

ROCK STARS:



Silhouette of William Smith, given by Smith (who probably drew it) to Samuel Woodward on 27 June 1833, when they met at the British Association meeting in Cambridge. Courtesy of Norfolk Museums Service.

William “Strata” Smith

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William Smith’s career should be of special interest to today’s aspiring geoscientists for the very many difficulties—both “scientific” (a word not yet in common use) and financial—that he overcame with extraordinary resolve. Most notably, he largely single-handedly produced the remarkably accurate and enormous (2.57 m × 1.80 m) stratigraphic map of England and Wales, with a part of Scotland, published in September 1815 (see next page). Mostly self-taught and trained on the job, Smith’s motivations were primarily practical—finding and developing resources and reclaiming lands. For much of his life, Smith was ignored or treated as an outsider; in any case, there was not yet much of a proper geological community that could take interest in such an unusual man.

William Smith was born on 23 March 1769 at The Forge, Churchill, Oxfordshire, England, son of village blacksmith John Smith and his wife Ann; his father died when he was 7, after which he was raised by his uncle. He grew up on the notably fossiliferous Middle Jurassic rocks in the English Cotswolds, where such fossils were his playthings. Educated at the village school until the age of 11 or 12, Smith at 18 became assistant to engineer and land surveyor Edward Webb at the town of Stow on the Wold, where he learned to make accurate maps and to assess land values. Impressed by Smith’s abilities, Webb in late 1791 sent Smith to survey estates belonging to Lady Elizabeth Jones in north Somerset. Smith walked more than 50 miles to get there and lodged at Rugbourn Farm, which he later named the birthplace of all his ideas. In Somerset, thin coal seams were mined in small,

often deep mines, and Smith soon became involved in underground surveys, which set him thinking about the succession of strata. These same beds had inspired pioneer stratigraphic observations by John Strachey in 1719.

Smith’s work impressed local landowners, who asked him to survey routes for the planned, double-branched Somerset Coal Canal (SCC), which would take coal barges to nearby cities like Bath and Bristol, and farther on to London. On a 1794 fact-finding tour of canal and colliery installations, Smith continued his embryonic geological investigations using the general appearance of the “lie of the land.” Canal digging started in July 1795 along two sub-parallel valleys about two miles apart. Through this first widespread “surgery” of the countryside, excavations revealed to Smith a regular succession of gently dipping strata, which he could compare from one canal branch to the other. By late 1795, at the age of 26, Smith had worked out a local stratigraphic column, and on 5 Jan. 1796, he recorded his critical observation that some of the strata contained fossils, and that those fossils could be used to individualize, or identify, the strata. This realization allowed Smith to separate, for the first time, strata that had previously been hopelessly confused because of their shared lithologies—a major geological breakthrough. Smith’s first such surviving list, from the “Chalk” (now Cretaceous) to the “Coal” (now Carboniferous) is dated 1797.

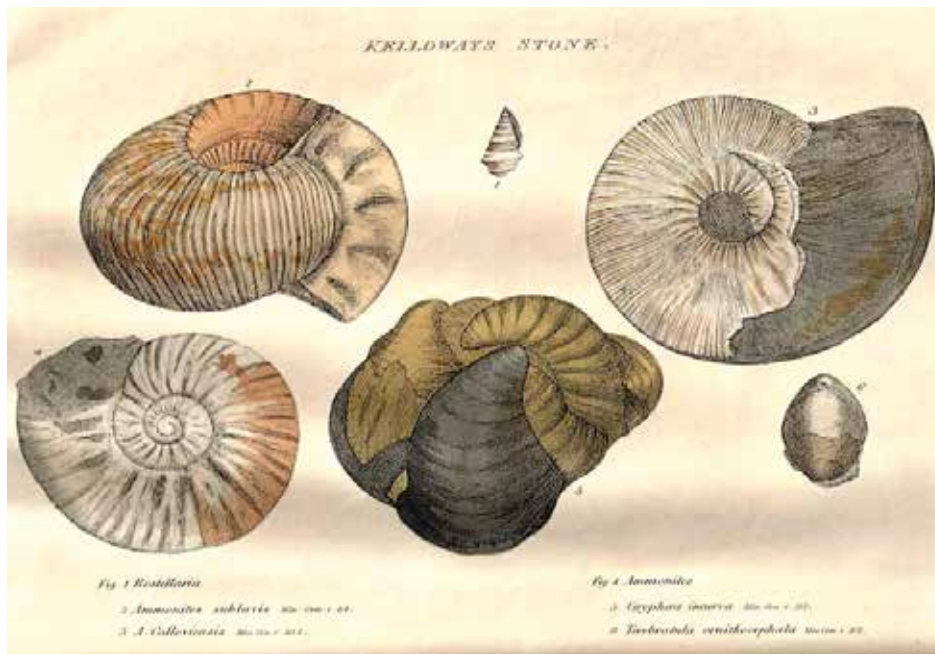
Smith’s training as a land surveyor led him to realize that he could now color such strata onto maps, since he understood their thickness and dip, and thus their geometry. From 1799, he started both to map local strata and to show them on geological cross sections. While canal excavations provided Smith with valuable geological data, however, by 1799 there were more practical and immediate construction problems. The SCC had decided to use a “caisson” canal lift, but the first one failed, and after disagreement over its fate, Smith was dismissed in June 1799. Immediately afterward, Smith dictated to two Bath clerical friends an improved “Order of the Strata round Bath,” which was widely disseminated in manuscript. In June 1801, he issued a prospectus for his intended book, *Accurate delineations and descriptions of the natural order of the various strata that are found in different parts of England and Wales*. Smith knew that his stratigraphic ideas held great economic potential, since they revealed where to find coal, iron, clay, and other minerals so vital to British industrialization.

