ORIGIN AND USE OF THE WORD “SHALE”*

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ABSTRACT. Shale is a word of Teutonic origin that developed its meaning of “laminated clayey rock” in the English mining district of Derbyshire. The first recorded use is in 1747, but clearly the term is much more ancient. By the first few years of the 19th century, it had superseded a number of local names as well as the classically derived schistus, which the early natural philosophers were accustomed to use. By the end of the 19th century, it was nearly the only term applied to clayey rocks of Jurassic age and older in England and to clayey rocks of all ages in the United States, except for the coastal plain strata of Cretaceous and Tertiary age. The word is now looked on with some disfavor because we use it both as the class name for fine-grained rocks and more precisely as the name for laminated clayey rocks. Both of these uses, however, seem permissible and justifiable.

The origin of the word “shale” is lost in the dusty beginnings of the mineral industry in England. Digging into the question exposes some of the roots of geologic terminology at the beginning of the 19th century and reveals layers of usage, recognition of which bears on problems of naming and classifying rocks. This brief review of the origin of the word “shale” and the development of its usage is based chiefly on literature available in the library of the U. S. Geological Survey. More reference material exists but has not been examined. This review, incomplete as it is, may remind us that words are a creation of man which, like children, are likely to turn out differently than expected.

The first explicit statement relating to the origin and geologic use of the word “shale” seems to be that of John Farey in 1811 (Derbyshire rept., v. 1, p. 443, cited by Oxford English Dictionary1):  

It is not uncommon with colliers to call any argillaceous stratum in very thin laminae by the name of shale.

The next explicit statement is that of Lyell (1833, App., p. 80):

SHALE. A provincial term, adopted in geological science, to express an indurated slaty clay. Ezym. German schalen, to peel, to split.

Subsequent compilers of glossaries such as Humble and Page seem to have followed Lyell on origin as well as meaning. Humble (1840, p. 233) gave schale as the source word; he perhaps lost the final n by error because he correctly gives schale as the source for shell. Page (1865, p. 465) refers to schalen. Gresley identifies the British regions that seem to be the sources for many terms used by miners, but he does not suggest either a source or origin for the word “shale” (1883, p. 216). Lyell’s definition of shale and its etymology have been noted in the American literature by Twenhofel (1917, App. I., p. 93).

This etymology, however, is denied by the Oxford English Dictionary, which says:

There is no sufficient reason for the common view that [the noun shale] is [from] the German [noun] schale . . . , which is not used in this sense, (the German equivalent being schieferton ‘slate-clay’): schale however occurs [in German] for a thin layer of ore or stone2 . . .

Arkell and Tomkeieff (1953, p. 105) states only that the word “shale”

* Publication authorized by the Director, U. S. Geological Survey.
2 This perhaps is the source of shell in the “sand and shells” of so many drillers logs.
Probably [is] a derivative of the verb shale, obsolete except in [English] dialect, which means 'shell off,' 'decorticate.'

Under scallett (p. 102), they remark

Presumably the word is a variety of scald, scalcé, meaning scabby, flaky, from the Old Teutonic root *skal*, from which shale and shell were derived.

*Webster’s New International Dictionary*, second edition, gives the etymology as

Middle English *shale, schale, schal* from Anglo-Saxon *scealu, scala*, shell, husk, drinking cup, balance: akin to Old High German *scala* shell, husk, Middle High German *schal*, German *Schale*, Danish and Swedish *skal*, a shell.

The etymologists thus differ among themselves as to details but are agreed that the term has a Teutonic source and seem to imply that the term is an ancient one, perhaps brought into England during the Teutonic invasions, which began in the 5th century.

Lyell’s mistake in deriving shale from the German verb *schalen* is inexplicable. He had visited Europe in 1828 and 1829 and was familiar with much German literature. In his glossary, Lyell refers only half a dozen or so words to German sources, among them blende, feldspar, and gneiss, as well as shale. These words seem to be peculiar choices because most of the early mineralogists were as diligent in citing the synonyms of mineral names (see Kirwan, 1784 or Jameson, 1816) as paleontologists are today. The abundant synonyms of Jameson would have made it clear to Lyell that slate-clay (1816, v. 1. p. 418) or bituminous shale (v. 1. p. 434) were varieties of Schiefer in the German of Werner. Aikin (1815, p. 242) should have been an acceptable source for this information, if Lyell’s vigorous adoption of Hutton’s views made him ignore the works of such ardent supporters of Werner as Kirwan and Jameson.

