

# John Shaw Billings: creator of *Index Medicus* and medical visionary

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## Introduction

John Shaw Billings (1838–1913) – sanitarian, statistician, war surgeon, student, narrator, medical historian, administrator, librarian, teacher and architect – established the groundwork for creating *Index Medicus*, the first attempt to identify and code the medical literature. But he was a remarkable man beyond his bibliographic achievements.

I came across Billings quite by accident while searching for articles about written medical English. I found suggestions to authors of medical articles published by Daroff et al.,<sup>1</sup> the editors of *Neurology*. These suggestions referred to ‘Billings’ rules’, of which I had never heard. The reference was to an article in the *BMJ* of 1881 entitled ‘An address on our medical literature’.<sup>2</sup>

I was expecting to find that the article was the usual (and usually ignored) plea to medical writers to avoid long words and complicated constructions, to write more or less as most people speak and to broaden their reading beyond medicine. I found that Billings’ rules were sensible and admirably succinct: ‘have something to say; say it; stop as soon as you’ve said it’. There was a fourth rule, not quoted in *Neurology*: ‘give the paper a proper title’. But there was more to the article than that.

Medical publishing is not what it was: Billings’ ‘address’ is over six pages long, nearly 7000 words. His advice to authors takes up little more than one paragraph. The rest is packed with medical wisdom. It is a reminder that, whatever details of physiological and medical knowledge have been unearthed since 1881, basic medical insights have not changed. The arrogance of hindsight can curl our lips at the past: occasionally reading the thoughts of our predecessors does us no harm. Billings’ thoughts are magnificent, prescient and beautifully written. He deserves to be better known.

## Billings’ life

It is easy to provide an outline of Billings’ life.<sup>3–6</sup> He was born in 1838. He served as a surgeon in the

Union Army in the American Civil War and was at Gettysburg. Towards the end of the war, he was transferred to the Surgeon General’s office, where he stayed for over 30 years. He had read voraciously as a child. It was while working for the thesis required for medical graduation at Miami University that he had realised the need for a medical library and catalogue. Once the war was over, he got down to work – work that resulted eventually in *Index Medicus* and the National Library of Medicine, which publishes it.<sup>7</sup> To say, as some of his biographers have, that he was the father of the *Index* is underplaying his role. He worked unbelievably hard, taking home piles of journals after his hospital work in the day, reading them and marking articles for his copyist to transfer to file cards. It was a massive undertaking: the first volume of the *Index-Catalogue*, the forerunner of the *Index Medicus*, covered A to Berlinski and catalogued 34,604 articles. His first catalogue was published in 1872, and a full specimen appeared for criticism by the profession in 1876. This was well received, and Billings was joined by Dr Robert Fletcher to work on the *Index-Catalogue*, which Fletcher eventually completed as the *Index Medicus*.

After leaving the National Library of Medicine in Bethesda, Billings later carried out more bibliographic work while Director of the New York Public Library between 1896 and his death in 1913. He also found time to be on the advisory board of the Johns Hopkins Hospital, to draw up the plans for the hospital and to get it organised. ‘He was at once a sanitarian, statistician, war surgeon, student, narrator, medical historian, administrator, librarian, teacher, and architect’.<sup>7</sup> His obituary in the *BMJ* was written by William Osler<sup>8</sup> whom Billings had recruited to the staff of the Johns Hopkins Hospital.

## Billings’ 1881 address on the medical literature

Billings’ ‘address’ published in the *BMJ* in 1881 was based on his lecture to the seventh session of the

International Medical Congress in London in August of that year.<sup>2</sup> At the same congress, Rudolf Virchow gave ‘An address on the value of pathological experiments’ – an impassioned plea on the value of vivisection.<sup>9</sup>

The first couple of pages of Billings’ address are detailed bibliography: a quantitative summary of the world’s medical publications, with tables for the years 1879 and 1880. For example, in 1879, 45 books, 37 theses and 1270 journal articles were published in the field of obstetrics. This material is all pretty dry, and I read it more because I was amazed at the detail than gripped by the content. But Billings was not just a number-cruncher; towards the end of the first page, there is a clue to what will follow: ‘This merely quantitative classification gives of course no idea as to the character, and very little as to the value of the product’. After the tables, he says of his analysis, ‘It would of course be extremely unscientific to use these figures as if they represented positively ascertained and comparable facts, the accuracy of which, as well as of the classification, could be verified’. He acknowledges that, ‘If I had to do the work again, I should not obtain the same results’, and then begins a more general discourse on medicine that, excising a few anachronisms, could be published now.

### 19th century thoughts for 21st century medicine

In all the subsequent quotations from Billings’ 1881 essay,<sup>2</sup> the added emphases using underlining are mine. Here are some examples to illustrate Billings’ perceptive thinking:

...the statistical axiom must be remembered, that the results obtained from a large number of facts are applicable to an aggregate of similar facts but not to single cases.

