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Naturwissen-
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Prof. Dr. Reinhard F. Werner

**Institut für Theoretische Physik
Leibniz Universität Hannover**

“Unschärfe von Heisenberg bis heute”

**Thursday, January 23, 2020, 4:15 p.m.
Building C6 4, Lecture Hall II**

The uncertainty relations are part of every quantum mechanics course. Yet the relation that is usually presented, i.e., a constraint on the variances of position and momentum measured in the same state, has little to say about the situation Heisenberg is actually discussing in his seminal paper. He presents his famous example of a microscope to show that an approximate measurement of position necessarily disturbs the momentum. This connection has for a long time been part of the folklore, and sometimes illustrated by examples, but was not made precise. It has even been claimed to be false. In this talk we show, on one hand, how measurement uncertainty, including the error-disturbance tradeoff, can be made as precise as the usual preparation uncertainty relation. The definitions work for general pairs or sets of observables, but the computation of optimal bounds can be hard. On the other hand, we go back to a careful reading of Heisenberg's paper and trace how much of these ideas can be found there. We will see that he was much more interested in heuristics than in quantitative relations. He certainly got the heuristics right, but his quantitative claims were not even wrong, i.e., there is nothing that could be refuted.

References on arXiv.org: historical: 1904.06139, results: quant-ph/0405184, 1312.4392, 1505.00049, 1601.03843, 1604.00566, 1604.00382, and in progress.

Host: Jürgen Eschner (58016)

Interested people are cordially invited

Coffee at 4:00 p.m. in front of the Lecture Hall

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