out in some part of Britain. The mere occurrence of colour adjectives which can be interpreted as ‘purple’, such as Latin *purpureus* or OE *brunbasu*, has not been taken, without corroboration, to indicate a whelk-dyed referent, since a purple colour can be obtained from other sources.

It is evident from the texts of the ancient world that purple fabric was produced in the Mediterranean region in a variety of grades, ranging from the most expensive commodity known, to a moderately-priced commercial item. The most luxurious and hideously expensive purple fabrics belonged to the two top grades, called ‘Tyrian’ (also known as *blatta* or *oxyblatta*), especially the Tyrian *dibapha* or ‘double-dyed’ fabric, and ‘amethystine’ (*hyacinthina*, *amethystina* or *iantbina*). In the later Roman Empire, these were the fabrics referred to as ‘sacer murex’, ‘the sacred purple (fabric)’, as opposed to the ‘publicus murex’, and stories of enormous prices, imperial restrictions, and severe penalties for infringing them, all refer to these grades of purple. The colour itself was never restricted, only certain grades of dye and fabric.⁸¹

Most purple fabrics and manufactured goods were not dyed with the highest grades of purple. Reinhold explains that there were production centres special-

⁸⁰ There are many languages worldwide which use macro-categories, and examples can be found in Berlin and Kay, *Basic Color Terms*, by retrieving any language classified as Stage VI or lower in the Berlin and Kay system.

⁸¹ M. Reinhold, *History of Purple as a Status Symbol in Antiquity*, Collection Latomus 116 (Brussels, 1970), p. 65.

izing in inexpensive purple-substitutes in the ancient world from the fourth century BC to the end of the Roman Empire and beyond.⁸² They produced cheaper purples by mixing whelk dye with other dyes, such as Mediterranean varieties of lichen purple, and by using non-whelk animal dyes, mineral and plant dyes. It should also be noted that true whelk dyeing could have been done with very few whelks, to reduce costs. Koren's experiments showed that one gram of wool could be dyed with only three whelk glands, although producing a somewhat pale colour without uniformity of coverage.⁸³ These cheaper fabrics were certainly produced in imitation of the esteemed whelk-dyed product, but they can only be termed 'fake' if they were sold as the real thing. No doubt, they sometimes were.

When considering the literary evidence, it should also be borne in mind that, even if whelk-dye is truly present, talk of 'purple garments' may be an exaggeration for what were, in fact, purple-ornamented garments. Either because of the expense, or, in the case of British whelk dyes, the small amount of dye available, the precious commodity may have been restricted to use on various trimmings, edgings, appliqués and embroidery. Such economy was known in the ancient world, since purple stripes are mentioned on Greek garments,⁸⁴ and the Romans applied roundels and strips (*clavi*) of dyed woollen fabric to undyed linen tunics, some of which were purple in colour.⁸⁵ In Anglo-Saxon contexts, it has been noticed that two-thirds of the larger fabrics investigated for dye traces, produced negative results, and were probably never dyed. Those larger pieces in which a dye *was* detected, tended to be blue, green, brown or yellow, and every trace of red and purple dyes was found on small items such as embroidery, narrow woven bands, and accessories such as a bag and a headdress.⁸⁶

Very few whelks would have been required to dye woollen threads for embroidery, or tablet-woven braids.⁸⁷ Small items such as reliquary covers, scarves, head-bands and caps could all have been dyed in small-scale operations, such as may have been available in Britain. In addition, imported items, such as silk ribbons and cords, could have been used to decorate the best

⁸² *Ibid.* p. 53. ⁸³ Koren, 'First Optimal', p. 142. ⁸⁴ Reinhold, *History of Purple*, p. 27.

⁸⁵ J. Bridgeman, 'Purple Dye in Late Antiquity and Byzantium', *The Royal Purple and the Biblical Blue, Argaman and Tekhelet: the Study of Chief Rabbi Dr Isaac Herzog on the Dye Industries in Ancient Israel and Recent Scientific Contributions*, ed. E. Spanier (Jerusalem, 1987), pp. 159–65, at 159. Henderson illustrates a Coptic textile on which an H-shape has been dyed with whelk purple (Henderson, 'Colour Purple', pl. III).

⁸⁶ Rogers, *Cloth and Clothing* (forthcoming). For traces of Anglo-Saxon embroidery, see E. Coatsworth, 'Stitches in Time: Establishing a History of Anglo-Saxon Embroidery', *Med. Clothing and Textiles* 1 (2005), 1–27.

⁸⁷ G. R. Owen-Crocker, *Dress in Anglo-Saxon England*, rev. ed. (Woodbridge and Rochester, NY, 2004), pp. 283–6.

garments of wearers who would have been unable to afford an entirely whelk-dyed garment.⁸⁸ Silk thread for embroidery was also imported.⁸⁹

Bede on British whelks

There is a reference to whelk dyeing in Britain which appears to establish beyond doubt that this craft was being actively pursued in the early medieval period. Bede opens his *Historia ecclesiastica gentis Anglorum* (completed in 731) with a brief description of Britain. After recording various mileages to indicate the size of the island and its distance from its nearest neighbours, he presents a list of Britain's natural resources, which include various varieties of shellfish ('... variorum generibus concyliorum'). The only two types of shellfish he names specifically are not significant to him as sources of food, but for their pearls (mussels) and their dye (whelks).⁹⁰ It should be noted that Bede is not referring to Irish whelk dyeing, since he describes Ireland separately, and, also, he is talking about the island of Britain ('Brittania Oceani insula'), so he is not necessarily referring to an Anglo-Saxon activity.