Within the last ten years the literature of France, Germany, Great Britain, and the United States has contained much with regard to medical education and the means for its improvement. In all these countries there is more or less dissatisfaction with the existing condition of things, although there is no general agreement as to the remedy... even a fool knows that he must have the semblance of wisdom, and a diploma to imply it... but to ensure the value of a diploma as a proof of education is the difficulty.

From several sources of high authority there have come of late years warnings and laments that science is becoming too utilitarian... each generation being more and more bent on material interests...

The languid scientific [authority] who thinks it bad style to be practical, who takes no interest in

anything but pure science, and makes it a point to refrain from any investigations which might lead to useful results lest he might be confounded with mere practical men or inventors, exists and has his admirers.

The separation of biological study from practical medicine, which has of late years become quite marked in the literature of the subject, has its advantages and disadvantages. Thus far the former have far out-weighted the latter, and both the science and the art of medicine have been promoted thereby. But are not the physiologists... separating themselves too completely from medicine for the best interests of their own science, in that they are neglecting human pathology?

The tacit assumption is that all, or at least the most important, phenomena of human disease may be reproduced in the physiological laboratory. If this were only true, what a tremendous stride would have been taken towards making medicine a science. Unfortunately it is not so. Many of the most interesting of these phenomena—the most interesting because as yet the most unexplainable—can only be observed in the sick man himself.

The increase in both the amount and value of the literature of the several specialties in medicine is readily seen by a comparison of recent catalogues and bibliographies with those of twenty or thirty years ago, and this increase still continues at a greater rate than prevails in the more general branches. There are great differences of opinion as to the relative value of this increase, and as to its future effect upon the profession; but there can be no doubt as to the fact. There must be specialties and specialists in medicine, and the results will be both good and evil; but the evils fall largely upon those who have an insufficient general education.

What will libraries and catalogues and bibliographies of a thousand, or even a hundred years hence be like if we are thus to go on in the ratio of geometric progression which has governed the press for the last few decades?... there is coming a time when our libraries will become large cities, and when it will require the services of everyone in the world, not engaged in writing, to catalogue and care for the annual product. [But] the rate of increase is becoming smaller. [Less will come from Western Europe] and it is in America, Russia, and southern Asia, that the greatest difference will be found between [now] and... a century hence.

Growth and development in the physical world imply the changes of death [and] excretion and destruction of dead, outgrown, and useless matters... There is a vast amount of this effete and worthless material in the literature of medicine, and it is increasing

rapidly... A large medical library is in itself discouraging to many inquirers... [who first find themselves] fairly in the presence of a mass of material... [They should] console themselves... that much the larger part of all of our literature which has any practical value belongs to the present century, and, indeed, will be found in the publications of the last twenty years.

There are a few medical books written prior to 1800 which every well educated man should,—I will not say read, but—dip into, such as some of the works of Hippocrates and Galen, of Harvey and Hunter, of Morgagni and Sydenham; but this is to be done to learn their methods and style rather than their facts or theories.

Some practical advice follows for a worker (always 'he') wanting to seek information through a catalogue, and the difficulties of classification:

... often the title of a book gives very little information as to its contents, if indeed it be not actually misleading... There may be a book... on diseases of the lymphatics, which contains just what he wants; but, unless he know that his case is one affecting the lymphatics, he will hardly get the clue.

Fully realising the redundancy in the literature, Billings warns:

... when he comes to examine the books and articles referred to, that at least one-half of them... are dilutions and dilatations, reshapes and summaries of the really original papers.

Very many of the exhaustive and exhausting list of references which are now so common in medical journal articles have been taken largely at second-hand, and thereby originate or perpetuate errors.

... a [foreign] paper, translated and condensed in the London Medical Record, then appearing in abstract under the name of the translator in a leading journal, then translated again, with a few new circumstances, in a continental periodical, and finally perhaps reversed and appearing as an original contribution in the pages of the Little Pedlington Medical Universe.

Billings reminds us that:

A mere accumulation of observations, no matter how great the number, does not constitute science, especially if these observations have been recorded under the influence of the same theories, and in essentially similar conditions.

Billings then considers difficulties in the scientific basis of medicine:

The great obstacle to the development of a science of medicine is the difficulty in ascertaining what cases are sufficiently similar to be comparable; which difficulty is, in its turn, largely due to insufficient and erroneous records of the phenomena observed. This defect in the records is largely due, first, to ignorance on the part of observers; second, to the want of proper means for precisely recording the phenomena; and, third, to the confused and faulty condition of our nomenclature and nosological classifications.

He expands on these points, noting how the temperature chart, the balance and the burette have enabled objective measurement, but that much else 'we must still trust to our memory'. Presciently he writes:

the phonograph and microphone strongly hint to us the possibility of either accurately reproducing the sounds of yesterday, or translating them into visible signs, perhaps something like the dot and dash record of the telegraph code, which [could] be compared with each other by readers at the antipodes.

This leads into further discussion of how the methods of the physical sciences could be brought into medicine.

The next section is on difficulties of terminology, and by way of complaining about 'defective or misleading titles', he comes to the four rules of presentation which first drew him to my attention.

