Title:
The measurement of properties in the Engineering Sciences

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Abstract:
The philosophy of science usually focuses on the epistemic role of measurements, in particular, in testing theories. Against this background, the theory-ladeness of empirical knowledge produced in measurements has been one of the major concerns.

From the perspective of the engineering sciences, some other philosophical issues are raised. Measurements provide qualitative and quantitative information about properties of the target system under study. However, most properties only become manifest by means of specific technological instruments and procedures. What is more, information on properties results from interactions between the measuring instrument and aspects of a target system. The more technological instruments we invent, the more properties and processes become manifest. We only have to take a look at the famous Handbook of Chemistry and Physics to see how many properties of materials have been established. Every physicist knows that the manifestation of these properties is dependent of the technological procedure for measuring them. Therefore, the description of such properties usually has the character of an operational definition, which means that it encompasses aspects of the measuring instrument and procedure.

In the engineering sciences we are interested in properties and processes for their roles in the functioning of technological artifacts. Put differently, the functioning or dysfunctioning of a technological artifact is usually conceived in terms of properties or processes that determine its functioning. Also, conceiving of possible improvements of a technological function, or even, creating new functions often is in terms of properties or processes.

A simple example is scientific research for the development of paint. The technological function(s) of paint include qualities such as protecting a surface, workability in its application, durability and esthetic qualities. The manifestations of these technological functions involve perceivable and/or quantifiable properties of paint such as its color, its viscosity, and its fastness of drying, its adherence to a surface, its smoothness, its shininess, its hardness, and the stability of these properties. Hence, these are the properties that manifest (or display) the technological function. Examples of manifestations of technological dysfunctions of paint are properties and processes such as the tendency to maintain ripples, the increase of viscosity when applied at higher temperatures, the tendency to capture air-bubbles, the toxicity of the solvent, formation of cracks in hardened paint, and the tendency to turn yellowish under the influence of sun-light. Hence, for a technological
artifact to perform its technological function(s), we aim at producing the properties or processes that are manifestations of its proper functioning, and prevent or change the occurrence of those that are manifestations of its improper functioning.

In this talk, I will explore how (the development of) instruments and procedures for measuring (and manifesting) properties and processes of a target-system is related to the development (production, improvement, etc) of technological functions.