After mentioning mussels (*musculae*) and the pearls they often contain, Bede lists the colours in which the pearls occur as *rubicundus*, *purpureus*, *iacintinus*, *prasinus* and (most often) *candidus*. Since this sentence is immediately followed by a description of whelk dye, using an unexpected colour adjective, it is important to ascertain whether the colour adjectives used of pearls are appropriate. British pearls are most commonly found in the fresh-water pearl mussel (*Margaritifera margaritifera* L.). Today, the species is endangered, partly because of over-exploitation in the modern period, and their principal remaining stronghold is Scotland. In the early medieval period, however, they could be found throughout western and northern parts of Britain, including Northumbria.⁹¹ In 1908, the colours of British pearls were described as follows:

The British pearls are in great variety of colors . . . Many of these opaque pearls are dark, lusterless brown . . . A large percentage are of a grayish or milky color, or of a

⁸⁸ For silk ribbons, apparently used as decorative edgings on garments, see P. Walton, 'Textile Production at Coppergate, York: Anglo-Saxon or Viking?', *Textiles in Northern Archaeology, NESAT III: Textile Symposium in York, 6–9 May 1987*, ed. P. Walton and J-P. Wild, North European Symposium for Archaeol. Textiles Monograph 3 (London, 1990), 61–72, at 69.

⁸⁹ Owen-Crocker, *Dress*, p. 301.

⁹⁰ *Venerabilis Baedae Historiam ecclesiasticam gentis Anglorum, Historiam abbatum, Epistolam ad Egbertum una cum Historiam abbatum auctore anonymo*, ed. C. Plummer (Oxford, 1896), p. 10.

⁹¹ Information from the website of the Joint Nature Conservation Committee (www.jncc.gov.uk/ProtectedSites/SACselection/SAC_species.asp), '1029 Freshwater Pearl Mussel, *Margaritifera margaritifera*', with a link to 'UK Resource for This Species' showing a distribution map of the animal from 1970 onwards. Although many of these populations are currently extinct, the map shows their presence in north-east England as far south as North Yorkshire well into the twentieth century.

bluish white tinge . . . A few are of a dark, fiery tint and of great luster. Sometimes the pearl is of a beautiful pink tint, sometimes of a light violet, or other exquisite shade . . . The best are those having the sweet, pure white light which constitutes the inimitable loveliness of a pearl . . .⁹²

It can now be seen that Bede's choice of colour adjectives to describe British pearls is very apt. *Rubicundus*, 'red or reddish' can be taken as equivalent to Kunz and Stevenson's 'pink tint'.⁹³ *Iacintinus* (*hyacinthinus*), 'blue' is equivalent to 'a bluish white tinge', and *candidus*, '(pure) white' to 'the sweet, pure white light'. *Prasinus*, 'of a leek-green colour' is not represented in Kunz and Stevenson's descriptions, but pale green pearls certainly occur. Bede's use of *purpureus* is particularly interesting in view of his immediately following description of whelk dye. By a process of elimination, this colour is best understood as being represented by Kunz and Stephenson's 'light violet'. It would appear that Bede mentions only those pearl colours which he admires, and this, apparently, excludes any dark colours. As regards his use of Latin colour vocabulary in this context, it would seem to be accurate and even subtle. This adds to the surprise of readers when his immediately following choice of colour adjective for whelk dye is encountered.

Bede writes of whelks: 'Sunt et cocleae satis superque abundantes, quibus tinctura coccinei coloris conficitur, cuius rubor pulcherrimus nullo umquam solis ardore, nulla valet pluviarum iniuria pallescere; sed quo vetustior, eo solet esse venustior.'⁹⁴ Bede's description of this dye, that neither sun nor rain can fade it, is fully compatible with modern experiments. Grierson tested such claims by marking a handkerchief with Scottish dog-whelk dye, and then putting it through the hot cycle of an automatic washing machine many times, along with modern washing powders. She found that the colour remained unchanged.⁹⁵

⁹² G. F. Kunz and C. H. Stevenson, *The Book of the Pearl: the History, Art, Science and Industry of the Queen of Gems* (London, 1908), p. 167.

⁹³ Definitions of British Medieval Latin words in this paper are taken from R. E. Latham and D. R. Howlett, *Dictionary of Medieval Latin from British Sources* (London, 1975–) (henceforth *DMLBS*) where possible (at the time of writing, the dictionary is published as far as the letter O). Failing this, the definition is from R. E. Latham, *Revised Medieval Latin Word-List from British and Irish Sources* (London, 1965) (henceforth *RMLWL*) where an appropriate entry occurs (the *RMLWL* does not include words which remained unchanged in form or meaning from Classical times: *RMLWL*, p. vii). Failing both these potential sources, the definition is from the *Oxford Latin Dictionary*, ed. P. G. W. Glare (Oxford, 1982) (henceforth *OLD*). The definitions are not necessarily cited in full in this paper.

⁹⁴ 'There is also a great abundance of whelks, from which a scarlet-coloured dye is made, a most beautiful red which neither fades through the heat of the sun nor exposure to the rain; indeed the older it is the more beautiful it becomes' (*Bede's Ecclesiastical History of the English People*, ed. B. Colgrave and R. A. B. Mynors (Oxford, 1991), p. 15).

