TIME MATTERS: GEOLOGY'S LEGACY TO SCIENTIFIC THOUGHT. Michael Leddra. 2010. Chichester: Wiley-Blackwell. 269 pp. Softcover, $64.95.

Geology students and those outside academia should go beyond textbooks and scholarly writings and seek out the popular science shelves of bookshops. This is what *Time Matters* advocates as a way to understand the personalities and concepts involved in geology's past, and the book states that many of the popular accounts provide "a very readable way of presenting concepts and ideas that some textbooks often fail to match". It is further observed that popular books on geology's history and philosophy appear in spurts. Moreover, we currently seem to be enjoying such a spurt, and *Time Matters* includes long quotations from, and makes extensive reference to, a great many books in a current crop of geology popularizations. Indeed, *Time Matters* presents a very useful overview of such literature.

One can certainly commend *Time Matters* for its goal of providing students and general readers with "an insight into the historical background behind some of the concepts that we use in geology today". Employing a breezy style, the text engages readers with anecdotes covering the personalities as well as the science of historical luminaries who will all be familiar to readers of *Earth Sciences History*. Nearly every other page of this text is punctuated with a highlighted box that provides supplementary material on a 'discussion point', 'background' or 'further reading'. On the other hand, the photographs of rock outcrops and landscapes are too small and unclear to be useful, and there are too many 'throw-away' facts and single-sentence paragraphs. Nevertheless, *Time Matters* generally makes for easy reading by students, and this is a very important attribute in today's teaching environment.

Unfortunately the text is marred by factual errors that hopefully will be corrected in a future edition. Historical scholars may enjoy picking these out. Among those that jumped out at me were references to 'Albertus Magun' and to a sixth-century Greek philosopher supposedly named 'Miletus'. The latter confusion of person with place is compounded by a later reference to an 'Anaximander of Mitetus'! Robert Dietz is described as an Arizona State University professor who proposed seafloor spreading in 1961. (Dietz worked for the U. S. Navy at the time, and did not move to Arizona State University until after his retirement from government service in 1977.) However, even more unfortunate than the factual errors are misrepresentations of important philosophical and historical interpretations. In one 'discussion point' it is claimed that T. C. Chamberlin's method of multiple working hypotheses is mainly concerned with the views "that all theories should be treated equally" and "that science should progress through consensus and the view of the majority", all this, of course, being very "American". Anglocentrism is also very much in evidence in the presumptions that underlie one of the key questions laid out in the last chapter of the book: "why was Britain so deeply involved in formulating so many of the foundations of modern geology?"

The avowed purpose of educating about the philosophy of geology gets rather confused in *Time Matters*. In one paragraph of the chapter 'Continental Drift and Plate Tectonics' field geology is described as "observational, qualitative, and inductive". In the next paragraph the methodology of geophysics in collecting data through instruments "independent of interpretation and other's influences" is contrasted with "traditional, field-based, deductive geology". In addition to confusing the student as to whether field geological reasoning is inductive or deductive, this simplification ignores the extensive scholarship that shows it primarily to be neither. As Von Engelhardt and Zimmerman showed in their 1982 book *Theorie der Geowissenshaft* (published as *Theory of Earth Science* by Cambridge University Press in 1988) geology is largely an abductive (or retroductive) science. This insight was recognized much earlier by a number of scholars, including William Whewell and Charles Sanders Peirce, and it underlies the views of T. C.

Chamberlin (unfortunately misrepresented in *Time Matters*), G. K. Gilbert, W. M. Davis, and other prominent geologists. However, one probably must ascribe blame for the lack understanding of the nature of geological reasoning to the lack of success by geologists in explaining this reasoning process effectively enough to get it into general textbooks and popular writings, where it needs to replace misleading and erroneous depictions of induction and deduction.

Readers of *Earth Sciences History* are likely to be of two minds on all this. On the one hand they will be rather dismayed that important historical personages in geology and geological concepts are described on the authority of Simon Winchester, Jack Repcheck and Gabrielle Walker; while no mention is made to the more appropriate authority of Hugh Torrens, Gordon Craig, Donald McIntyre, Dennis Dean, David Kitts, or William Whewell. While there is brief mention of Rudwick, no cited reference is made to Albritton, Carozzi, Dott, Ellenberger, Gillispie, Gohau, Greene, Herries Davies, Hooykaas, Laudan, Oldroyd, Secord, or Taylor. (My list of excluded scholars is merely for the purposes of illustration and I apologize to the many left out.)

