

Objective Description in Physics

What is it? What good is it?

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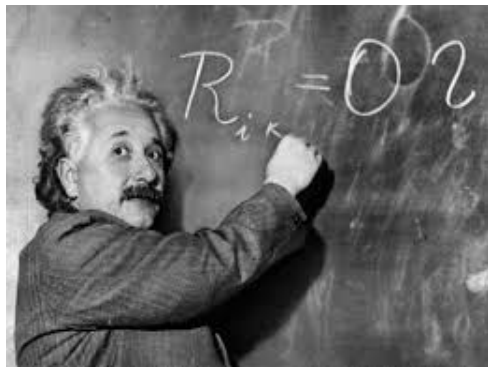
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- Objectivity as a concrete scientific virtue
- The demand for objectivity as a norm for choosing research paradigms
- In public discussion, the sciences (and esp physics) are taken as the paradigm of objectivity
- Two pictures of objectivity: Einstein (mind of god) versus Bohr (unambiguous communication)

Outline

- 1 Einstein's divine aspiration
- 2 Bohr on objective description
- 3 Who is the realist about quantum theory?



"I want to know God's thoughts, the rest are details."

Bernard Williams: the absolute conception



“What God has given us, according to Descartes, is an insight into the nature of the world as it seems to God, and the world as it seems to God must be the world as it really is.” (p 196)

“... a conception of reality as it is independently of our thought, and to which all representations of reality can be related.” (p 196)

“If what they both have is knowledge, then it seems to follow that there must be some coherent way of understanding why these representations differ, and how they are related to one another.” (p 49)

North Atlantic Metaphysical Madness theory without convention



$$T_1 \quad \forall x \exists y Rxy$$

$$T_2 \quad \forall y \exists x Rxy$$

$$T^+ \quad \text{there is a serial relation}$$

coordinate free description

science liberated from language

“The semantic view of theories makes language irrelevant to the subject”
(Bas van Fraassen)

“In our discussion, a model is not such an interpretation [i.e., not an Σ -structure], matching statements to a set of objects which bear certain relations among themselves, but the set of objects itself.” (Lisa Lloyd)

$$\{\{a, b, \langle a, a \rangle\}, \{\langle a, a \rangle\}\}$$

Summary: the Einstein view of objectivity

- 1 The absolute conception (Williams) / view from nowhere (Nagel) / god's eye view (Putnam)
- 2 Theory without conventions
- 3 Spacetime description without coordinates
- 4 Theory without language
No need for coordinative definitions
- 5 Perfectly natural properties and relations (Lewis, Sider)
Don't depend on our interests (as Nelson Goodman suggested)

Summary

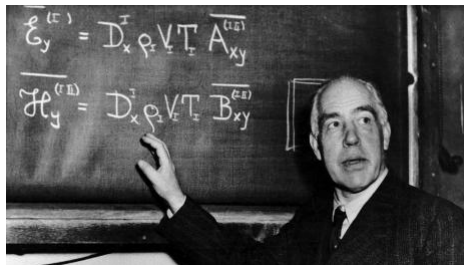
In the limit, objective descriptions are:

- ① empirically ambiguous (description without a describer)
- ② impossible in principle (speech without a language)

And yet, objectivity is a value

Proposal: objectivity is a relative value

objectivity as univocity



“Every scientist is constantly confronted with the problem of objective description of experience by which we mean **unambiguous communication**.”

“We must strive continually to extend the scope of our description, but in such a way that our messages do not thereby lose their **objective or unambiguous** character.”

objectivity as univocity

“... the account of the experimental arrangement and of the results of the observations must be expressed in **unambiguous language** with suitable application of the terminology of classical physics.”

“... our task must be to account for such experience in a manner independent of individual subjective judgment and therefore objective in the sense that it can be **unambiguously communicated in ordinary human language.**”

objectivity as intertranslatability

“The relativistic description is also objective inasmuch as every observer can deduce by calculation what the other observer will perceive or has perceived. For all that, we have come a long way from the classical ideal of objective descriptions.”

⇒ bringing harmony to apparently disagreeing perceptions

objectivity as intertranslatability

When are two first-order theories T_1 and T_2 intertranslatable?

- 1 (Montague) If the relation symbols of T_1 can be reinterpreted as relations in T_2 , and the relation symbols of T_2 can be reinterpreted as relations in T_1 such that ...
- 2 (Morita) If the quantifier phrases of T_1 can be reinterpreted as ...

standards for good translation

- Not purely arbitrary

If arbitrary, then ultimately there are no standards, no truth, no good science and bad science

Already building upon aeons of shared communication

Empirical reality is our guide

- Not a simple fact

Why is this level better than the former?

The problem of the infinite regress of meta-

Summary: Bohr on objective description

- 1 Objectivity is all about **unambiguous** communication
- 2 Unambiguous communication requires creation of a separation line between subject and object
i.e. clearly delineating the object of inquiry
What are we talking about? How does what you're saying play out in terms of actions and reactions?
- 3 Such a delineation cannot happen at a purely intellectual level; it happens through our interactions with the world

The old new story

The Copenhagen (or collapse) interpretation is bad because it involves an **observer** as a primitive

The many-worlds interpretation is good because it simply says: the world is like this — a wavefunction, evolving in time according to the Schrödinger equation

The new old story

The many-worlds interpretation is bad to the extent that it fails to tie the relevant mathematical objects (e.g. wavefunction) down into the shared world of our experience

To interpret quantum theory is to explain how to use it (Healey,)

Lessons

- 1 There is no product of scientific activity (e.g. theory, model) that in itself is objective
- 2 There are more or less objective *processes of inquiry*, and *modes of communication*
- 3 Ironically, the limit of objective description (i.e. pure math) is again empirically ambiguous
“The world is modelled by the number 42!”
“The world is a four-dimensional Lorentzian manifold!”
- 4 To communicate unambiguously, one must anchor the description in the world of shared experience