Response to Mills’ comments on the SI notation

Mills gives a good overview of the organization of the International Bureau for Weights and Measures (BIPM), International Committee for Weights and Measures (CIPM), Consultative Committee for Units (CCU) and the International System of Units (SI), and of the challenges facing the CCU in deciding on notation, but does not address the key point of the original paper by Foster (2009). This paper is not about making the SI parsable for technical software, such as MATHCAD, which already incorporates unambiguous type representations of units and operators, allowing automatic quantity checking and unit simplification in quantity expressions. The paper is about the syntactic ambiguity of the SI notation in text, where this mechanism is not available, which affects all forms of written communication and all readers, not just technical SI users.

Mills suggested that the International Organization for Standardization (ISO) standards are primarily concerned with quantities, not units. This is not so. ISO 1000 is wholly about SI units and differed/differs from its contemporary SI brochures editions 6, 7 and 8 in allowing the multiplication operators ‘full-stop’ and ‘implicit’, both of which may cause syntactic ambiguities. ISO 1000 is not merely ‘a useful source of information’; engineers around the world have used it (or its national equivalents) as the sole source of correct SI usage since 1981, and its recommendations have unfortunately passed into general use. It is a ‘published’ (i.e. active) ISO standard, last revised in 1998. Its influence should not be discounted by the CCU.

Regarding the prefix ‘da’: while it is true that there is a SI syntactic rule prohibiting the concatenation of prefixes, it would greatly simplify parsing of the SI (and therefore reduce software design errors) if all prefixes were of single character.

Regarding the unit ‘cd’: while it is true that there is a SI semantic rule prohibiting the use of prefixes with the non-SI units of time (i.e. ‘centiday’ is deprecated), it would greatly simplify parsing of the SI if its notation was syntactically unambiguous. Clearly this requirement cannot be extended to all non-SI units, but it should extend to those non-SI units specifically admitted ‘for use with the SI’, such as the day (symbol ‘d’). Mills is concerned that specialists in photometry and radiometry would raise strong objections to any change in the symbol for the candela; while this may be true, it is at odds with the CCU’s own assertion of the importance of ‘taking a broad and profound view of the SI to ensure that it meets the needs of all users’ (BIPM 2005).

The accompanying comment can be viewed at http://dx.doi.org/doi:10.1098/rspa.2009.0047.
Mills argues that a ‘good system of units and conventions should be stable and familiar to all users’. This is a rather low hurdle for an important international system to clear. A broader view is that ‘In any field of science and technology, the relevant vocabulary should be descriptive, systematic, unambiguous, internally consistent and relatively stable’ (Dybkaer 1998). The original paper (Foster 2009) concentrates only on the ambiguity question, which seems to me to be a prime requirement for a notation, and expressly avoids discussing the many inconsistent and non-systematic features acknowledged by Mills, which may be inelegant, but which are second-order issues.

The CCU seems to favour stability over usability. This is its prerogative. In my opinion, improving a formal notation is not ‘tinkering’ (a rather pejorative term), but shows foresight in adapting to the changing requirements (i.e. the widespread adoption of computers) of its users, especially as the SI is declared to be ‘an evolving system’. In this regard, the CCU may be underestimating the flexibility of SI users. Citizens of industrialized countries are used to continual change in technology, society, legislation and workplace; for instance, rapid changes in currency, units and road laws have been completed successfully in Australia to achieve long-term benefits.

If the CCU is concerned about the ‘familiarity’ of the SI notation, the best impact it could have is to ensure the next version of ISO 1000 is harmonized with the SI brochure, so scientists and engineers have a common understanding of the correct notation.

The formal declaration of the SI in 1960 has been of immense benefit to the communication, safety and economy of science, engineering and commerce, but this does not mean that the SI notation should be immutable. Change can be presented positively, and is always best done sooner rather than later if the number of users is increasing; for instance, if the CIPM had taken the bold decision in 1960, to name the base unit of mass without a prefix (the grave and Giorgi, symbol ‘G’, were mooted), the 3 billion people born since then would have had the benefit of a more consistent and better structured system of units, and the rest of us would have adjusted to the idea.

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References
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