Two brief remarks on Martin Carrier's paper

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The first remark is the following: is Martin Carrier's reflection on incommensurability relativistic or realistic? A short sentence stroke me: "incommensurability is real". It is like a profession of faith and I know that Kuhn never defines himself as a relativist but as a realist. However I am forced to recognize that, in comparing the theories of Lorentz and Einstein, Martin Carrier never uses the term false or true. If I understand his point of view, he considers that the two theories were a priori relevant.

As a physicist, I think that the Lorentz theory was false and that the Einstein theory is true. When Lorentz supposes that the initially spherical electron becomes, when it moves a flattened ellipsoïd due to the action of the ether, it was simply a misconception. And Poincaré, in his desire to save the hypothesis of Lorentz, tried also to analyse the interaction of the electron with ether in the same terms. They considered both that the contraction of distances was due to a mechanical effect and consequently were unable to construct a theory which facts which hold together. Even if they deduced the exact shape of the so-called "Lorentz-transformations" (and that just before Einstein), their goal was restricted to a verification of the relevancy of the Maxwell equations of electromagnetism.

On the contrary, Einstein was true when he deduced the Lorentz transformations as a result of the attempt to measure distance and duration between events from different point of view, from different frames.

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So, cannot we say that incommensurability could be a mask for hidden relativism (in the sense of philosophy of science)?

My second point is to agree with Martin Carrier and Kuhn about the semantic perturbations which arise during the passage from a theory to a new one. For Martin Carrier, these semantic perturbations result in the untranslatability of the two competing theories : indeed, between Lorentz and Einstein, it was like a dialogue of the deaf.

However, let me give two other examples where I consider that the situation is less clear.

In 1925, Werner Heisenberg was the first to realize the passage from the theory of quanta (Einstein, Bohr) to the quantum theory: a system is no more described in terms of a representation which is always an intuition (*Anschauung*) of the reality, but in terms of symbolic entities : Heisenberg and Born used matrices, Schrödinger wave functions, Dirac bra and ket vectors. These entities play the same role in the theory. In spite of a "representation" (*Vorstellung*), we have a "representant" (*Repräsentant*).

This shift is quite explicit in the papers of Heisenberg and Dirac but appears as problematic in the papers of Schrödinger. I think that it plays an important role in the birth of the quantum theory and constitute a kind of epistemological rupture. Instead of the word "shift" which is used by physicists to analyse the changes in wavelength of the lines in spectroscopy, it is perhaps more relevant to use the term "displacement' (*Verschiebung*) employed by Freud in his first topic.

Second example : a few years after the birth of quantum theory, chemists began to be interested by using this theory to describe diatomic or polyatomic molecules. A physicist of Göttingen, Friederich Hund, and an american physico-chemist, Robert Mulliken, invented the theory of molecular "orbitals". They explicitly abandoned the term "orbit" used by Bohr to describe the trajectories of electron around nucleus. This small displacement indicates that it was incorrect to localize electron but that it is only possible to deduce the more probable zone where you can find it.

I took these two examples to show that this notion of displacement entails the fact that it is possible to translate the concepts of the theory of quanta in the quantum theory.