⁹⁵ Grierson, *Colour Cauldron*, p. 162. Schunck would agree, since he writes that the 'remarkably stable' colour resists the action of soap, alkalis, and most acids, and is destroyed only by nitric

Bede's description of the colour produced by British whelks often causes surprise. He refers to it as *coccinei coloris*, and the colour adjective *coccineus* (*coccinus*) is usually translated as 'scarlet', which is defined in the *OED* as 'a brilliant vivid red colour, inclining to orange'. Since Bede associates *coccum* with the appearance of fire,⁹⁶ and the prototypical colour of flames is orange, while thoroughly burning material like wood is focal red, the *OED*'s definition of *scarlet* can be taken as a reasonable translation of Bede's *coccineus*. It has been shown above, however, that the colours obtained from British whelks usually occur on a range from red-purple to violet, while blue, 'brownish red' and crimson have also been mentioned.⁹⁷ So, taking the experimental evidence, along with observations of whelk dyeing in other parts of the world, it can be said that, at the very least, results producing scarlet are very hard to find.⁹⁸ Because of this, Henderson had a strong suspicion that Bede had not himself seen the results of British whelk dyeing activities, but there may be another explanation.⁹⁹

The adjective *coccineus*, and its noun *coccus*, have a history which is worth tracing in this context. In Ancient Greek, the noun *κόκκος* meant 'a grain, seed', or, specifically, 'the kermesberry, used to dye scarlet'.¹⁰⁰ Kermes dye produced the most vivid red colour known in Europe before the seventeenth century, and, although cheaper than whelk dye, it was, nonetheless, expensive. As can be seen from the definition of the Greek word, it was widely believed that the dye was produced from a berry, although, in fact, the source was various species of scale insect belonging to the Kermesidae. The most impor-

acid and chlorine (E. Schunck, 'Notes on the Purple of the Ancients', *Jnl of the Chemical Soc.* 35 (1879), 589–96, at 590).

⁹⁶ Bede, *De tabernaculo*, III, line 259 (*Beda's Venerabilis opera*, vol. 2a: *De tabernaculo; De templo; In Ezram et Neemiam*, ed. D. Hurst, CCSL 119a (Turnhout, 1967)). '... scarlet, which shines with the appearance of fire' (A. G. Holder, trans., *Bede: On the Tabernacle*, Translated Texts for Historians 18 (Liverpool, 1994), 114).

⁹⁷ Baker describes Mediterranean whelk dyes as ranging from 'brownish red to bluish grey through violet, purple and even deep indigo blue' (J. T. Baker, 'Tyrian Purple: Ancient Dye, a Modern Problem', *Endeavour* 33.118 (1974), 11–17, at 11). Munro's list of colours includes crimson (J. H. Munro, 'The Medieval Scarlet and the Economics of Sartorial Splendour', *Cloth and Clothing in Medieval Europe: Essays in Memory of Professor E. M. Carus-Wilson*, Pasold Stud. in Textile Hist. 2 (London, 1983), 13–70, at 14). *Crimson* is defined in the *COD* as 'a rich deep red colour inclining to purple'.

⁹⁸ Bede may have wondered why only imported, (supposedly) whelk-dyed fabrics were scarlet, but it would be easy to assume a wider range from an exotic whelk. It is not impossible that he saw, in his monastery at Jarrow, locally produced whelk-dyed products, since the north-east coast has, even today when numbers are declining, a plentiful supply of dog whelks. I am grateful to Jane Lancaster, Berwickshire and North Northumberland European Marine Site Implementation Officer, for this information.

⁹⁹ Henderson, 'Colour Purple', pp. 130 and 135.

¹⁰⁰ H. G. Liddell and R. Scott, *An Intermediate Greek–English Lexicon Founded upon the Seventh Edition of Liddell and Scott's Greek–English Lexicon* (Oxford, 1889).

tant was probably *Kermes vermilio* Planchon, which lives parasitically on the kermes oak, a Mediterranean tree. When the Greek word was borrowed into Classical Latin as *coccus* (*coccum*), the specific 'kermes' sense became the primary one, and the word was used to indicate the berry or gall which was believed to be the source of the dye, along with closely related concepts such as the dye itself, the colour scarlet, and wool or cloth of that colour.

In Britain, the source of the dye was even further obscured. Although the *DMLBS* gives the prime sense of British Medieval Latin *coccus* (*coccum*) as 'shrub (kermes) bearing cochineal insects (mistaken for berries)', the only quotation for this sense dates from the fourteenth century. In other words, it cannot be demonstrated from Anglo-Saxon texts that even the erroneous source of the dye was understood, and this is confirmed by the second sense of *coccus* in the *DMLBS*, namely, 'whelk (or red dye derived from it)'. It appears that, in Anglo-Saxon England, the source of *coccus* dye was widely believed to be whelks, although there must have been a few scholars who lit upon the 'true' facts in southern European texts. For those who did not, it is likely that the shared initial syllable of *cochlea*, 'snail, shellfish, whelk' and *coccus* could have misled them into linking the two words, especially since it was evident from biblical and other Latin texts, that *coccus* indicated a very expensive and prestigious dye, just like whelk dye.¹⁰¹

If Bede believed that the *coccus* (kermes scarlet) dye came from whelks, where does that leave the expensive purple dyes? It seems that Bede believed they came from whelks too, since that is the conclusion suggested by his treatise, *De tabernaculo*. In this text, the dye- and fabric-words *coccus*, *purpura* and *hyacinthus* frequently appear together in a contrastive semantic structure. The reason is, of course, that God's instructions to Moses on the making of the Tabernacle listed the materials to be used, and they included cloth of these three colours.¹⁰² Because the colours have symbolic meanings, Bede's understanding of the words in this context is clear to a modern reader. He writes that *hyacinthus* 'resembles the appearance of air and heaven', *purpura* 'displays the colour of blood and is also dyed with the actual . . . blood of shellfish', and *coccus* 'has the appearance of fire'.¹⁰³ In other words, *purpura* is the colour of blood, and this is obtained from whelk dye. Human blood ranges in colour from scarlet to crimson, but, in this contrastive structure with *coccus*, Bede must have envisaged crimson, not scarlet, for the *purpura*-dyed fabric, since it is clear that the three types of hangings for the Tabernacle must differ in colour from each other. As regards Bede's colour terms, this suggests he would have

¹⁰¹ Munro points out that the costly scarlet and purple dyes were closely associated and hardly distinguished elsewhere in medieval Europe and in earlier times as well (Munro, 'Medieval Scarlet', p. 14, including note 4).