The linguistic source of the word “shale” may be left to the etymologists. It is now of interest to us only to examine some of the names used for clayey rocks in English before the word “shale” appears in the literature.

The first mention I have found of the rock we call shale is in the logs of holes drilled for coal in Yorkshire in 1639 by Thomas Waike. These logs were communicated to the Royal Society in 1699 by Dr. Martin Lister (1699 [1809], p. 354). The following extract is typical:

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<tr>
<td>A cowshot coloured² stone</td>
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<tr>
<td>Black metal</td>
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<tr>
<td>Cowshot coloured stone</td>
<td>3</td>
<td>9</td>
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<tr>
<td>Coal mixed with metal</td>
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<td>9</td>
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<td>A blue metal</td>
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<td>Coal</td>
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<td>9</td>
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<tr>
<td>Cowshot coloured stone</td>
<td>6</td>
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² From cowshuts, a stock dove, and therefore gray (Arkell and Tonkeieff, 1953, p. 31).

From its position in relation to the coal bed in Mr. Waike’s log, metal clearly refers to shale. Waike also uses the words “rammel” and “slate” in logs of other holes. The *Oxford English Dictionary* cites J. Morton, (1712, Nat. Hist. Northampt., p. 129) as defining rammel [sic] as a “stone unfit for building
because it cleaves or shales into many small uneven pieces.” Arkell and Tomkjeff (1953, p. 110) find the word “slate” is derived from the Old French esclat, a splinter, and that it appeared in literature with the meaning roofing slates in the first half of the 14th century.

Shale associated with coal apparently was sometimes called slate, as it still is. In 1676, Hodgson ([1809], p. 359), in speaking of a fire in a coal mine near Newcastle says, “There is also a sort of mineral called slate, which is partly coal, partly alum-stone, partly marcassite . . .” Colwall says (1678 [1809], p. 458), “Alum is made of a stone . . . of a bluish colour, and [that] will cleave like Cornish-slate.” The rock names used by both Hodgson and Colwall were not the native terminology for rocks and perhaps they were consciously using the terms of the educated. Marcasite, for instance, probably was obtained from Agricola (Bandy and Bandy. 1955, p. 17) or directly from classical sources. Brassil (Hooson. 1747, entry Brassil) was an ancient English name for iron sulfide. The ancient name for Cornish slate was killas (Pryce. 1778, p. 323), and the name still is used (Wells and Kirkaldy. 1951, p. 173).

Clay rocks were mentioned by Lister (1683) in his “ingenious proposal for a new sort of map,” which seems to have been the first suggestion for the making of geologic maps and is a very clear statement of the uses to which they can be put. His proposal is accompanied by a table in which are described different kinds of clays. Under pure clays, “such as [are] soft like butter to the teeth, and [have] little or no grittiness . . .”, he included the “cow-shot” clay, or the “soap scale lying in coal mines” (1683 [1809], p. 85).

In the southwest of England, the word for the rocks directly over coal was clives (singular cliff), Strachey said (1719 [1809], p. 402). “These clives vary much in hardness . . .; so likewise . . . in colour . . .; wherever they are met with. coal is sure to be found under them, though not always worth the digging.” In 1725, Strachey ([1809], p. 119) equates coal-clives [sic] with slate, a term that apparently was acquired during an examination of coal mines in Scotland and Northumberland.

Shale appears as a noun and receives its first definition in what seems to be the earliest English miner's guide. Published in 1747 by William Hooson, who characterizes himself as “a Derbyshire miner,” the book explains “not only the terms used by miners, but also the theory and practice of [the] art of mining, more especially of lead-mines.” The book was written in Hooson’s old age (see epilogue following the entry “Yockings”), and he claimed to have more than 40 years experience in mining. The definition merits full quotation:

SHALE

A tolerably hard and black substance, lying most commonly on some places next to the Lime-Rock, most of it will cut pritty well, rising in thin Pieces; the Joynts in it are of a red colour, or gankey, when it is sunk some space into it is mixt with bands, and when it is drawn up to the Day; it melts and crumbles into small, and into much lesser Pieces: * it is subject to Water, Veins will sometimes put up into it, and bear Ore, otherwise it seldom fails in any considerable Vein, but there will breath up a Spar leading in the form of a Ribb, and probably Smuts of Ore in it; this Shale seldom requires any Timber to support it, it is very strong and Sulphorous Work, and apt to breed the Ground-Damp, without a good Wind to throw it out.

