Book Review

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J.C. Rigg, S.S. Brown, R. Dybkaer and H. Olesen. *Compendium of Terminology and Nomenclature of properties in Clinical Laboratory Sciences (Recommendations 1995).* Blackwell Science Ltd, 1995.

This volume, the *Silver Book*, prepared on behalf of the International Union of Pure and Applied Chemistry (IUPAC) and the International Federation of Clinical Chemistry (IFCC), is the first systematic and comprehensive guide to approved terminology and nomenclature for clinical chemistry and allied fields. The chief intent of the work is to harmonize and promulgate rules and conventions on quantities, dimensions and units.

Official recommendations published by IUPAC, IFCC, and other bodies, some of them not readily accessible to the scientific community, are here brought together and set forth in a unified format. The authors have exercised considerable editorial discretion in selecting material for inclusion and in coordinating recommendations from diverse sources. A voluminous bibliography supplies historical and authoritative underpinning.

This work is not just a bald catalogue of metrologic standards, but is a thorough treatment of the subject, including background information and definitions of terms pertaining to laboratory medicine, as well as valuable details on the history and philosophy of clinical laboratory metrology.

The marriage between laboratory science and practical medicine has never been altogether harmonious. Although workers in the two disciplines share essentially the same goals, they differ markedly in method and point of view. Medical interpretations and decisions tend to be far more qualitative, empirical and even subjective than those in pure science.

In view of the diversity of potential users, the *Silver Book* supplies definitions of terms and concepts in both pure science and clinical laboratory work. For the laboratory scientist, the authors provide an orientation to the clinical setting, with useful information about the processes whereby specimens are obtained, identified, and submitted for testing. The medical professional will discover that the goal of the work is not regimentation but international consistency and internal coherence in measurement.

Metrologic standards are prescribed for certain specialized fields (optical spectroscopy and spectrometry,

centrifugation, electrophoresis, and enzymology) having particular relevance to laboratory medicine. The *Silver Book* does not, however, pretend to be all-inclusive, much less definitive. Some branches of metrology have been passed over because a consensus on terminology and units has yet to be reached, others because they were not deemed sufficiently relevant to clinical laboratory work.

As the formal title of the book suggests, its recommendations are by no means limited to metrologic standards. Some narrow restrictions have also been placed on terminology. Terms such as activity, density, power and strength are rejected as ambiguous. Abbreviations are no longer acceptable for the names of chemical components, because some of these have more than one meaning, are not understood internationally or even across disciplines, or have been formed from obsolete terms. For example, TSH, universal shorthand for thyroid-stimulating hormone, is condemned because the latter term has supposedly been replaced by thyrotropin.

Although the *Silver Book* sets forth recommended standards, it does not undertake to persuade either laboratory workers or physicians and allied health practitioners to abandon deeply entrenched metrologic traditions, some of them rooted in the 19th century.

What kind of new units, standards and conventions are workers in laboratory medicine as well as physicians now asked to put into practice? A concrete example may help to clarify the type and extent of such changes.

Almost from the origins of modem clinical chemistry, concentrations have been recorded in units of weight (grams or submultiples of the gram) per standard volume (generally either one litre or one decalitre)—for instance, glucose: 124 mg/dL. By exception, ionic analytes such as sodium (Na^+) and bicarbonate (HCO_3^-) have in recent decades been reported in milliequivalents (mEq, based on molecular weight) to facilitate calculations of serum electrolyte balance.

Meeting the standards laid down in the *Silver Book* will require the following changes from current practice:

1 Concentrations (now called volume fractions) of most analytes must be reported in units based on molecular weight (now called relative molar mass) per unit volume. The only exceptions will be complex molecules or mixtures, for which a molar mass cannot be established; these will continue to be measured by weight. Applying the appropriate conversion factor to the glucose concentration given above, we get 0.688 mEq/dL.

2 The equivalent, or val, has been renamed the mole (mol). The glucose concentration thus becomes 0.688 mmol (millimoles)/dL.

3 Since the standard denominator, or volume unit, in a concentration is now one litre, our value for glucose must be restated as 6.88 mmol/L.

4 In line with Continental practice, the comma has replaced the decimal point: 6,88 mmol/L. (Using the comma to break up large figures into groups of three numerals—1,234,567,890—is no longer approved.)

5 A further change, though not yet required, appears extensively throughout the book and will no doubt become *de rigueur* in due course. This is the expression of an implied division, not with a slash mark, but by showing the denominator as a factor with a negative exponent: 6,88 mmol L^{-1}.

The first three of these changes have been put into effect by the publishers of a number of medical reference works and of some clinically oriented journals. But the 21st century will probably be well advanced before all these changes gain universal acceptance among clinical laboratory workers and physicians.

Even scientifically oriented workers may resist some of the innovations spelled out in the *Silver Book*. Everyone has trouble abandoning long-familiar language, units and symbols for new ones, but some of the standards proposed actually represent new ways of looking at physical reality. The language and perspective of systems-analysis theory is all-pervasive. The term constant is now restricted to 'universal constants of nature'. Hence, although molar number constant is approved as a new name for Avogadro's number, equilibrium constants are now expected to be termed equilibrium coefficients.

Among 'kinds-of-quantity of dimension one' (those in which exponents of dimensional terms are all zero), percentage and its symbol (%) are acceptable, but parts per million (p.p.m.) is not. Many old friends appear in unfamiliar guises. Density has become areic number, and specific gravity is now relative volumic mass. Specific heat has emerged from the furnace as massic kelvic enthalpy.

The language of this book is lean and rigorously precise. Even those who object to some of the recommendations as arbitrary or irrational must concede that the presentation of the material is clear and admirably coordinated. British-Continental spelling appears throughout: colour, litre, metre, titre; but: gram, kilogram.

Neither the *Silver Book* nor the recommendations of IUPAC, IFCC, and other bodies that it contains have any legislative force, unless they should be made mandatory by institutional or governmental authority. How fully the new standards will be voluntarily adopted, and by how large a segment of the scientific and medical world, remains to be seen.

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