On the other hand, it is heartening to this geologist that popular science writing is engaging an educated public with subject matter that goes beyond the uncommon sense of quantum paradoxes, untestable conjectures about the multiverse, and the happenings of the big bang during its first 10–43 second. It is the purpose of *Time Matters* to engage its readers, and the success of much popular writing is exemplary for such engagement. Of course, this a long-standing issue in historiography: does one engage a readership with exciting narrative, or does one stay true to meticulous scholarship via the mind-numbing detailing of all relevant facts? This is probably an overly polarized dichotomy, but it is closely related to an important issue for our times. Perhaps more than at any time in history, there is presently a need for public understanding of issues in Earth science that pose a great threat to the future well being of humankind. Yet, we are also at a time when the public understanding of science, and the general abilities of scientist to communicate to the public are at a low point. This problem has been outlined in books like Randy Olson's Don't be Such a Scientist: Talking Substance in an Age of Style (Island Press, 2009). Olson's elevation of style above substance may seem radical to some, but it is a logical reaction to the sorry state of effective communication of science to the public.

One final complaint among many more that can be laid upon *Time Matters* concerns a claim in the concluding chapter (entitled 'What Have We Learnt?') where the text turns once again to Simon Winchester as an authority. A quotation is taken from Winchester's *A Crack in the Edge of the World* (Harper Collins, 2005) that reminds one of John Muir Wood's polemics (in *The Dark Side of the Earth*, Allen and Unwin, 1985) concerning the 'New Earth Science' replacing the 'Old Geology', and Claude's Allegre's account of heroic progress (*The Behavior of the Earth,* Harvard University Press, 1988) wherein the quantitative methods of geochemistry and geophysics replace the old "mapping mentality" of geology. Winchester likens the "old geology" to "alchemy and the medicine of the leach and the bleeding rod", and describes it as "a science born long ago (most formally in the 18th century) . . . [that] never truly left the age of its making". Winchester glorifies recent developments, since the 1960s, that have profoundly remodeled reworked geology so that it now views the world as a single system. Historians may be amused at this recent 'discovery' of a holistic view of our planet as they pursue their scholarship on what Winchester apparently believes to be the intellectual equivalent of bloodletting.

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Bullen, K. E. and Bolt, Bruce A. 1985. *Introduction to the Theory of Seismology*. 4th edn. Cambridge: Cambridge University Press.

Good, Gregory A. (ed.). 1998. S*ciences of the Earth: An Encyclopedia of Events, People, and Phenomena*. 2 vols. New York and London: Garland Publishing Inc.

Suess, Eduard, 1904–1924. *The Face of the Earth (Das Antliz der Erde)*, translated by Hertha B. C. Sollas. 5 vols. Oxford: Clarendon Press.

Articles in journals

Jago, J. B., Pharaoh, M. D. and Wilson-Roberts, C. L. 2005. Douglas Mawson's first major geological expedition: the New Hebrides, 1903. *Earth Sciences History* 24: 93–111.

Articles or chapters in books

Branagan, D. F. 1998. Geological periodization. In: S*ciences of the Earth: An Encyclopedia of Events, People, and Phenomena*, edited by Gregory A. Good, Vol. 2, 306–314. New York and London: Garland Publishing Inc.

Unpublished thesis or dissertation

Wolter, John A. 1975. The Emerging Discipline of Cartography. PhD dissertation, University of Minnesota.

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For further information and expression of interest, please contact: Dr George Vlahakis, Institute for Neohellenic Research, National Hellenic Research Foundation (gnvlahakis@mpiwg-berlin.mpg.de and gvlahakis@yahoo.com); or Associate Professor Manos Dassenakis, Department of Chemistry, National and Kapodistrian University of Athens (edasenak@chem.uoa.gr).

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CONTENTS