¹⁰² The specifications for the materials to be used are extremely precise. See Exod. XXV–XXVI.

¹⁰³ Holder, *Bede: On the Tabernacle*, pp. 49–50.

regarded both *coccineus* and *purpureus* as appropriate for colours derived from whelks.

The above discussion indicates that Bede believed whelks produced colours ranging, at least, from scarlet to crimson. Crimson ('a rich deep red colour inclining to purple') is perceptually very close to red-purple, one of the colours typical of whelk dye, and it should probably not be excluded from this range. Bede would have expected a dye to produce a range of colours, since that is the norm with natural dyes, and Anglo-Saxons would not have expected the colour precision we take for granted today, neither in the production nor the naming of colours. Because it indicated a range, it was possible for a dye-colour term to indicate different colours in different contexts, and this would hardly have been surprising for speakers of a language using macro-categories, such as AS RED. There is, therefore, no contradiction in Bede's use of *coccus* as symbolic of fire (scarlet) in the *De tabernaculo*, and his use of *coccineus* to indicate crimson or red-purple in connection with British whelk dye.¹⁰⁴

It is interesting, and disappointing, that Bede does not appear to connect whelk dyeing with manuscript illustration. Although he does not specify that his subject is a fabric dye, his talk of the coloured object being exposed to the rain surely excludes manuscripts. In his list of Britain's resources, he shows apparent enthusiasm for only four items: mussels with pearls, hot springs, jet and whelks, yet, in spite of this particular interest in 'cocleae', and also in view of the fact that he spent a lifetime in Jarrow monastery, he fails to mention the application of whelk pigment or dye to manuscripts. To conclude, there is no reason to suppose that Bede had not seen whelk-dyed textiles, but he had probably not seen whelk-dyed or painted manuscript pages.

When the *Historia ecclesiastica* was translated into Old English in the late ninth century, some small changes were made. Sadly for the colour semanticist, the colours of British pearls do not feature in the continuous translation; they become merely 'ælces hiwes', 'of every colour'.¹⁰⁵ Bede's description of the dye is translated as follows: 'ȝ her beoð swyþe genihtsume weolocas, of þam bið geweorht se weolocreada tælg, þone ne mæg sunne blæcan ne ne regn wyrðan; ac swa he biþ yldra, swa he fægerra biþ'.¹⁰⁶ Bede's *coccineus* has been translated as *weolocread*, literally 'whelk-red', involving AS RED. This compound term clearly

¹⁰⁴ Bede's description of British whelk dye as having a *rubor pulcherrimus*, 'a most beautiful redness' is not problematic either, since this represents AS RED which includes red-purple. (See *Venerabilis Baedae Historiam ecclesiasticam*, ed. Plummer, p. 10).

¹⁰⁵ Although the pearl colours do not appear in the continuous translation, there are individual glosses to the Latin colour words in other manuscripts.

¹⁰⁶ 'There is also here abundance of molluscs, from which is made the dye of "shell-fish red"; this neither the sun can bleach nor the rain mar, and it grows fairer with age' (*The Old English Version of Bede's Ecclesiastical History of the English People, Part I.1*, ed. T. Miller, EETS os 95 (London, 1890), 27).

shows that the translator believed, as Bede apparently did, that the source of *coccus* was shellfish, and that the colour they produced was correctly denoted by OE *read*. Because *read* is a basic term in Old English, it is a superordinate colour term for the Anglo-Saxon category of RED. This includes prototypical red, of course, but also, red-purple. Whatever shade of AS RED the translator actually envisaged, his choice of word does not exclude a red-purple colour.¹⁰⁷

Experimental work has shown that the colours obtained from British whelk dyes are usually red-purple or violet. It is understandable that red-purple could be accommodated in AS RED, since the red element in this mixed colour is perceived to be dominant. In violet, however, the blue element is dominant, and this is more of a problem. One possibility is that, when red-purple and violet were discussed in the context of whelk dye, but *only* in that context, they were considered to be inseparable and were, in effect, both included in AS RED. It is not necessary, however, to imagine that all Anglo-Saxons would have made the same choice on this matter, as the decisions of modern native speakers at the category boundaries are notoriously contradictory. There is fairly convincing evidence, however, that at least one Anglo-Saxon understood violet to be a characteristic colour of whelk dye, and that, for him or her, it properly belonged to AS BLUE.

In London, British Library, Cotton Tiberius C. ii (S England, probably Canterbury, s.ix^{2/4}), a manuscript of Bede's Latin text of the *Historia ecclesiastica*, certain tenth-century scratched glosses occur in Old English, and the phrase *coccinei coloris* is glossed *hæwmangedes biowes*.¹⁰⁸ I have argued elsewhere that OE *hawe(n)* was the principal word for AS BLUE, and that *hæwmanged* means literally 'blue mixed'.¹⁰⁹ The interpretation of the element *hæw-* as 'blue' is confirmed just two glosses before *hæwmanged*, where, in describing a pearl colour, Latin *hyacinthini* (*hyacinthini*), 'of blue' is glossed with OE *hawes*. Since blue is not perceived as a mixed colour, and since the glossator was aware that the context for the phrase

¹⁰⁷ It is interesting to note that, at one place in the Old English translation of the *Medicina de quadrupedibus*, *weolocread* appears to be an acceptable equivalent of both *coccus* and *purpureus*. The passage in question belongs to the treatise on the mulberry, and involves the making of an amulet from a mulberry berry. The berry has to be picked in the correct way, and a charm has to be recited over it. It is then to be wrapped twice in cloth. The Latin text instructs that it should be first wrapped 'cocco galatico', 'in Galatian kermes-dyed (fabric)', and then to be sewn 'lino purpureo', 'in purple linen'. The Old English translation simply instructs the reader to wrap the berry in 'weolcreadam godwebbe', 'in whelk-red fine cloth', and then to sew it again with a covering 'oþres godwebbes', 'of another fine cloth'. In this passage, *weolocread* has been deemed appropriate for both scarlet and purple or, possibly, crimson. (*The Old English Herbarium and Medicina de quadrupedibus*, ed. H. J. de Vriend, EETS os 286 (London, 1984), 238–9.

