

is admittedly a rather special taste but if you are interested in these developments, do not miss this nicely written and well organized history; you are expected to be familiar with the terminology of modern algebra, notably fields, rings and ideals, though the author provides ample reminders and explanations.

### 1.6. *Units and Exodus*

*Moreover, pathos is a tide: often it carries the awakener of it off his feet, and whirls him over and over, armour and all in ignominious attitudes of helpless prostration, whereof he may well be ashamed in the retrospect. We cannot quite preserve our dignity when we stoop to the work of calling forth tears. Moses had probably to take a nimble jump away from the rock after that venerable Law-giver had knocked the water out of it.*

George Meredith, *The Egoist*

And now, two books in the 'greener grass' category: *Encyclopaedia of Scientific Units, Weights and Measures, Their SI Equivalences and Origins* by F. Cardarelli [29] and *The Miracle of Exodus, a scientist's discovery of the extraordinary natural causes of the biblical stories* by C. Humphreys [30]. I have already filled several pages of *Ultramicroscopy* with quotations from Cardarelli's earlier book, *Scientific Unit Conversion* (SCU) but although the *Encyclopaedia* is called a revised and expanded edition, this is much too modest a description. The 488 chequebook-shaped pages of SCU have become 848 standard-shaped pages with narrow margins and only a few blank millimetres at top and bottom. Virtually every section has been expanded enormously. 'Obsolete [British and American] weight and capacity measures', for example, had only four entries in SCU; UK units for beer wine and spirits; UK clothes units of length; UK and US hay and straw weights; and UK weights for wool. In the *Encyclopaedia*, there are twelve sections, with new information about butter and cheese, coal, units of capacity used in food recipes, stacked firewood and UK and US dimensionless counting units (great gross, shock, flock, score, baker's

dozen, dicker, hat trick or nest, pair or brace or yoke, point, half, quart, tithe—1 great gross = 17280 tithes). This section also includes sections on Modern and Old UK and US dimensionless units for numbers of paper sheets, from which I learnt that nowadays, there are 25 sheets/quire instead of 24 as formerly; quires, reams, bundles, and bales survive unchanged. The basic standard (defined in St Petersburg and Pittsburgh) for stacked firewood is 165 cubic feet,  $55\pi$  faggots (the unit is fgt), or  $55/4$  squared loads = 99/16 hewn loads. The biggest change is in 'Obsolete national and regional systems', formerly limited to France, Italy, Spain, Portugal, the Netherlands, Germany, Russia, Sweden and Japan. This section has become so large that it has had to be subdivided into six subsections: first, Western and Southern Europe, with many new countries included, notably Belgium, Scotland, Ireland, Malta, the Balearic Islands, Greece, Cyprus and Turkey. (In Scotland, 20 acres = 1 nook and 4 gills = 1 mutchkin; no doubt the gill (0.1 litre) was far too small a measure for whisky.) Then Central and Northern Europe, with numerous new lists including more recondite lands such as Iceland and some of the Baltic States (not Lithuania); I now know that a faust is an old Hungarian unit of length (1 faust = 105.35 mm). Africa is entirely new, though F. Cardarelli has not ventured far south (the Magreb, Abyssinia, Eritrea, Ethiopia, Somaliland and Guinea) and so too is Middle East and Asia, apart from Japan. Why, one wonders, did the Siamese subdivide the tchang (about 1 kg) into so many smaller parts? Eight more diminutive units are listed, in powers of two from the tamung downwards, the smallest (the kлом) being  $1/10240$  tchang. Next Central and South America where, no doubt to F. Cardarelli's relief, Honduras, Costa Rica, Nicaragua, Salvador and Guatemala used (almost) the same units (though the vara and the manzana did vary slightly between countries; I was most disappointed to find that the manzana is a unit not of weight but of area, about  $6800 \text{ m}^2$ ). None of these South American units seems to be pre-Columbian; do we know nothing about Mayan and Aztec units? Last, North America, which in fact denotes Mexico.

