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Fundamental concepts of metrology in the perspective of the International Vocabulary of Metrology

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The opinions expressed here do not necessarily represent the view of Joint Committee for Guides in Metrology (JCGM) Working Group 2 (VIM)

Data deluge

Reliable information

Measurement

“This is an opinion”

“This is a measurement result”

How can the difference be justified?

(*“measurement” is not a trademarked term*)

It is not a matter
of truth
or of quality

It is a matter
of **public and transparent**
statement of reliability

Establishing how reliable a measurement result is depends on:

- the connection between the result and what is measured
  (*that is why measuring instruments are improved*)
  → **Objectivity**

- the shared understanding of the result
  (*that is why metrological systems—including systems of units, measurement standards, traceability chains—are improved*)
  → **Intersubjectivity**

For measurement to serve society effectively,
measurement results must be consistently understood
across countries, cultures, economies, …

For example, we communicate the reliability of measurement-related processes, procedures, instruments, and results using terms such as uncertainty, error, accuracy, trueness, precision, sensitivity, selectivity, …

But what exactly do we mean by these terms?

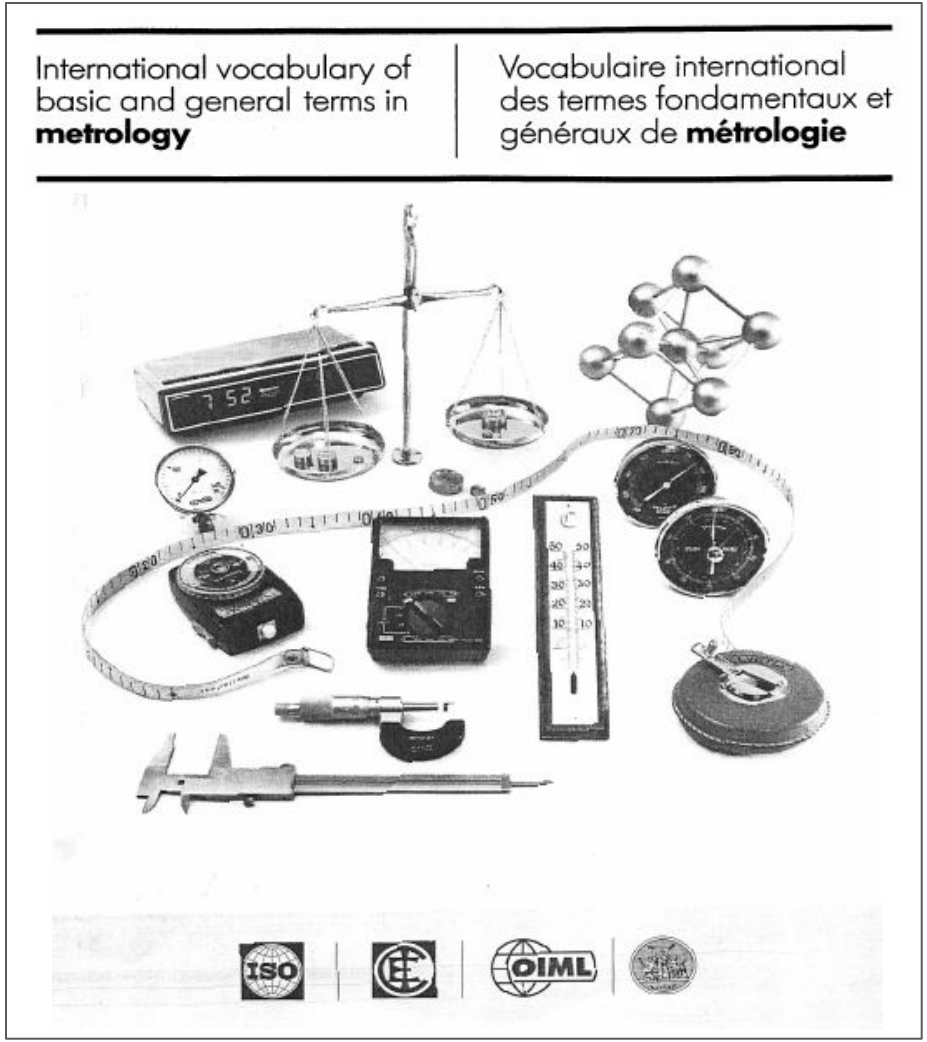
Measurement is something we do, not something we find in nature:
we cannot turn to nature for an answer

1984

This Vocabulary has been prepared simultaneously in English and French by a joint working group consisting of experts appointed by:

