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Cover illustration

Large facilities in physics: how they came to be and their many roles. See the special report on the 1994 EPS Large Facilities in Physics Conference *(Lausanne; 12-14 September 1994), page 163.*

A Question of Tuning

The authors of a study of physics in the European Union plus Sweden and Hungary in the 1980s [*] rightly claimed that scientometric indicators, if properly used, are powerful measures of national research performance. They also spoke of the limitations. Publication activity varies greatly between subfields (theorists, for instance, tend to publish infrequently), so comparisons between subfields of publication counts to measure scientific productivity may lead to the wrong conclusions. Errors are magnified if one introduces the second basic indicator, namely the citation count that estimates quality, because citations represent only one measure of the use of scientific information. Moreover, citation patterns in different subfields vary even more than publication activity.

It is therefore of some concern to hear about reports from east and central Europe that scientometric indicators are being used by relatively anonymous evaluation panels as absolute measures of performance, in the sense that someone with an index below a certain level is not considered a suitable candidate for a position. Scientometric indicators were never intended for this purpose, but as one set of tools among many others.

Moreover, generating reliable indicators remains more of an art than a science. For example, most surveys of physics have up to now used first-generation bibliometric data, with articles and citations allocated to subfields on the basis of the journals in which they were published. The second-generation approach employed in the survey of physics in the European Union assigned each publication to one of 88 subfields on the basis of the *Physics and Astronomy Classification Scheme* (PACS) of the American Institute of Physics (AIP). This allowed for the fact that papers and citations published in a journal on say fluid dynamics can cover many fields.

Such considerations are not too important in well-established, relatively academic subfields. This can be seen from data published in an earlier report *(The Dutch Publication Output in Physics: 1978-1988)* from the same source as the European Union survey. It showed that the number of Dutch publications in mathematical physics, in nuclear physics, and in the physics of condensed matter, of fluids and plasmas, and of particles and fields, were the same for the two methods. But for less well-defined subfields, there was much less overlap (acoustics: 56% overlap; crystallography: 50%; spectroscopy: 33%).

Classification codes therefore clearly matter in generating accurate scientometric data for emerging areas of physics. The problem is that the level of refinement varies among the various other uses of classification schemes. Scientiometrics calls for a fairly course coding that rarely needs revision because sample sizes cannot be too small. Suppliers of bibliographic information *via* electronic databases, on the other hand, aim to offer efficient, finely tuned searches by subject and keywords. The INSPEC classification produced commercially by the UK's The Institution of Electrical Engineers (IEE) is therefore being updated at a fine scale, ready for the merger in January of the INSPEC database with Physics Briefs (see *EN*, September 1994) to give the world's largest bibliographic database in physics.

Even the emergence of the electronic age probably does not justify the considerable effort needed to ensure a continuous process of standardisation or harmonisation between the various classifications. Meanwhile, experts feel that physics has not evolved sufficiently to justify a major intermittent revision of the *International Classification Scheme for Physics (ICSP)* of the International Council for Scientific and Technical Information (ICSTI), which is seen as providing the basis for other schemes (it was last updated in 1991). However, authors, editors, analysts, and database operators probably hope that producers of the major classification schemes will collaborate to some extent, notably in "hot" areas such as high-temperature superconductivity and optics.

Finally, it would be unjust not to point out that the survey for the European Union found that Denmark had the highest citation impact from among the 13 countries evaluated, by virtue of excellent citation rates in all subfields except fundamental areas of phenomenology (it was indeed number one in most of the reviewed aspects).

P.G. Boswell

* W. Glänzel *et al., Physics in the European Union in the 80's* (FOM, Utrecht and ISSRU, Budapest) 1994.

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