

Mallard, Alexandre, Compare, Standardise and Settle Agreement: On Some Usual Metrological Problems, *Social Studies of Science*, 28(4), Aug. 1998, 571-601.¹

Mots-Clés/Keywords

Mots-clés standardisés (voir banque de données): Physique, stratégies expérimentales, sciences en général, techniques et technologies, aspects tacites, robustesse, calibration, SHS

Autres mots-clés : standardisation, normes, erreurs, négociations et ‘closure’, circulation et diffusion des savoirs, précision et pratiques scientifiques, SSK, vérité/erreur (aspects conventionnels de la dichotomie)

Domaine Objet/Domain & Topic

Physique (applicable aux domaines de recherche faisant grand usage de la mesure), métrologie, standards et normes (sociales, culturelles et juridiques), instrumentation et techniques afin d’élaboration de connaissances précises en sciences

Résumé/Summary

The paper tackles with the issue of precision in the sciences, more specifically with the various precision issues raised by, and during measurement practices. In Mallard’s narrative, the measurement practices enacted while at the elaboration of good measurement standards and norms are humanly made. Measurement standards and norms, Mallard argues, are the products of social negotiation processes wherein measuring instruments and practices are evaluated according to their knowledge capability and also mundane socio-cultural criteria such as the subjective social cross-evaluation of experimental evidence and calibration strategies. Mallard’s argument, an investigation of the dynamics of metrological networks, shows “that the achievement of precision measurement can take various forms and the word ‘metrology’, like ‘statistics’, covers a range of quite different phenomena” (p. 574). That is, metrological activities are not immune from influences from, but rather shaped by the settings wherein they are deployed. The case studies developed expand about practices in legal metrology, related to metrology as scientific discipline and to metrology as component of administrative and legal institutions.

Thèses, Organisation de l’Article/Thesis & Argument, Narrative Organisation

Mallard’s paper is divided in 6 sections. In his introduction (pp. 571-574), Mallard expands on the importance of measurement practices as practices crucially shaping modern science, measurement being hailed “the hallmark of modern science” (p. 571). He reviews the literature on the topic pointing out at a series of classic papers and authors on the issue (Hacking, Licoppe, Schaffer, Olesko, Hunt, Knorr Cetina, Collins, Latour), commenting on how the concepts and analyses proposed by authors of the sociology of knowledge trend suggest challenging metrological practices as affected too, if not configured, by socio-cultural issues.

¹ This paper is referenced in the PratiScienS bibliography under : Mallard, Alexandre, 1998, « Compare, Standardize and Settle Agreement: On Some Usual Metrological Problems », *Social Studies of Science*, 28(4), 571-601.

In “Pacified Metrology” (pp. 574-578), Mallard develops a case study on legal metrology. In this, he explores how the implementation of the standard legally enforced CO-CO₂ analyzer for the measurement of car gas exhausts meant much more work than a simple decision on the chosen standard, and implied too the distribution of standards for the local calibration of the analyser, and the creation of a complex network for the distribution and control of legally recognised CO-CO₂ analysers and of their proper use: set-up of procedures for the approval of models, the traceability of used instruments and their verification (distribution of standardised bottled gas samples necessary for the verification of analysers, ...), ...

“Looking for Stable Instruments and Standards” (pp. 578-582) is a critical commentary on the elaboration for a common standard sea-water analyser for oceanographic research. The scientists involved were confronted with the realisation of how the coordinated functioning of the many parts of sea-water analysers “involves many intermediary procedures and precautions relying on both explicit and tacit knowledge” (p. 579). Even with one instrument chosen as reference, replicating this chosen instrument led to diverse improvement efforts, and the de facto re-diversification of instruments’ technical capabilities. Attempts at turning around this issue through the fabrication of ‘standard sea-water’ supposed to fare uniformly on instruments did not deliver either due to debates as to what counts as sea water.

Next, “Capturing Metrology in a Laboratory” (pp. 582-587) expands on the issue of metrological trials, developing a case study on the Differential Optical Absorption Spectrometry (DOAS) air-quality control technology. DOAS technology, Mallard tells, is a problematically materially diverse technology. Smoothing differences and discrepancies and uniformising outputs inspired a laboratory testing of these field instruments. This metrological trial was however challenged by references to practices on the field. Mallard highlights here the importance of personal, tacit, judgemental abilities and skills by scientists – their “ordinary ‘intimate’ relationship” with instruments (p. 585) – as regards to the difficulties raised and experienced during trials.

“A Metrology without Standards” (pp. 587-594) is devoted to a last case study on metrological practices lacking the possibility to refer to pre-existing transportable standards and established authoritative calibration procedures. He expands on an intercomparison campaign among DOAS researchers, highlighting how the campaign was shaped up by the trust relationship between the scientists involved and their a priori willingness to see the campaign succeed. The distribution of power and authority among the scientists involved was also peculiarly symmetrical, esp. as compared to the usually asymmetrical situations of metrological assessments wherein the assessed instrument is expressly put in a “weaker condition than all the other well-calibrated devices used to produce and control the experimental conditions” (p. 588). Another factor shaping the campaign is the changeability of the rules invoked for comparison. Comparing instruments’ behaviours – through the comparisons of measurement graphs – led to discussion of preset experimental conditions, and other additional observed issues too. Work thus implied an “important interpretative role” by scientists (p. 593) due to the lack of comprehensive guide for the reading of graphs, and the diversity of experimental environments and equipment.

Mallard's conclusion (pp. 594-596) spells out his conviction that 'truth' is a problematic notion to apply to measurements. In his opinion, "measurements are never completely true, nor completely conventional, but precisely 'conventionally true,'" and it is crucial to "articulat[e] the natural [...] and social [...] character of precise measurement" (p. 594). His closing comments sum up how the various configurations of the precision social collectives described show how what counts as true depends on issues such as measurements' 'closeness' to socio-culturally recognised values, even if the scientific legitimacy of these are challenged as only approximate.

Démarche/Approach

Assembly of SSK-like case studies on practices leading out to philosophical comments

Apports Spécifiques/Specific Inputs:

1/ As regards to the issue of scientific practice, the paper is very interesting; it relates how good validated measurement practices - and the knowledge claims related - are not only evaluated using 'truth'-evaluating procedures. They also enact socio-cultural value systems, either through the persons (scientists, metrologists, users) involved in the evaluation process or through the very (unavoidable) situatedness of the conditions for instruments' validation (experimental conditions etc.). 2 categories of issues are mainly discussed here:

- Material issues with the instruments themselves, with the way they are potentially (mis-)used, with the environments in which usages and validation procedures are deployed.
- Socio-cultural issues as regards to what counts as good practice. Mallard especially makes interesting comments in the last section as regards to how putting authority in the hands of a selected group of scientists and/or metrologists crucially affects.

2/ An issue partly evoked here is that of quantification as shaper of the validity of a scientific procedure or practice. While Mallard comments it in interesting terms in the introduction, the topic is however left out of the remaining of the paper and becomes a background issue, Mallard commenting little on how the 'quantified' presentation of the measurement output may influence their social validation and the elaboration and pursuit of calibration procedures.

3/ Good references and round-up of the literature on measurement/standards/norms issues, also referring to the literature on metrology and also to sociology of knowledge papers in relation to this issue. Among the references cited by Mallard:

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