Smith now set up a partnership with Jeremiah Cruse as land surveyors in Bath, which proved a fortunate location because so many landed gentry holidayed there. Between 1802 and 1805, in the Bath shop, Smith publicly displayed his fossil collections in stratigraphic order. From 1800 on, he also traveled in search of both commissions and data concerning the ordering of strata farther afield in the British Isles. Smith’s life was now highly itinerant and financially precarious. At various sites throughout England and Wales, to stay solvent, he worked as a land and mineral surveyor, a drainer, a coal explorationist, a sea-defense builder, a harbor improver, and a canal surveyor. The difficulty of combining writing with so much traveling meant that Smith was only able to publish one book during this period, *Water Meadows* (1806), on draining bogs for practical use, but its publication was unprofitable.

Smith’s work brought him into close contact with the polymath John Farey, who was so impressed with its novelty and economic importance that in early 1802, he brought Smith’s work to the



Smith's *A Delineation of the Strata of England and Wales, with Part of Scotland*, published in September 1815. Image courtesy British Geological Survey as a one-time-only reproduction: British Geological Survey copyright permit no. CP15/050, © NERC. All rights reserved.



The “Kelloways Stone” plate from *Strata identified by Organized Fossils*, part 3, September 1817, by William Smith, mineral surveyor. These Kelloways fossils had allowed Smith, in 1805, to determine that the expensive Bruton Coal Trial of 1803–1810 would prove both misplaced and futile.

attention of the president of the Royal Society, Sir Joseph Banks. Attempts at early publication of Smith’s stratigraphic work were foiled by his prospective publisher’s bankruptcies, so in 1804 Banks opened a subscription toward publication of Smith’s geological map, but the subscription drew only one other supporter. Nevertheless, in 1803 Smith had established a London office, and beginning in 1805 he displayed his ordered fossil collections there on shelves corresponding to the strata. On 24 March 1805, in a most significant first, Smith was able to inform those hunting coal near Bruton in Somerset that they were wasting time and money because they had been misled by superficial similarities into digging where no coal could be reached.

From 1806, and following Banks’ support for map publication, Farey began to extol Smith’s work in several magazines. Smith continued to add specimens from new strata to his increasingly large collection of the “characteristic” fossils he found in England. The Geological Society of London was founded in late 1807, but many of its members remained unconvinced of the value of Smith’s work and rather proposed to publish a rival map! By 1810, they were ostracizing Farey for his outspoken support of Smith. Finally, in 1812, the London mapmaker John Cary offered to publish Smith’s map, with specially engraved plates for which Smith designed topographic details. The first version was published in September 1815, dedicated to Banks, who had immediately realized the economic significance of Smith’s results. This map was continually modified until at least 1818, and copies with mid-1830s watermarks survive.

By 1815, Smith was in serious financial trouble, and in June 1819 he was imprisoned for debt, spending almost ten weeks in the King’s Bench prison in London. Smith’s financial difficulties were broadly due to “laissez-faire” policies, with a critical lack of governmental support for work like his. However, the immediate cause of Smith’s imprisonment was an unfortunate investment in a quarrying concern. The disaster was only partially assuaged between 1815 and 1818 by enforced sale of his wonderful fossil collections, at Banks’ instigation, to an uninterested British

Museum. Smith’s library also had to be sold; only some of his personal papers were rescued by a friend.

Smith’s achievements were enormous. His 1815 map helped inspire the French government to fund an equivalent mapping project. J.-F. d’Aubuisson de Voisins wrote in 1819 “what it has taken the most eminent mineralogists half a century to achieve in a small area of Germany, one man has undertaken and accomplished single-handed for the whole of England; and his work is quite as fine in its results as it is astounding in its scope.”

Smith in later life finally received some recognition of his pioneering work, including the first Wollaston Medal of the Geological Society of London (1831), which 146 years later named after Smith its medal for excellence in contributions to applied and economic aspects of geology. The methods Smith developed are a fundamental underpinning of biostratigraphy and a basis of every student’s field mapping exercise to the present day.

FURTHER READING

Online gateway to Smith’s maps and much more: www.strata-smith.com.

d’Aubuisson de Voisins, J.-F., 1819, *Traité de géognosie, ou exposé des connaissances actuelles sur la constitution physique et minérale du globe terrestre*: Strasbourg, F.G. Levrault, 2 vol., in-8, pl. d-rel., 665 p.

Phillips, John, 1844, *Memoirs of William Smith LL.D.*: London, Murray (reprinted in 2003 with additions by Hugh Torrens by the Bath Royal Literary and Scientific Institution), 288 p.

Torrens, H.S., 2004, *William Smith*, Oxford Dictionary of National Biography: <http://www.oxforddnb.com>.

The “Rock Stars” series is produced by GSA’s History and Philosophy of Geology Division. Learn more at www.gsa.org/notices/HIST_RSGuide_revised_12-13.pdf.