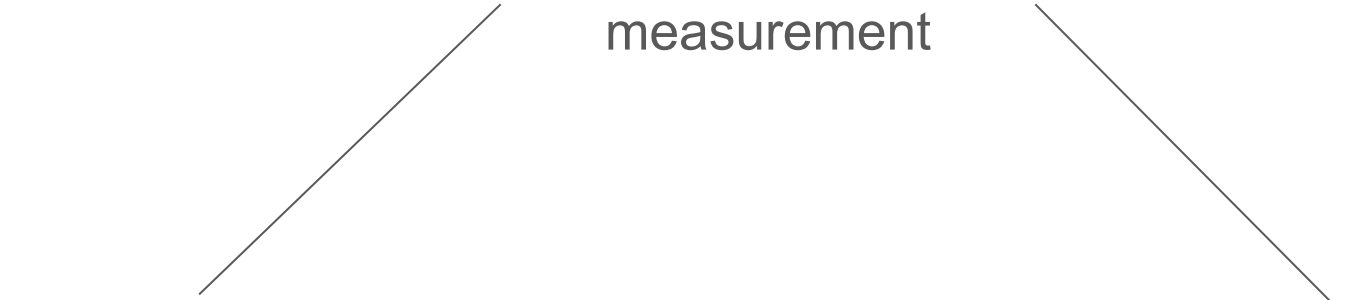
BIPM	International Bureau of Weights and Measures
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
OIML	International Organization of Legal Metrology

The Vocabulary is published in the name of these organizations.



(**definitions** expressing **concepts**
in a body of knowledge)

what we know about
measurement



the English term
“measurement”

(**terms** in
a language)

a measurement

(**entities** in
the world)

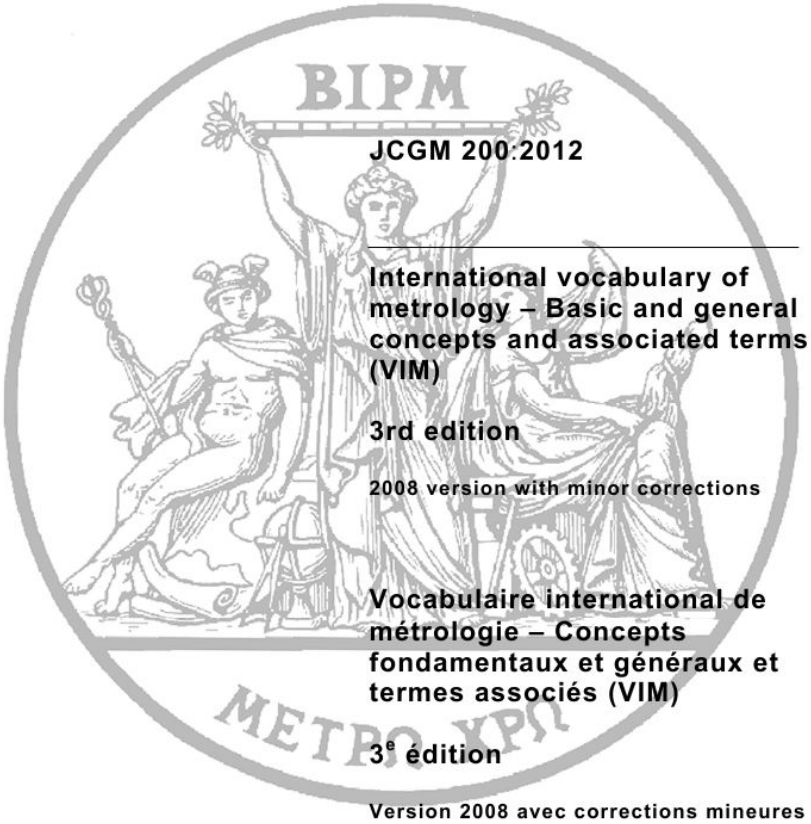
A **vocabulary** is then also a **concept system** and an **ontology**

Ten years later: Joint Committee for Guides in Metrology

The current membership of the JCGM:

- the two inter-governmental organizations concerned with metrology:
  - the Bureau International des Poids et Mesures (**BIPM**)
  - the Organisation Internationale de Métrologie Légale (**OIML**)
- the two principal international standardization organizations:
  - the International Organization for Standardization (**ISO**)
  - the International Electrotechnical Commission (**IEC**)
- three international unions:
  - the International Union of Pure and Applied Chemistry (**IUPAC**)
  - the International Union of Pure and Applied Physics (**IUPAP**)
  - the International Federation of Clinical Chemistry and Laboratory Medicine (**IFCC**)
- one international accreditation organization:
  - the International Laboratory Accreditation Cooperation (**ILAC**)

The International Vocabulary of Metrology



https://www.bipm.org/en/committees/jc/jcgm/publications

But why should it be updated?