* As the Shale lies on a Level or Diping, so may be expected the Lime Rock to lie, that lies under it.
With respect to the origin of the word, this definition is like an iceberg: the most important part is out of sight. Hooson used the word in several other places in his book (see entry under Lidds, for instance), and it always is used as a common term and one that had long been known, needing no other explanation. Mawe (1802) did not include the word in his glossary of Derbyshire mining terms, but he used shale in the text, mostly apologetically. I infer, and usually as a synonym for schistus, a word that he clearly preferred even though shale might be first on his tongue (p. 12). Mawe also pointed out that the Derbyshire mining district had been active since the time of the Romans (p. 6). The antiquity of workings in the district is emphasized by the Hoovers (1950, footnote, p. 85), who pointed out that the first records of the district begin in 1288. They also found the mining customs of Derbyshire to be distinctly different from other mining districts in England and to be of undoubted Saxon origin. They believed that the ratification of these customs by the Normans caused the survival of one of the few Saxon institutions in England. Mawe’s references to Saxon and German miners (p. A2, 46, and 109) seem to apply to the miners imported to England in the 16th and 17th centuries. A readily apparent Saxon survival is Hooson’s use of the word “groove” for mine. By Mawe’s time, grove had become grove (1802, p. 205). This is remarkably similar to the modern German Grube, which has the same meaning. Thomson (1814, p. 418) found groove used for mine in northern England and commented on its similarity to the Swedish word grufve, which he said “has the same meaning and... sound.”

A tantalizing hint as to the possible antiquity of the word “shale” is contained in the rhymed account of “King Coal’s Levee”, the second edition of which was published in 1819. The title page reads, “King Coal’s Levee, or Geological Etiquette, with explanatory notes. To which is added The Council of the Metals, by John Scafe, Esq.” The following leaf reads “To the Geological Society of London this Humble Attempt to render more popular a science of which daily experience proves the increasing utility.” The author acknowledges his indebtedness to Conybeare and to Buckland for technical assistance. John Scafe is not listed (Woodward, 1908, p. 268-285) as a member of the Geological Society, and I am not certain that he is the author of more than “The Council of Metals,” which seems to be an addition made for the second edition. The verses describe a reception held by King Coal and Queen Pyrites. After the geologic formations of England are presented in stratigraphic order, beginning with Duke Granite and ending with Jack Clay and the retinue of Baron Basalt. Shale appears (p. 32):

But from that group step forward shiv’ring Shale,
And grace’d his bow with compliments quite stale;
Such as, mid hoops and ruffs, by every beau
Were drawled around, two centuries ago.
“Where has he liv’d?” Pyrites cried:—“Unique.”
“Oh! quite a gem!—decidedly antique!”
“An old acquaintance,” straight the King replied,
And bade old Shale stand snugly by his side.

These lines suggest that their author believed the term “shale” to have become current in the early 1600s.

Shale, although of Teutonic origin, seems to have come from the early
Saxon invasions rather than being imported with Saxon miners. The earliest recorded entry of German miners into England is mentioned by the Hoovers (1950, footnote, p. 283) as having taken place in 1561 during the reign of Queen Elizabeth. Taylor (1799, p. 361) states that the technique of blasting was brought into English mining by Germans in about 1670. By at least 1556, Agricola was describing the Mansfield copper slates as *Lapis aerosus fissilis*, which he translated into German as *schifer* [sic] (Hoover and Hoover, 1950, footnote, p. 127). It would seem that these miners would have brought with them the term “Schiefer” or cognates of it, rather than shale. Shale would have acquired its present meaning on English soil.

For reasons that are not evident, the word “shale” became the most widely accepted name for laminated clayey rocks. In arriving at this position, shale superseded a number of names, probably local both in origin and usage, that stemmed from the jargon of miners. Some of these names are listed below. A few names not strictly applicable to laminated clayey rocks are included simply because they are interesting.