¹⁰⁸ H. D. Meritt, *Old English Glosses (a Collection)*, Mod. Lang. Assoc. of Amer. general ser. 16 (New York, 1945), no. 4, line 12.

¹⁰⁹ C. P. Biggam, *Blue in Old English: an Interdisciplinary Semantic Study*, Costerus ns 110 (Amsterdam and Atlanta, 1997), 115–270, especially 205–6.

coccinei coloris was whelk dye, the meaning is taken to be ‘mixed blue’ or ‘mixed with blue’, indicating a mixture of blue and red. The use of *hæwe(n)* as the only hue word in this compound term indicates that BLUE was envisaged by the glossator as the dominant hue in the mixture, and it seems reasonable to conclude, therefore, that s/he believed violet to be the colour most commonly obtained from whelks. It is particularly interesting that this glossator appears to contradict Bede, whose choice of Latin vocabulary suggests he believed a redder colour to be usual for whelk dye. Surely such a contradiction of a respected scholar could only come from the confidence of personal knowledge?

If the interpretation presented here is correct, Bede and his translator would have envisaged scarlet (actually from kermes dye), crimson or red-purple as the colour of whelk dye, and at least one of the glossators of his text envisaged violet. Apart from the scarlet, they were all correct, of course, and this very difference of opinion lends authenticity to Bede’s statement that whelk dye was produced in Britain.

Bede on the accession of Aldfrith

In addition to his prose *Life* of St Cuthbert, Bede also wrote a metrical version which Lapidge dates to within a year or two of 705.¹¹⁰ Bede relates the death in battle of King Ecgfrith of Northumbria in 685, and the return to the kingdom from Ireland of his successor, Aldfrith. Bede’s poetic description of Aldfrith’s accession includes the phrase ‘Tyrio . . . in ostro’, ‘in Tyrian purple’.¹¹¹ If this phrase could be taken literally, the image of a Northumbrian king wearing an imported garment or minor vestment coloured with the dye of Mediterranean whelks would be of the greatest interest, but there is, of course, a strong suspicion that Bede is simply echoing Roman phrases for the accession of an Emperor, such as ‘assuming the purple’. That Bede was aware of this phraseology is clear from examples in the *Historia ecclesiastica*, one of which occurs when he describes the seizure of power in Britain by Carausius in the late third century: ‘purpuram sumsit’, ‘he took the purple’.¹¹²

While accepting that Aldfrith’s ‘taking of the purple’ may simply be an example of poetic phraseology, it is also distinctly possible that, whatever ceremony was involved when Aldfrith became king, it may have included an echo of Imperial Rome and Byzantium. It should be noted that the other occurrence of *Tyrio . . . ostro* in the *Historia ecclesiastica* is where Bede quotes Wilfrid’s epitaph at Ripon, referring to the gold and purple vestments given by him to

¹¹⁰ M. Lapidge, ‘Bede’s Metrical *Vita S. Cuthberti?*, *St Cuthbert, his Cult and his Community to AD 1200*, ed. G. Bonner, D. Rollason and C. Stancliffe (Woodbridge, 1989), p. 78.

¹¹¹ W. Jaager, *Bedas metrische Vita sancti Cuthberti*, Palaestra 198 (Leipzig, 1935), 99.

¹¹² *Venerabilis Baedae Historiam ecclesiasticam*, ed. Plummer, p. 17. Although this section is taken from Orosius, it nonetheless shows Bede’s awareness of the terminology.

the church there.¹¹³ Wilfrid had brought many and various treasures to England from Rome, including ‘indumenta purpureaque et serica’, ‘vestments of purple and silk’.¹¹⁴ The ‘vestments of purple’, if literally, as opposed to poetically ‘Tyrian’, are likely to have been made from one of the medium grades of purple fabric, mentioned above. Since Wilfrid appeared to have plenty of money to spend in southern Europe, this is a reasonable possibility. It is conceivable that he, or someone else who had visited Italy, included in their luggage some secular items intended as gifts for politically important individuals, such as the current Northumbrian king.

The phrase *Tyrio . . . ostro* occurs with another royal connection in Bede’s commentary on the Gospel of Saint Luke. At the birth of Christ, he makes the point that the baby was wrapped in humble swaddling clothes (‘pannis squalentibus’) rather than in Tyrian Purple (as befits a king).¹¹⁵ The prestigious surroundings of Aldfrith’s accession remain in evidence in Old English. In the manuscript Cambridge, Corpus Christi College 183 (S England, 934 × 939), certain words and phrases from Bede’s metrical *Vita S. Cuthberti* comprise a small glossary recorded, on folio 70, between the texts of the prose and verse lives of St Cuthbert. The phrase ‘in ostro tyrio’ is glossed in Old English ‘in tiriscum godwebbe’.¹¹⁶ Owen-Crocker defines *godwebb* as ‘something made of precious cloth, frequently purple, normally of silk; probably shot-silk taffeta’.¹¹⁷

While it is easy to believe that the accession of a new king would be celebrated with the most costly artifacts available, and that the ceremony would contain certain imagery, such as the colour purple, believed to evoke the great past and contemporary empires of the Mediterranean region, nonetheless, the possibility of exaggeration in a poetic context encourages caution with this text.

