BOOKS: GEOLOGY

The Story of Strata-Smith

David Oldroyd

William Smith (1769–1839), dubbed "the father of English geology" by Adam Sedgwick, has long lacked a definitive biography, although the historian of geology Hugh Torrens is currently preparing one. Simon Winchester says Torrens "gave generously of his time, his advice and help, and handed me an immense number of his own most useful papers, both published and unpublished, from which I learned much." *The Map That Changed the World*, then, is represented as an "hors d'oeuvre while we wait in eager anticipation for [Torrens's] main dish, soon to come." But it would have been more seemly if Winchester had waited longer before publishing, given that one of his themes is Smith's treatment by George Greenough, the first president of the Geological Society of London. Greenough used Smith's geological map of England and Wales (1815) in the Society's map of 1820—the year after Smith was imprisoned for debt.

The Map That Changed the World
William Smith and the Birth of Modern Geology
by Simon Winchester
Viking, London, and HarperCollins, New York, 2001. 352 pp. £12.99. ISBN 0-67-088407-3. $26, C$39.50. ISBN 0-06-019361-1.

It is gratifying that books on the history of science can become best sellers. Indeed, their recent success has launched a bandwagon, and Winchester is jumping onto it. His book is being widely advertised and promoted by a nine-city author tour in the United States. The dust jacket unfolds to reveal a color replica of Smith's map. And the work is being released in ordinary- and large-print versions as well as on audio tapes. Someone expects to make money out of all this.

Well, Winchester does tell a good story. He relates how the engineer–surveyor Smith came to his idea that strata can be ordered according to their fossil contents. Fossils display a recognizable sequence in the geometrical arrangement of rocks; so by using fossils one can locate the position of strata in the stratigraphic column. Smith used this principle in preparing, largely single-handedly, his wonderful hand-colored map of 1815. (He also prepared some earlier, less well-known maps including a 1799 map of the geology around Bath.) But Smith got into financial difficulties through property deals and, surprisingly, through an ill-judged investment in a quarry and associated equipment. After release from debtors' prison, he took refuge in the north of England. Eventually the Geological Society, after a turnover of its membership, recognized his accomplishments and awarded him its Wollaston Medal in 1831.

Winchester's judgment as to what is important in a life of Smith is somewhat idiosyncratic. He devotes considerable space to describing how he followed Smith's footsteps, tracing outcrops from Dorset to Yorkshire. I commend such fieldwork (which can give warrant for a pleasant holiday), but I question the need to be told about some of Winchester's childhood experiences, such as swimming off the Dorset coast under the eye of schoolteacher nuns.

Strata delineated. At the scale of five miles to the inch, the map of 1815 measured 105 inches by 74 inches. It was printed on 15 sheets; this part of number XI shows Somersetshire, with the Mendip Hills prominent on the left and the Salisbury Plain on the right.

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What might Winchester have discussed in place of such stories? Well, there is the question of Smith's use of his stratigraphic understanding to argue against the search for coal at a site in Somerset, advice that was ignored by overly sanguine investors to their financial detriment. Something similar occurred later in Sussex, and elsewhere. There is the question of the successive versions of Smith's map. Back in 1938, Victor and Joan Eyles showed how the gradual amplification of Smith's knowledge allows his maps to be placed in approximate chronological order, according to their detail. It would have been good to discuss Smith's ideas on time. In fact, his concerns were chiefly geometrical and practical; having little regard for time, he was, in a sense, not thinking geologically. I would have liked a consideration of Rachel Laudan's controversial claim that Smith did not always deploy his own stratigraphic principle, as he sometimes confused rocks that look similar but contain different fossils.

And readers would have benefited from more probing of Smith's private thoughts. Winchester represents Smith as changing the way we think about the world, helping to get religion out of geoscience. But in his memoir that accompanied the 1815 map (available at www.unh.edu/esci/wmsmith.html), Smith wrote that "the earth is formed as well as governed like the other works of its greater Creator, according to immutable laws...discoverable by human industry and observation." And, in page proofs for his unpublished *Abstract Views of Geology*, he speculated that "stratification has resulted from a chemical conversion of liquids and gases into the solid state." So although Smith's "geotheory" was intensely empirical, he was also theologically conventional and sometimes physically speculative.

Winchester is right, as Torrens likely advised him, to emphasize that Smith learned much from miners in the Somerset coalfield, which he examined early in his career. Yet while the colliers knew the pattern of the disturbed coal seams, they did not recognize the regularity of the unconformably overlying strata, which Smith mapped so successfully. Smith's vision was assuredly wider than his informants'. But his mapmaking was not quite so original or unique as Winchester presents it. (The dust-jacket blurb tells us that Smith was "obsessed with creating the world's first [sic] geological map.") There were earlier crude stratigraphic maps such as that of Thuringia by Füchsel (1761). There was the (Smith-inspired) production of Brongniart and Cuvier for the Paris Basin (1811). Winchester mentions Smith's polymathic colleague John Farey, but he does not discuss Farey's extraordinary geo-

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logical map (1812) of Joseph Banks's Derbyshire estate. Found by Torrens in a California collection, this looks like something from the late 19th century, very different from Smith's sometimes "broad-brush" maps. Although Farey learned his geological mapmaking from Smith, Winchester magnifies Smith's achievement by disregarding these other productions. Smith was only one of the harbingers of "a whole new science": geology. On the other hand, Smith did map all England and Wales, and he produced, as Winchester rightly emphasizes, a work of great beauty as well as originality.