Basses—Slaty clay with a bluish-black color and usually containing pyrite. May be coaly and grade into slaty coal or combined with petroleum and grade into cannel coal (Aikin, 1811, p. 197). Strachey (1719 [1809], p. 401) mentions the verb “to basset” for “to crop out” as having come from the north of England. This may be related to the fact that the hard shale above or below a coal bed is what is most often seen on outcrop, the softer coal being weathered back and covered.

Bat—Coal strata “have between them a bat, or bed, of a peculiar sort of matter, about the thickness of a crown piece.” Below the coal strata are “different metalline strata; as a black substance called the Dun-row hat.” The bats seem to take their names from the overlying coal beds (Chambers, 1751, article Coal). Shale is not mentioned.

Binder—A miner’s term from the Pembrokeshire coal field translated by De La Beche simply as shale (1823, p. 19).

Binds—“Beds of Stone that always lie mixt with a certain thickness of Shale, or Clay between them: . . . they are commonly black Stone, very hard and sharp, the lesser or thinner the Shale, or Clay-Beds are between them, the more nearer they resemble the Nature of the approaching Ouges . . .” (Hooson, 1747). The Ouges are the firm hard rock that borders the veins, and in Derbyshire are mostly limestone.

Clod—Indurated clay; compact, dull, and smooth but somewhat meagre [harsh, rough?] to the touch (Aikin, 1811, p. 196).

Clunch—An indurated clay that is glossy, unctuous, tending to slaty texture (Aikin, 1811, p. 196). This clay sounds similar to the soap scale of Lister (1683 [1809], p. 85). Mawe (1802, p. 22) mentions a similar word, “clutch,” as the colliers’ term for the rock above coal.

Duns—A miner’s term for a massive clay (Buckland and Conybeare, 1824, p. 253) found in southwest England. In this district, a fissile clay above coal is called clives, as has been mentioned. Buckland and Conybeare considered duns to be “obviously of the same origin as the German Thon.” The miners in southwest England also used another term of possible German origin, Strachey
(1719 [1809], p. 401) mentions the phrase “appears to the day” as a miner’s term. “To the day” was also used as the general directional term for the mouth of the mine or the surface of the ground in Derbyshire (Hooson, 1747, entry Day). The usages are remarkably similar to the modern German terms “zu Tage ausgehen” meaning crop out, and “Tagbau” for open-pit mine, as called to my attention by Curt Teichert (oral communication, November 1959). If duns comes from the German Thon, it does so by way of a German influence that is not readily apparent.

**Dunstone**—Translated by De La Beche simply as shale (1823, p. 19).

**Griddle**—“A thin hard bed of slate-clay or sandstone” (Thomson, 1814, p. 418).

**Shiver**—“Slate-clay approaching to a shale” (Thomson, 1814, p. 418). This word may have been adopted from German Schiefer, according to the Oxford English Dictionary, which cites the first usage of shiver from 1729. Farey (1814, p. 261) equates shiver and shale.

**Slat**—“Impressions of various kinds of plants [are found] particularly in the stratum of earthy slat, which always lies immediately on the coal stratum ...” (da Costa, 1757 [1809], p. 123).

The general acceptance of the term “shale” by geologists presumably was sometime prior to 1814, because Thomson (1814, p. 418) defines the miner’s specialized words “in the common mineralogical language which has been adopted in this country.” In 1808, Farey was using shale as a common lithologic term for a clayey rock, and he also was using shale as a stratigraphic name in the combinations “coal-shale” and “limestone-shale.” Farey hardly could have influenced English mineralogy very much because he was a practical mineral surveyor who was never accepted by the Geological Society of London. In fact, he was deliberately snubbed, it appears, and a paper that he offered to the Society in 1812 was treated brutally. (See Farey, 1813, footnote, p. 55, for a powerful expression of righteous indignation.) Perhaps Thomson had reference to an unrecorded action of a committee established by the Geological Society in 1808 to “remove the confusion that now prevails” in mineralogical and geological nomenclature (Woodward, 1908, p. 23). Woodward adds that no records appear to have been preserved of any decision reached by the committee.