Aldhelm on inappropriate dress

Aldhelm, who rose to become bishop of Sherborne from 705, had studied in Canterbury, for perhaps as long as ten years, under Archbishop Theodore and Abbot Hadrian, both of whom were natives of the Mediterranean region.¹¹⁸ Aldhelm does not refer directly and specifically to British whelk dye in his

¹¹³ *Venerabilis Baedae Historiam ecclesiasticam*, ed. Plummer, p. 330.

¹¹⁴ B. Colgrave, *The Life of Bishop Wilfrid by Eddius Stephanus* (Cambridge, 1927), pp. 120–1.

¹¹⁵ Bede, *In Lucae evangelium expositio* I.2, line 1284 (*Bedaee Venerabilis opera, pars 2: Opera exegetica, 3: In Lucae evangelium expositio, In Marci evangelium expositio*, ed. D. Hurst, CCSL 120 (Turnhout, 1960)).

¹¹⁶ Meritt, *Old English Glosses*, no. 8, line 14. See also ‘on tyrisicum’ glossing *tyrio* in *ibid.* no. 9, line 40. ¹¹⁷ Owen-Crocker, *Dress*, p. 334.

¹¹⁸ M. Lapidge, ‘Aldhelm’, *The Blackwell Encyclopaedia*, ed. Lapidge *et al.*, pp. 25–7, at 25.

works, but he finds himself in this article because of Old English glosses on his vocabulary.

The Latin word of interest is, again, *coccineus*, and the crucial passage occurs in Aldhelm's prose *De virginitate*, a treatise in praise of virginity written for the abbess and nuns of Barking Abbey. The passage of relevance to this article occurs in a rather lengthy diversion on the luxurious and colourful clothing which could be seen in certain monastic communities. He writes: 'Nam cultus gemini sexus huiuscemodi constat subucula bissina, tonica coccinea sive iacintina, capitium et manicae sericis clavatae; galliculae rubricatis pellibus ambiuntur; antiae frontis et temporum cincinni calamistro crispantur; pulla capitis velamina candidis et coloratis mafortibus cedunt, quae vittarum nexibus assutae talotenus prolixius dependunt'.¹¹⁹ Aldhelm does not state where he has seen these shocking costumes (and he certainly does sound like an eyewitness), but it seems highly likely that it was somewhere, or several places, in England, since he goes on to say that he intends to cease his tirade lest he attract insults.

What precise colours Aldhelm himself had in mind when he chose the words *coccineus* and *hyacinthinus* is not evident from the context, and the two colours are usually translated simply as 'red' and 'blue'. It is likely that Aldhelm is referring to the luxury clothes of the highest ranks of Anglo-Saxon society, since the heads of religious houses were often aristocrats and even royalty. There is ample evidence to be found elsewhere in Aldhelm's diversion on inappropriate dress, for the wealth and social standing of these wayward monks and nuns. In addressing the principle that churchmen and women do not need to adorn their exterior bodies, but rather to beautify their inner selves, he states, 'Therefore, the forbidden finery of a world which is to be destroyed, coloured with precious dyes of purple tincture, cannot be duly and appropriately suited to disciples of the convent, to handmaidens of Christ, to virgins of the Church . . .'¹²⁰ The phrase 'with precious dyes of purple tincture' ('purpureae pretiosis tincturae muricibus'), includes the word *murex*, which, in its dye sense, is defined by the *DMLBS* as 'purple dye obtained from the *murex*', implying a Mediterranean whelk dye.

Aldhelm confirms this impression of high quality when, still involved in his rant against luxurious, and, perhaps, exotic clothes, he makes the argu-

¹¹⁹ *Aldhelmi opera*, ed. R. Ehwald, MGH Auct. antiq. 15 (Berlin, 1919), 318. 'This sort of glamorization for either sex consists in fine linen shirts, in scarlet or blue tunics, in necklines and sleeves embroidered with silk; their shoes are trimmed with red-dyed leather; the hair of their forelocks and the curls at their temples are crimped with a curling-iron; dark-grey veils for the head give way to bright and coloured head-dresses, which are sewn with interlacings of ribbons and hang down as far as the ankles' (M. Lapidge and M. Herren, *Aldhelm: the Prose Works* (Cambridge, 1979), pp. 127–8). ¹²⁰ *Ibid.* p. 124.

ment that God would have provided ready coloured fleeces if he had thought it necessary: ‘And couldn’t God, the founder and creator of all things, dye the shaggy wool of lambs and the wiry fleece of wethers with the red blood of the shell-fish . . . if He had foreseen with his wise prescience that this would be convenient to our use . . . ?’¹²¹ ‘With the red blood of the shell-fish’ (‘*rubro conquillii sanguine*’) again makes it clear that Aldhelm, although borrowing an image from Vergil, is talking about the most expensive dye he can imagine.¹²² These high quality clothes, moreover, have silk-embroidered sleeves, and are worn with shoes trimmed with red leather. Their wearers’ fingernails ‘are sharpened after the manner of falcons or hawks’, which certainly suggests they do no manual work. For all these reasons, the impression gained is that the *coccineus* and *hyacinthinus* garments are envisaged as being of high quality, and dyed with Mediterranean whelk dye. Furthermore, as has been seen in discussion of Bede’s *De tabernaculo* above, the nouns *coccus* and *hyacinthus* were used for the fabrics specified by God for the Tabernacle. If Aldhelm believed, as Bede apparently did, that kermes scarlet originated from Mediterranean whelks, that colour must be added to the presumed range for the *coccineus* garments.