He knows also of fraud:

we find books and papers from men who are either constitutionally incapable of telling the simple literal truth as to their observations or experiments, although they may not write with fixed intention to deceive, or from men who seek to advertise themselves by deliberate falsehoods as to the results of their practice.

We think that medical specialisation is a recent thing, but it was ever thus. Billings writes:

A little over a hundred years ago, Haller in Göttingen was professor of anatomy, botany, physiology, surgery, and obstetrics, and lecturer on medical jurisprudence... To-day, any one of these branches requires all the time of the most energetic and learned of our contemporaries... [Nonetheless, he cautions] our actual progress is by no means in proportion to the work done.

He sums up by remarking how medicine has moved from being the guarded knowledge of its practitioners—‘the communication of the formula destroyed its power, and...attempts to reveal the secret must always fail’—to the time now, in 1881, when, ‘Every physician hastens to publish his discoveries and special knowledge, and a good many do the same by that which is not special, or which is not knowledge’. He concludes with quotes about the need to go on acquiring knowledge, ending with ‘a verse from the Talmud which will remind you of the first aphorism of Hippocrates... “It is not incumbent on thee to complete the work, but thou must not therefore cease from it”’.

Billings’ article lists just two references!

### Beyond Billings’ 1881 address

Five years after Billings’ 1881 address at the International Medical Congress, he addressed the British Medical Association as a representative of the American medical profession (their original choice had been Austin Flint, who had died<sup>10</sup>). Billings’ address again resulted in a long article in the *BMJ* but, titled ‘Medicine in the United States, and its relations to co-operative investigation’,<sup>11</sup> it was more a descriptive than a philosophical essay. There are, however, plenty of topical resonances. There is much about standards of medical education, reflections on the importance of experience as opposed to ‘book learning’, discussions of tests of qualification and of diplomas and the difficulties of providing doctors in rural areas of the USA. He presents numbers and maps for some diseases across the USA. Of the increase in cancer in general, which he judges a disease of ‘civilised’ countries, he writes, ‘How far this increase [in deaths from cancer] is a real one, and how far it is due simply to improvement in diagnosis, is a question yet unanswered’.

Billings asks how we know whether tests of medical qualification ‘affect the health and life of the people’. He writes:

Almost the only matter in which figures seem to demonstrate the importance of superior medical education and skill is in the statistics of deaths due to childbirth, and of the results of surgical operations.

This is expanded a good deal while he describes how diplomas are regulated in various states of the Union. In the course of this, he writes:

The work of the physician will not be lessened by preventive medicine; it will simply be required more for older persons, and for another class of diseases.

This lesson was not properly learned after the formation of the UK’s National Health Service, when it was thought that introducing universal provision would eventually reduce the need for medical care. The lesson has still not been learned.

And in case anyone should think that the woes of the medical profession in the UK today are unique: ‘Privately, and between ourselves, we grumble and declare that the country and profession are going to the dogs—nay, we must do so, or we should not be of true English blood...’

### Our debt to John Shaw Billings

Billings’ monumental work of classification and cataloguing came long before computers, which have made the work so much easier. We are now moving beyond simple collation to the ability of computers to link inferences in documents, the ‘semantic web’, ‘which should bring order to the 21st century web in the same way that Dr John Shaw Billings’s *Index Medicus* brought order to medical research back in the 19th century’.<sup>12</sup> But Billings was more even than the founder of collected medical knowledge, and he deserves to be remembered and read to keep our 21st century medical feet firmly on the ground.

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### References

1. Daroff R, Rossi A, Stevens-Ross LM and Rowland LP. Suggestions to authors. *Neurology* 1996; 46: 298–300.
2. Billings JS. An address on our medical literature. *BMJ* 1881; 2: 262–268.
3. Garrison FH. *John Shaw Billings: a memoir*. New York and London: GP Putnam’s Sons, 1951.
4. Arlington National Cemetery Website. See [www.arlingtoncemetery.net/jsbillings.htm](http://www.arlingtoncemetery.net/jsbillings.htm) (last checked 23 January 2018).
5. Phalen JM. Colonel John Shaw Billings: a many-sided genius. *Army Medical Bull* 1942. See <http://history.amedd.army.mil/biographies/billings.html>.
6. WRB. Nova et Vetera. *BMJ* 1938; 1: 796.
7. Marson J. John Shaw Billings as a bibliographer. *Bull Med Libr Assoc* 1969; 57: 379–390.
8. Osler W. John S. Billings M.D. *BMJ* 1913; 1: 641–642.

9. Virchow R. An address on the value of pathological experiments. *BMJ* 1881; 2: 198–203.
10. Flint A. A contribution toward the natural history of articular rheumatism; consisting of a report of thirteen cases treated solely with palliative measures. *Am J Med Sci* 1863; 46: 17–36.
11. Billings JS. Address in medicine. *BMJ* 1886; 2: 299–307.
12. Giustini D. Web 3.0 and medicine. *BMJ* 2007; 335. See [www.bmj.com/content/335/7633/1273](http://www.bmj.com/content/335/7633/1273) (last checked 23 January 2018).