In the late 18th and early 19th centuries, the term “schist” was widely used by the educated for rocks that we would call shale. Kirwan (1784, p. 86) uses schisti as a group term for “argillaceous fissile stones.” Hutton (1788, p. 245) refers to the “bituminous schistus” in which ironstones occur, and schistus also is used by Playfair (1802, p. 12). This usage probably extends back to Pliny, who wrote of *lapis schistos* (Oxford English Dictionary), but it just as easily could have sprung independently from the knowledge of Latin and Greek possessed by the natural philosophers of the 18th century. The usage of the word does not come from Agricola, to whom schistos was an iron mineral (Bandy and Bandy, 1955, p. 8; Hoover and Hoover, 1950, p. 111).

Probably Lyell was largely responsible for the general acceptance of shale as a broad geological rather than a provincial mining term. His *Principles of Geology* went through at least 9 editions between 1830 and 1853, and his
Elements of Geology, and the succeeding Manual, went through at least 4 editions between 1838 and 1852. They were the most widely read geological texts of their time. In these books, shale is quite generally associated with stratigraphic names, such as “Wenlock shales,” and applied to nearly all English clayey rocks of Jurassic age or older; only the Cretaceous and Tertiary strata of England seem to lack shale. Lyell’s books were printed in several American editions and he spent the years 1841 and 1842 in the United States. His influence in the United States was large.

It is not practicable to review in detail the development of terminology for fine-grained rocks in the United States, nor is it necessary, for the literature is readily available. The general trend prior to 1850 seems to have been to use shale for almost any clayey rock of Paleozoic age; afterwards the term came to be applied to many clayey rocks of all ages.

When Hayden and Meek began their explorations of the rocks of Cretaceous age in the Missouri River country, they were meticulous in calling the rocks known to us as the Pierre shale, and fine-grained rocks in younger strata, by the name “clay.” (See Hall and Meek, 1855, p. 405.) Hayden is reasonably consistent in this usage in his later writings. Shale seems to have been attached to the Cretaceous rocks after the conflicts of interest between Hayden’s Territorial Survey and King’s Survey of the 40th parallel became apparent. King (1878, p. 298), in recognizing Hayden’s priority in naming the Cretaceous rocks of the Western Interior region (Meek and Hayden, 1857, and 1862, p. 419), says that he appealed to Hayden “for a name to represent the three groups combined [Ft. Benton, Niobrara, and Ft. Pierre]. Accepting his suggestion of the name of Colorado . . . .” On p. 306, King states that the Ft. Pierre group consists of grayish-black carbonaceous shales and marls, and nearly black arenaceous clays. In 1881, however, Stevenson writes (p. 95), “The Colorado group was proposed by Mr. King to include the Ft. Benton, Niobrara, and Ft. Pierre shales of Meek and Hayden.” From this time on, nearly all stratigraphic units of mainly clay-sized rocks in the Western Interior region have been called shale, except for strata of Tertiary age, and even among these are found the Green River and Sentinel Butte shales.

Exposed rock units of Cretaceous and Tertiary ages in the southern and eastern coastal plain of the United States still are called clay, but many rock units of these ages on the Pacific coast are called shale. The expansion of the oil industry and rapid accumulation of subsurface data soon led to the general designation of fine-grained rocks in wells as shales. This was entirely natural because the exact nature of the rock could not easily be determined from cuttings, and may have been of no consequence. Electric logs give only an approximate identification of rock types.

J. Volney Lewis, in 1924, pointed out that the word “shale” was properly applied only to laminated clayey rocks (p. 568) and the validity of this usage was emphasized by Bradley (1931, p. 7). These suggestions came at a time when the study of sedimentary rocks was becoming more detailed and quantitative. The Journal of Sedimentary Petrology was founded in 1931. Since then, the nomenclature of sedimentary rocks has received much scrutiny.

This trend toward greater precision (and rigidity) in nomenclature tends
to blind us to an historical fact. Shale is the generally accepted name for the class of fine-grained rocks, of equal standing with sandstone and carbonate as names for major rock groups. We are committed. I think, to the continued use of the word "shale" for this purpose, and I see no reason to try to avoid it. Certainly our comprehension is broad enough to include two meanings of the word "shale": First, the reasonably precise meaning of "laminated clayey rock" to which the origin of the word entitles it, and second, the meaning of the "general class of fine-grained rocks," which our historical use of the word bequeaths to it.

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Geopressures are common in young Tertiary sedimentary basins where marine units underlie rocks of higher permeability. A low permeability environment and conditions that reduce available pore space or increase fluid volume are necessary for geopressures to occur and be...