It is good that popular books on the history of geology are being actively promoted. Nonetheless, they should build on scholarly studies, rather than pre-empting them. Is someone who thinks that Sedgwick was "godfather of the Ordovician" the right person to be in the game?

BOOKS: BIOGRAPHY

The Model Science Adviser

Keith O'Nions

At various times, individual scientists have exerted great influence on government policy, particularly in the area of defense. Amongst these, Solly Zuckerman, an adviser to the U.K. government over a 25-year period, looms large. He was exceptional for the breadth of scientific issues, defense and civil, he addressed, his closeness to U.S. administrations, and the extraordinary long period over which he remained an influential and trusted adviser in Whitehall. Zuckerman's advice was sought on a wide range of scientific matters, including jail security and the use of detergents to mop up oil after the *Torrey Canyon* wreck on the coast of Cornwall. However, his most significant impact was probably on Cold War defense issues, where his views frequently challenged governments, both Conservative and Labour.

Solly Zuckerman
A Scientist out of the Ordinary
by John Peyton
John Murray, London, 2001. 286 pp. £22.50. ISBN 0-7195-6283-X.

John Peyton, a former minister of transport, shadow leader, and member of the House of Commons for over 30 years, knew Zuckerman well. He has written *A Scientist out of the Ordinary* to fill some of the gaps and voids in Zuckerman's two-volume autobiography (*1*, *2*). In particular, Peyton highlights Zuckerman's upbringing in South Africa, his education at Cape Town University as a physiologist, and the start of his long interest in the anatomy of monkeys and apes. The book appears at a particularly opportune time, given that memories of Zuckerman's academic achievements and his reign as a science adviser are now fading. With the huge importance of current scientific issues such as climate change, biodiversity, and missile defenses, Zuckerman as a role model remains highly relevant.

From Peyton's account, scientists will immediately recognize Zuckerman as an eminent and highly successful researcher and academic. After receiving B.A. and M.A. degrees, Zuckerman arrived in England in 1926, carrying with him an intense interest in the natural world. In an entertaining and informative manner, Peyton tracks the course of Zuckerman's research and teaching through the years before World War II at Oxford and the postwar years at Birmingham University. Over his long term as head of Birmingham's Department of Anatomy, Zuckerman built up a major research program in physiology, contributed tirelessly to professional bodies, and by any standards had an outstanding mainstream academic career.

An invaluable adviser.

Most scientists will find the second strand of Zuckerman's career less familiar and more difficult to comprehend. It leaves both his biographer and myself in some awe. Peyton provides a detailed account of Zuckerman's role as an adviser to the Royal Air Force in the Second World War, during which Zuckerman cut his teeth on working with the military. At the end of the war, he had become the acknowledged expert on the effectiveness of bombing and bomb damage. The narrative offers interesting insights into Zuckerman's involvement in debates on the philosophy of Allied bombing and reveals the link to his later, much-publicized views on the limitations of nuclear weapons in bombing campaigns.

Zuckerman's high-profile career advising governments really started when he became the full-time Chief Scientific Adviser to the Ministry of Defence in 1961. He served with distinction for five years, and then moved to the Cabinet Office for another four years as the first Chief Scientific Adviser to the Government. Both positions continue to the present day, as does the tradition of filling them with appointments from the mainstream of academia. Peyton's depiction of Zuckerman in this most important decade of his career spotlights an extraordinary scientist, one better connected in Whitehall and Washington than most of the ministers he served. The biography balances the exceptional advantage that Zuckerman's experience gave him with some of the difficulties it created for him at times.

Of a number of key decisions made by the U.K. government during the Cold War, the most significant was to acquire the submarine-launched Polaris missile from the United States. The book describes, at some length, Zuckerman's evolving views on nuclear deterrence in these years. Peyton devotes particular attention to both the philosophical and pragmatic issues surrounding nuclear deterrence, but at times the reader is left a little uncertain as to where Zuckerman's views finish and those of his biographer begin.

Peyton has wrestled to disentangle and understand the two strands of Zuckerman's life. On the whole, he has done well. He presents the facts and his impressions in an easy-to-read account that will be enjoyed by scientists and nonscientists alike. But, by his own admission, he remains dazzled by the success of the two parallel careers. Zuckerman was certainly exceptional in his generation, and no U.K. scientist has subsequently had such a long and successful engagement with government. From his start in South Africa through the 70 years he lived in England, Zuckerman repeatedly found himself in the right place at the right time. Zuckerman once wrote on the six colleagues he most admired (*3*): two Nobel-winning physicists (Rabi and Blackett) and four military leaders (Spatz, Rickover, Tedder, and Mountbatten). Peyton describes Zuckerman's relations with each in some detail. This book makes it clear that its subject was equally out of the ordinary.

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2. S. Zuckerman, *Monkeys, Men and Missiles* (Collins, London, 1988).
3. S. Zuckerman, *Six Men Out of the Ordinary* (Peter Owen, London, 1992).

CREDIT: ZUCKERMAN FAMILY ARCHIVE/FROM *SOLLY ZUCKERMAN*