viable sense of "observe directly," observables do have this nature and that the common-sense framework is incompatible with current scientific knowledge, and must, therefore, be abandoned when our goal is to get as close to the truth as possible. That he is entirely correct is, I believe, as certain as any of our other current knowledge, but this view will not be defended here.

In this paper an attempt has been made to apply Russell's principle of acquaintance and some of his work on descriptions, augmented either by use of the Ramsey sentence or by model theory, to some of the main problems of the theory of scientific theories. The problem of the meaning of theoretical terms has been eliminated while, at the same time, a means of explicating a realist interpretation of theories is provided. The approach also yields an explication of the view of Russell and others that our knowledge of the physical world is limited to its purely structural aspects. A framework for a view that might be called "structural realism" is thereby provided.

JOSEPH MARGOLIS

Notes on Feyerabend and Hanson

I should like to make some very schematic points, largely about Feyerabend's views, in part about Hanson's, with a view to raising certain fundamental questions.[1]

Feyerabend asks us to consider a case in which there are two incompatible theories T and T', from which, respectively, C and C' are derivable and are, in the language of T, observationally indistinguishable. In addition, another observational proposition M is derivable from T' but not from T. We are to suppose that M is true, from which we are to conclude, in this context, that T is refuted. Let us concede the case and consider the implications. One must suppose that if M refutes T and is an observational statement, then the meaning of M remains constant for T and T'. But if it remains constant for T and T', T and T' being incompatible, M cannot be theory-laden in the sense that the meaning of the observational terms of M cannot depend on the incompatible theoretical statements that are being tested. In general, if the competing theories are construed as entire systems that are tested by M, the observation statement M is theory-free in that the meaning of its terms does not depend on the meaning of the theoretical terms of those systems. Alternatively, the testing scientist must possess a language L in which the incompatibility of T and T' may be identified as well as the refuting force of M. This must be true even if M is incommensurable with the concepts of T, so that no expectations whatsoever regarding M may be formulated from the vantage of T. But to say this is to say that observation statements may be theory-free, in the relevant sense.

Now, it is altogether reasonable to say, as Feyerabend has said, that one has no satisfactory theory of meaning that squares at once with the change in theory from T to T', the indistinguishable nature of C and C' from the

point of view of T, and the fact that M refutes T, is incommensurable with the concepts of T, and is derivable from T′. This may be fair; but if it is, it is not in keeping with this very concession to insist that observation sentences are theory-laden or that theories somehow unilaterally generate their own observation vocabularies. These are simply reverse sides of the same coin: not to have an account of the one is not to be able to assert the other. Nevertheless, there may be a sense, utterly different from that which apparently is to obtain in Feyerabend's instance, in which observation sentences may be said to be theory-laden. The difficulty lies in making this sense precise, though it is important to note that its clarification cannot possibly depend on the sort of instance Feyerabend has asked us to consider. Furthermore, the question cannot possibly be a question for science since, in the respects in which science is at stake, as we have seen, observation sentences must be theory-free.

As to Hanson's account, I take it that he would not subscribe to the view I am attributing to Feyerabend. In any case, it strikes me that his own illustrative example, the development of fluid mechanics, argues that observational terms may be theory-free in the sense alleged, precisely because, on his own admission, there were no relevant theories available that might have borne a relationship to observation sentences at all like that obtaining in Feyerabend's example.

Please notice that I do not say "relatively theory-free" but rather "theory-free" simpliciter. The notion that an observation language is *relatively* theory-free or theory-laden must relate to some sort of philosophical analysis of the observation language of science that is, for such issues as Feyerabend and Hanson raise, theory-free simpliciter. The argument does not require, however, that one must be able to enumerate individual observation sentences that are or remain theory-free forever, nor does the argument deny that particular observation terms may be shown to depend on changes in the meaning of theoretical terms. Alternatively, to demonstrate that in fact certain observational terms are altered in meaning presupposes once again that, in the relevant sense, our observation language is theory-free.

The beauty of the argument, if it is a genuinely good one, is precisely that it avoids a hasty solution of the vexed question of the distinction between changes in meaning and changes in belief. To put the point in the form of a dilemma: Either T cannot be refuted on the strength of independent observations (however conveniently provided by attending to the

implications of some competing or incompatible theory) or else the view, relevant in our context, that observation statements are theory-laden is itself incoherent.

On the philosophical or second-order question of whether observational terms are theory-laden, it must be conceded that if observation sentences are used to talk about the world, changes in the meaning of observation terms cannot be said, as such, to effect changes in the observables themselves. Moreover, observational terms whose meanings may admittedly change (and, in some cases, ascribably to the effect of changes in the meaning of theoretical terms) must be acknowledged to be theory-free in the sense that they are used in sentences in order to speak about observables that remain identifiably the same despite such changes in meaning. Feyerabend concedes that observables themselves, e.g., hands, operations, pointer readings, machinery, will not change in spite of the fact that our description of these observables, infected by the alternative theories to which we subscribe, may change as well as our theoretical concepts. He fails to see that if he concedes, as he must, that these observables will remain the same, there must be some residual descriptive language that is theory-free (in the relevant sense) in virtue of which the identity of such operations, machinery, and the like may be detailed.

As a first approximation to a satisfactory account, I suggest that when we speak of terms as theory-laden in the context of science we should consider the history and analysis of the use of these terms distributively; and that when, in the same context, we speak of terms as theory-free, we should consider the function of the entire set of observation sentences that compose our language as in testing the tenability of competing theories. "Theory-laden" and "theory-free," therefore, are not, in this context, coordinate expressions. But to say this is to take the bite out of the charge that our observation language is theory-laden.