The largest section of the book and the most useful (as opposed to the most diverting) is Section 4, Conversion tables, which begins with about 500 pages of units in alphabetical order, followed by tables for various physical quantities (mass, length and many more). Here, scientists brought up in the SI era can discover what earlier generations meant by oersteds and poises and all the other units that have fallen into desuetude. Section 5 lists the fundamental mathematical and physical constants. The nineteen appendices cover a vast range of topics, including clothing and shoe sizes. I noted that in Japan, women's shoe sizes stop at 24.5 (= 8 USA) or  $6\frac{1}{2}$  (UK) and Japanese ladies never need a sweater bigger than a size 44 (Europe). I find it hard to believe that Japanese men likewise never need shoes bigger than 24.5, perhaps those with big feet buy them in English shops in the smart areas of Tokyo. The notes are most informative, explaining the difference between shoe sizes in Europe and the USA. And did you know that "men's hat sizes measure the diameter of the hat as if it were deformed into a perfect circle while women's hat sizes measure the circumference directly"? We are not told why size  $7\frac{1}{2}$  (American men) corresponds to 60 (European and Japanese men), however; surely there is a  $\pi$  missing ( $60/\pi = 19.1$  cm, which corresponds to  $7\frac{1}{2}$  in). Table 6–13 reminds us of the geological time-scale, working back from the Cenozoic, a mere 0.01 Ma ago, to the pre-Cambrian era, where the Cryptic age is 4560 Ma behind us. Paper sizes are explained (An is  $2^{-(n/2+1/4)}$  m wide and  $2^{(1/4-n/2)}$  m high); country codes are given in six different forms (though a few, such as Heard Island and the McDonald Islands have no UN or IOC codes and the Isle of Man has only an internet suffix and a numerical code; Guernsey and Jersey are even less well provided for and Sark is absent altogether).

There is no other book even remotely as informative as Cardarelli's *Encyclopaedia* on these matters, which goes far beyond the promise of the title. Stand it beside your (early edition of) Fowler's *Modern English Usage* and think of it as what our forebears called a 'Complete Enquire Within'.

C.J. Humphreys the electron microscopist is well known in the world of physics and we might

have expected to find his name among the books on applied electron microscopy. But no, he has put aside his Williams and Carter or his Fultz and Howe in favour of the *Old Testament* and in particular, the Book of Exodus. "There, in the spring of 1995, standing on the top of the traditional Mount Sinai, also called Jebel Musa, the mountain of Moses, I resolved to tackle the problem of finding the real Mount Sinai" for "How could two million Israelites or even twenty thousand, with their flocks and herds of animals, have survived for about a year at the desolate foot of Mount Sinai [where] there was little water and virtually no vegetation?" Five key questions are addressed: "1. Is the story coherent and consistent? 2. Is the story factually accurate? 3. Can we understand the miracles? 4. Has the Exodus text been misinterpreted? 5. Can we reconstruct the Exodus route and find the true Mount Sinai?". "Come with me," exhorts C.J. Humphreys, "on an amazing detective adventure to reconstruct the extraordinary journey taken by Moses three thousand years ago" [30].

The story is indeed enthralling. After "Setting the scene", with a persuasive argument in favour of situating Moses and the exodus in the reign of Ramesses II, Humphreys examines in detail the numerous miracles associated with Moses, the escape from Egypt and the long journey to... where exactly *did* he go? For the real Mount Sinai had to be located as well. Everywhere, the author finds natural explanations for phenomena that are treated in the Bible as miraculous; the aptness of the timing was indeed miraculous but not the events themselves. A long chapter on the Burning Bush (which opens with Zsa Zsa Gabor's observation that "Husbands are like fires: they go out if unattended") offers more than one natural explanation of the Bush (natural gas or a volcanic vent are thought to be the most plausible). Along the way, we are told that Humphreys' lounge has a coal-effect gas-fire, which perplexed visiting Japanese scientists who photographed it to amaze their friends back home, and are reminded of incidents in *Pilgrim's Progress*, the life of St Catherine of Alexandria and the trances of the Pythia in Delphi. Moving on to Chapter 7, 'Mission impossible, the Exodus strategy', we are told that "Moses' *Mission*