COMMENTARY

Hamilton and Hardy for the 21st Century

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ABSTRACT

Hamilton and Hardy's *Industrial Toxicology* is now 80 years old, and the new sixth edition links us with a pioneer era. This is an impressive book, but the usefulness of the hardback version as a reference book is unfortunately limited by its poor index. There is now an ebook version, and for the practitioner on the move this has the great advantages of searchability and portability. However, Wiley ebooks can apparently only be downloaded when first purchased, so their lifetime is limited to that of the device. The Kindle edition should avoid this shortcoming.

KEYWORDS: Alice Hamilton; book review; ebooks; Harriet Hardy; toxicology

One day around 1947, Dr Harriet Hardy was invited out to lunch. By her own account, Harriet had come from a comfortable and privileged home, but her early hospital training had given her 'insight into human behaviour of the sick, dying, and the troubled and underprivileged' (Harvard, 1997). By the time of the lunch, she was working for Massachusetts Department of Health, Division of Industrial Hygiene, and had become known for her investigations of cadmium and beryllium poisoning. This had met admiration from her peers, but concern in the Atomic Energy Commission about the implications for their new industry.

Harriet was in her early 40s, but her host Alice Hamilton was 36 years older and a famous name in the field. She had been born in 1869, and graduated MD from the University of Michigan in 1893. The USA was well ahead of many countries in medical education for women, but Alice's was still an achievement which had required determination and toughness against

many practical difficulties and prejudices. In Chicago in the early years of the 20th century she came across occupational diseases whose existence was denied by employers, notably lead poisoning, and with more determination and toughness she became one of those pioneer physicians who uncovered epidemics of industrial disease, battled to improve conditions, and in doing so launched modern occupational hygiene. In 1919 she became Harvard's first female faculty member, at a time when women were not admitted as students. She was appointed Assistant Professor in the Medical School, and stayed in that position until she retired in 1935. She also saw the need for a new textbook, and just before the end of her time at Harvard the first edition of 'Industrial Toxicology' was published.

Then, a dozen years later, over the lunch, Alice put a proposal that Harriet should be the co-author of the second edition of her book. In an interview for the American Public Health Association, available on

YouTube ([APHA, 1988](#)), Harriet recalled what happened. Alice went through the planned chapters, allocating some to herself and some to Harriet, who found that she had been placed on Alice's deaf side so that she could not object! The second edition was published in 1949, when Alice was 80. Harriet remembered in her interview that although Alice in due course invited Harriet to call her by her Christian name, Harriet's respect was such that she could never bring herself to do so.

Alice died in 1970 at the age of 101. Four years later, Harriet brought out the third edition of their book—by then she had become Harvard Medical School's second-ever female full professor, echoing her older collaborator's achievement. The fourth edition was in 1983, with Asher Finkel as a new co-author. Harriet died in 1993, but by then 'Hamilton and Hardy' had become one of those rare textbooks which move into the hands of new editors and become potentially immortal. Raymond Harbison was lead editor of the fifth edition in 1998, as he is of this new edition ([Harbison et al., 2015](#)). This book has therefore been around for 80 years, taking us a quarter of the way back to Bernardino Ramazzini's foundational work and the start of occupational medicine ([Ramazzini, 1700](#)). How well does the new edition of Hamilton and Hardy's classic match modern needs?

The editors of the sixth edition are all at the College of Public Health of the University of South Florida. They have brought together about 100 authors, of whom two are from China, one each from Canada, Italy, Poland, and the UK, and the rest from the USA—quite a growth from Alice and Harriet's lunch. I will not try to critically evaluate the content, but I will look at its likely usefulness to someone trying to improve occupational conditions today.

There are 121 chapters. These are detailed on the publisher's website for the book, with a Google preview of the whole, but in outline the arrangement is as follows: two general chapters, and then sections on metal and metalloids (38 chapters), inorganic compounds (12), organic compounds (21), 'Organic high polymers, monomers, and polymer additives' (including some durable polymer fibres) (16), pesticides (5), dusts and fibres (8), physical agents (8), and special topics (16). The special topics section includes essays on topics such as carcinogenesis, reproductive toxicology, developmental toxicology, ototoxicity,

sensitization, and genotoxicity testing, and also a mix of miscellaneous topics such as mycotoxins, phosphine, diesel exhaust, and spaceflight operations.