The expensive colours envisaged by Aldhelm for the offending tunics and dresses are probably best interpreted as violet (*hyacinthinus*) and scarlet, crimson or red-purple (*coccineus*). Aldhelm, like Bede, implies a close relationship between the colours *coccineus* and *purpureus*, since the tunics and dresses are, apparently, the same as the garments referred to earlier, in the phrase ‘*purpureae pretiosis tincturae muricibus*’. The association of *purpureus* with the shellfish term *murex* in this phrase, and its apparent equivalence to both *hyacinthinus* and *coccineus*, suggests that *purpureus* could function as a superordinate term for the colours of whelk dyes.¹²³ This must include the colour crimson, since Bede described *purpura* fabric as having the colour of blood, in

¹²¹ *Ibid.* p. 126.

¹²² Latin *ruber*, the basic term for the red category, had, like OE *read*, a broader coverage than Brit. RED, and should not be understood as excluding Brit. PURPLE. This is understood, and one of the senses of *conchylium* (*conquiliium*) in the *DMLBS* is given as ‘purple colour’. *Conquillii* in this particular passage, is also glossed with *fiscdeab* in the manuscript Brussels, Bibliothèque Royale, 1650 (1520) (Abingdon, s. xi in.), which means literally ‘(shell)fish dye’, probably intended as a gloss to the whole phrase ‘the red blood of the shellfish’ (*The Old English Glosses of MS. Brussels, Royal Library, 1650 (Aldhelm’s De laudibus virginis)*, ed. L. Goossens, *Verhandelingen van die Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België, Klasse der Letteren, Jaargang 36, 74.* (Brussels, 1974), p. 471, line 5075).

¹²³ Another passage which suggests the superordinate nature of *purpureus* occurs in Aldhelm’s *De metris et enigmatibus ac pedum regulis*, in which he describes the hangings of the Tabernacle as ‘*purpureis ostris et cocci coloribus fucatae*’, ‘dyed with the *purpureus* colours of *ostrum* and *coccus*’ (*Aldhelmi opera*, ed. Ehwald, p. 64, line 19).

a context which excludes scarlet, and *purpureus* is also one of Aldhelm's favourite words to describe the blood of martyrs.¹²⁴

Aldhelm appears to be describing garments which are entirely whelk dyed. The garment he mentions is the *tonica* (*tunica*), adopted into Old English as *tunece*. Modern English *tunic* is defined as 'a loose sleeveless garment reaching to the thigh or knees' (*COD*), and this seems to be the best term for the male garment denoted by Latin *tunica*, although the Anglo-Saxon 'tunic' often had sleeves.¹²⁵ For the nuns, however, a different definition is required. Owen-Crocker describes the women's *tunece* as being similar to the *cyrtel*, and she identifies the latter with the long dress with sleeves seen in manuscript illustrations, and constituting the standard female garment for both secular and religious women.¹²⁶ Since this is not compatible with the meaning of PDE *tunic*, it is referred to in this paper as 'a dress'.¹²⁷

Although it is clear that Aldhelm is speaking of luxurious clothes, it may be hard to accept the concept of a long dress dyed entirely with whelk dye. If the cloth were from Byzantine territory, would the cost not be astronomical? Furthermore, Aldhelm implies that there are several of them to be seen in English monastic houses. If the dye were from Northern whelks, are we to believe that sufficient quantities were available for such large-scale projects? It is speculation, of course, but I find it more likely that such garments, or the cloth for making them, originated in the Mediterranean area. It has been shown above that whelk-dyed fabric was produced there in several grades, and the grades that were commercially available in the markets of the south were considerably inferior to those worn by the emperors. They were, no doubt, still very costly, but within the reach of those who owned estates and property.

The glossators who worked on Aldhelm's texts certainly believed that the inappropriate garments were whelk dyed, since they glossed Aldhelm's *coccineus* with OE *weolocread* (various spellings), 'whelk red',¹²⁸ which has been discussed in the section above on Bede and British whelks, and should be understood as a colour compatible with AS RED.

¹²⁴ The *DMLBS*, moreover, includes 'deep red' in the definition of one of the senses of *murex*. I take this to indicate a darkened, fully saturated hue, adequately described as 'crimson'.

¹²⁵ Owen-Crocker, *Dress*, pp. 245–51.

¹²⁶ *Ibid.* pp. 214–17. See also G. R. Owen, 'Wynflæd's Wardrobe', *ASE* 8 (1979), 195–222, at 211.

¹²⁷ A frequent definition of both *tunece* (for female dress) and *cyrtel* is 'gown', but the *COD* defines this as for formal occasions only.

¹²⁸ Of course, this decision may have been that of a single glossator, who created a precedent which was then copied. For examples, see *Old English Glosses*, ed. Goosens, p. 479, line 5198 (*weolred*); *Old English Glosses Chiefly Unpublished*, ed. A. S. Napier, *Anecdota Oxoniensia* 4, part 11 (Oxford, 1900), p. 134, line 5319 (*wolcread*).

An interesting gloss to Aldhelm's *murex* (in the phrase 'with precious dyes of purple tincture' discussed above) is *cornwurma*,¹²⁹ defined in the *DOE* as 'scarlet dye'.¹³⁰ The combination of OE *wurma*, 'dye' with *corn* is puzzling. The primary sense of *corn* is 'grain, cereal plants grown as crops', but this is unhelpful in the context of a dye, so the secondary sense of 'seed, berry or fruit of a plant' is considered to be more likely.¹³¹ It is possible that *cornwurma* meant 'berry dye', referring to kermes dye which was (wrongly) believed to be found in certain berries. This seems unlikely, however, at least in those cases in which *cornwurma* translates *murex*, since the latter was known to have been a shellfish dye. It is tentatively suggested here that the glossator knew that purple dye could be obtained from whelk eggs.¹³² If this were the case, *cornwurma* would mean "'seed" dye', referring to the tiny, seed-like eggs.

