McGILL UNIVERSITY

Foundations and Philosophy of Science Unit

Montreal, 21. 12. 1971

Professor Carl G Hempel
Princeton University

Dear Professor Hempel

I was moved but also worried by your Bucharest lecture, and now by your paper in the 4th volume of the Minnesota Studies. Moved by your intellectual honesty - such a scarce commodity these days. Worried because you seem to have dismissed an important problem and, by so doing, have unwittingly joined the ranks of the nihilists. Let me explain.

You have participated, with admirable clarity and candor, in the criticism of one approach to the solution of the problem of interpreting theoretical terms, namely, the empiricist approach. Since this particular approach has failed, you have come to the conclusion that the problem itself was misconceived from the start. Which takes you undesirably close to the anarchistic (quasi irrationalistic and nearly spiritualist) philosophy of science, whose only merit is that it keeps constructive people on their toes.

I think the problem is a very real and important one for the practising theoretical scientist. (I have lived with this problem, as a physicist, for many years.) He faces every day the problem of "reading" his formulas in terms of things and their properties. He knows intuitively that every mathematical formalism can be interpreted in any number of ways: he knows this because he meets the same equations, with different meanings, in different fields of research. The scientist tries to solve this problem to the best of his ability. But the problem happens to be half scientific, half semantic. And he has no viable semantical theory to help him out. So, he relies either on naive realism or on old fashioned operationism. The philosophers have forsaken him: they have not built a semantics of science, one suitable for live scientific theories. They have been too busy with ideological programs, such as ramseyfication.

I suggest not only that the problem is a genuine one but also that it can be solved at least in part. I believe the solution lies in trying an alternative semantic policy, namely critical realism. The way to implement this other policy is to add, to the formalism (or calculus) of a scientific theory, semantic formulas of two kinds: (a) rules of denotation stipulating what the concepts refer to, and (b) semantic assumptions saying what aspects of the referent the construct represents. For example, in the case of Maxwell's

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electromagnetic theory we will say that "E(f, x, t)" refers to an electromagnetic field f and represents the strength of its electric component at the point x and the instant t. This is enough to indicate the referent of the symbol; as to its sense, it is given by the very equations in which it occurs. Since meaning may be taken to be just reference cum sense, we have specified the meaning of "E". With one important qualification: such a specification, far from being exact and complete, is just a sketch. But this is all we need.

I have tried to live up to such a realist semantics by proposing axiomatic systems for a number of fundamental physical theories, in my Foundations of Physics (Springer '67). I still have to be shown that this method is not viable. What that book does not contain is a full fledged semantic theory. This is the subject of a book in preparation, Meaning and Truth in Science.

To sum up: the problem to which Carnap, you and others have devoted so much effort and ingenuity was not a pseudoproblem, but is still an important problem for both scientists and philosophers of science. And it can be solved, albeit not in a complete way.

I should greatly appreciate learning your reaction to this telegram.

Sincerely yours

Mario Bunge

P.S. Achinstein was wrong in your discussion with him (Minnesota Studies IV, 224). Bohr's theory contained at least three new terms (concepts): those of quantum number(s), stationary orbits, and Planck's constant. None of them belonged either to classical electrodynamics or to the previous atomic theories.