Most of the chapters addressing specific substances are a few pages long, although some of the essays are much longer. Taking the *n*-hexane article as an example, this has a section in the chapter on aliphatic hydrocarbons, and begins with the target organs and US occupational exposure limits, and then classification and risk and safety phrases. The entry then deals with background and uses, physical and chemical properties, mammalian toxicology (acute effects, chronic effects, mechanisms of action, chemical pathology), then sources of exposure (very brief, and covering occupational and environmental), industrial hygiene, and medical management. For many substances, other topics appear as appropriate, such as first aid and ecotoxicity. The arrangement of the physical agent chapters is necessarily rather different.

The industrial hygiene entries are brief, typically one or two hundred words. In many cases there is not much specific to say about industrial hygiene for particular substances, and obviously for the hygienist this book is a place to learn about possible effects, not details of exposure and control options.

Despite the careful arrangement of the contents list, the reader using this as a reference work is clearly going to need a good index, but in the hard copy version the index is very inadequate. For the example of hexane already summarized, the index has six entries, with no indication of which is the main entry. 'Fiber' has just a list of 37 page numbers. That is not useful to anyone. If you want any information on welding fume, you will not find it by using the contents or the index—'welding' gets a list of 35 page entries with no indication of what is what. No doubt this is all computer generated, but if the publisher had spent two or three dollars a copy on a human index editor the book could have been more useful.

However, and surely our pioneer authors would have appreciated this, there is an ebook edition. This will obviously be a big advantage for the physician or hygienist moving from workplace to workplace, who no longer needs to carry the 3 kg of the hard copy and find somewhere to rest it. Alice and Harriet's successor can now carry their work on a tablet, and quickly find what is needed, because, of course, the ebook solves the index problem. For example, a free text search

shows that there are 14 references to welding fume, and each search result includes a few words of context, so the reader will get a good idea of which of the references are helpful. Each reference is a hyperlink, so touching it opens the book at the passage in question. In the text, the reader can also highlight sections or add notes.

If a non-fiction ebook is not properly formatted it can be useless. Wiley's is produced through Adobe Digital Editions, and works well. It can be used on a Nook, Kobo, Sony eReader, iPad/iPhone, or an Android device. A Kindle edition is available from Amazon.

I have tried the Wiley ebook on a 25-cm (10-inch) Samsung Android tablet using the Bluefire Reader, to a lesser extent on a desktop computer running Windows 7, and have checked that it will load without problems to an Android smartphone and a laptop running Windows 10, but have not tested it on Apple devices; nor have I tried the Kindle edition. It will be necessary to experiment with display options to balance appearance and usability of the hyperlinks. I did not try using it on a smaller screen, and I think that that might be less convenient. There are not many diagrams in the book; in the hard-cover book they are all in black and white, but in the ebook makes some use of colour. The detailed contents list in the ebook no longer has page numbers of course; each item in the list is a hyperlink. The hard copy will look good on a library shelf, but if you want a copy for daily reference, particularly on the move, the portability and searchability of the ebook would make it much more useful, except for one major flaw.

The flaw is this. If you buy a Wiley ebook, you may download it to up to four devices, but must do so within 14 days, and you may not transfer it any other device (Wiley, 2015). These security precautions seem to mean that when your device has become obsolete or no longer usable, say in 3 years' time, you will lose the book with the device and will not be able to download it again. This edition of Hamilton and Hardy is likely to have a lifetime of around 15 years, and to lose it after three is unacceptable, especially as the ebook and hardback are about the same price. I queried this with the publisher, and have an email saying this is not the case: it continues to be downloadable, but that reassurance is a flat contradiction of the general Wiley ebook conditions, so purchaser, beware!

However, this impermanence is not usually a problem with Kindle editions, which continue to be available on the purchaser's account and downloadable to new devices registered to the purchaser, and presumably this applies to Hamilton and Hardy as other Kindle books. I have not tried the Kindle version; the screen size of a Kindle reader might be a disadvantage, but the publisher can use the book on a tablet with a Kindle app. Kindle books are usually searchable as outlined above, and of course are portable. Because of this permanence, the Kindle version looks a much better buy. It is regrettable that for many users this fine book has been spoiled in hardback by the poor index and in Wiley ebook by its limited life.

The publisher's list price in the Europe is £130 or €175.50, very reasonable by the standards of modern reference books. Subscribers to Wiley's on-line library can get it in that form. The Wiley ebook is £118 (€158). Amazon's UK price for the Kindle edition is £124.80 (\$187.67 in the USA).

If Harriet were today having lunch and missed Alice's company, she could prop up her tablet against the vase of flowers, and enjoy the article on beryllium, noting with pleasure that it still cites her work. For the rest of us, we can give the pioneers a passing grateful thought as we benefit from what they started.

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