There is also a single case of *vuormcorn*, with transposed elements, which could mean 'dye "seed"', but may have been intended to be a compound with *wyrm*.¹³³ This word is defined by CH as 'reptile, snake, dragon, worm, insect, mite', and it would probably also have been appropriate to refer to the whelk's body inside its shell. The meaning of *wyrmcorn* would then indicate "'worm" seed', again referring to whelk eggs and, obliquely, to their dye. As *vuormcorn* glosses *vermiculus*, literally 'little worm', but also the name of a dye, the lemma could well have influenced the transposition of the elements. The source of this gloss to *vermiculus* is Isaiah I.18: 'et si fuerint rubra quasi vermiculus velut lana erunt', translated in the Authorized Version as 'though they [your sins] be red like crimson, they shall be as wool'. Ælfric refers to this same text, and chooses OE *weolocread* to describe the colour of the sins, so he, at least, certainly connected this colour with whelks.¹³⁴

¹²⁹ For example: *Old English Glosses*, ed. Goossens, p. 468, line 5023 (*cornwurmu*); *Old English Glosses*, ed. Napier, p. 130, line 5141 (*cornwurmu*). *Cornwurma* only occurs in glosses (*DOE*).

¹³⁰ Definitions of Old English words in this paper are taken from the *Dictionary of Old English A–F* (CD-ROM, Version 1.0), ed. A. Cameron, A. C. Amos and A. diPaolo Healey (Toronto, 2003) (henceforth *DOE*) where possible (publication is currently in progress). Failing this, the definition is from Clark Hall, *Concise Anglo-Saxon Dictionary* (henceforth CH). The definitions are not necessarily cited in full in this paper.

¹³¹ The *DOE* notes that *corn-worm* is recorded in the *OED* where it is defined as 'the larva of the Corn-moth or other insect, destructive to grain'. It seems unlikely there is any connection with the Old English word, since the second element, *-wurma*, seems, quite clearly, to represent this word's usual connection with dyes.

¹³² Grierson, *Colour Cauldron*, p. 161 describes the eggs as 'cream coloured, oval'. The similar appearance to seeds or corn grain is clear. ¹³³ Meritt, *Old English Glosses*, no. 55, line 3.

¹³⁴ 'and gif eowere synna wæron wolcnreade ær ðan hi beoð scinende on snawes hwitnyssæ' (*Ælfric's Catholic Homilies. The Second Series. Text*, ed. M. Godden, EETS ss 5 (London, 1979), p. 184, lines 139–40).

If the above suggestion is acceptable, it has the significant implication that those glossators who did not simply copy *cornwurma* from an earlier gloss, knew of the use of whelk eggs as a dye. This form of dye extraction, requiring no tools or technology, and producing only small quantities of dye, had, most likely, been observed in Britain.

CONCLUSION

This article began with the aim of exploring two questions. The first asked whether whelk-dyed fabrics and garments from the Mediterranean region were imported into England. It is certainly clear from various texts that both valuable and purple-coloured textiles were imported, but were any of them whelk dyed? The opinion is often expressed that the astonishingly high prices of such goods, coupled with the draconian imperial regulations surrounding them, make it unlikely that any reached England. While no hard evidence has emerged from this study to refute that view, I suggest it is untenable in its most comprehensive form. The crux of the matter is that whelk-dyed fabric occurred in several grades, ranging from the highest-quality, double-dyed pure-whelk fabric down to purple-coloured fabrics whose dyes had contained a minimum possible number of whelk glands, either with or without the addition of other dyes. It is, therefore, highly likely that some of the purple-coloured fine textiles brought to England could have legitimately been called whelk dyed, although not of imperial quality.

The second question posed at the beginning of this paper concerned the possibility of whelk dyeing in Britain. Here too, a conclusion has mostly to be based on the balance of probability, since the only hard evidence currently available comes from a single page of a single manuscript. It is the case with this question, as with the first, that a better understanding of the processes involved in whelk dyeing, suggests several alternative scenarios to the one normally contemplated. It is usually considered highly unlikely that whelk dyeing was carried out in early medieval Britain, since no-one has found immense heaps of discarded shells, as can be found on the Levantine coast. Certainly, it is highly unlikely that there was ever a large vat-dyeing industry using whelks in Britain, but it is now evident that humbler forms of dyeing are possible. Perhaps a small vat-dyeing operation such as that at Inishkea North is also unlikely for Britain, since archaeology has not yet found such a site, but that still leaves the possibilities of dyeing thread directly from the whelk, or using small containers of water and whelk glands, as did Kanold, to soak small textile items or parchment, or working with whelk eggs. Minor forms of whelk dyeing, such as these, were practised locally in many places in Europe, according to seventeenth- to nineteenth-century observations, and even vat-dyeing has been evidenced from Ireland and Brittany in the early medieval period. It

begins to look unlikely that Anglo-Saxons would constitute an exception, especially since Bede claims the craft was practised somewhere in Britain, and his colour terminology has been exonerated.

I end on an optimistic note. It should be taken into consideration that the scientific and practical analysis of manuscript pigments is only just beginning, and that the current lack of evidence from textiles could easily reflect the fact that so little survives of the brilliant world of Anglo-Saxon fabrics. If we cast aside a preoccupation with imperial-grade textiles, and think more in terms of a 'cottage industry', there is no reason why that single bromine reading from the Barberini Gospels should not be the first of many indications of whelk exploitation in Anglo-Saxon England.