International Vocabulary of Metrology

Fourth edition – Second Committee Draft (VIM4 2CD)

31 July 2023

The contents of this document shall not be quoted in any publication

https://www.bipm.org/documents/20126/115700832/VIM4_2CD_clean/c6d0dfb2-ddbf-059e-1f74-9b025c9c59d8

Metrology is a moving target

An example: what is measurement?

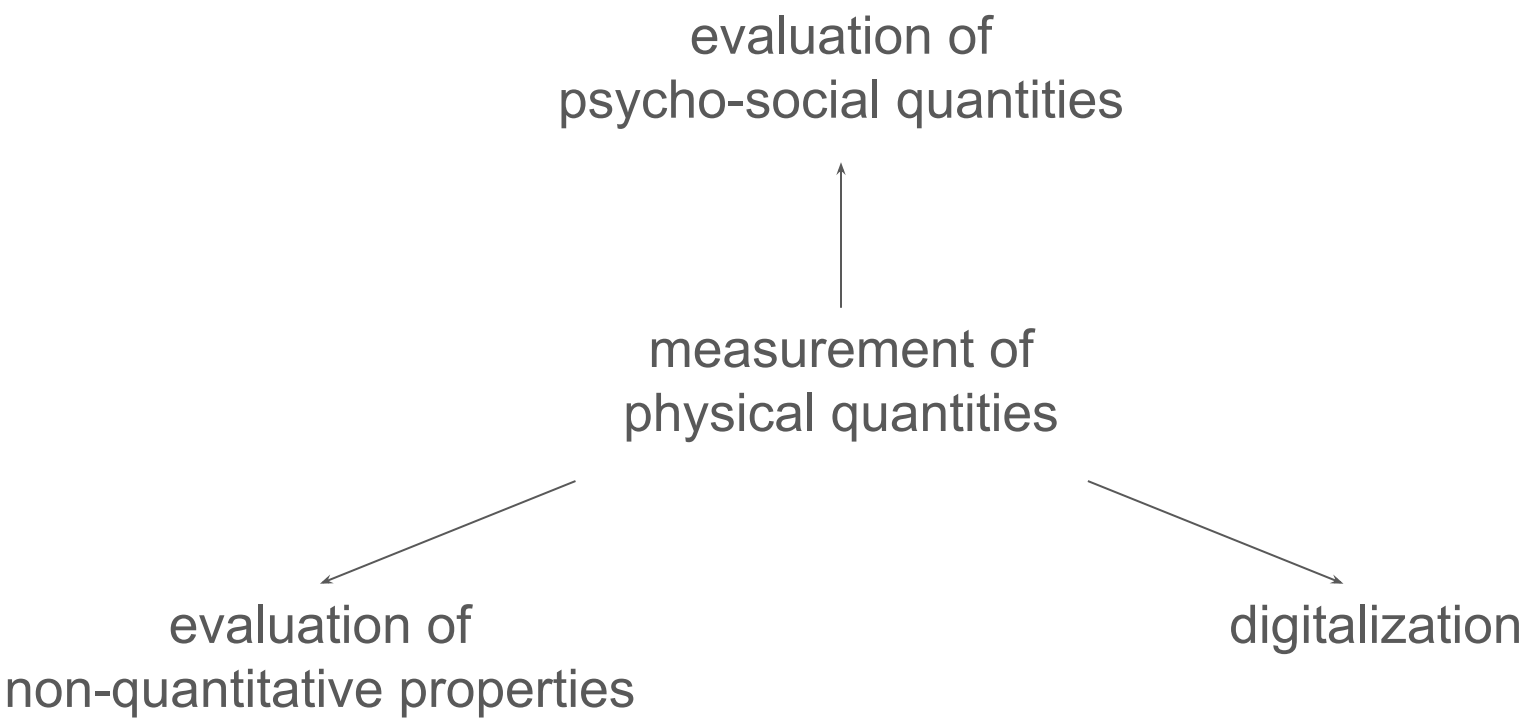
"weights and measures"?

‘‘mensuration": "the part of geometry concerned with ascertaining lengths, areas, and volumes" (OED)

[VIM1] "set of operations having the object of determining the value of a quantity"

[VIM2] "set of operations having the object of determining a value of a quantity"

[VIM3] "process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity"


evaluation of
psycho-social quantities
measurement of
physical quantities
evaluation of
non-quantitative properties
digitalization

Thank you for your attention

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