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I. Summary of the general view held by Professors Feyerabend, Hanson, Kuhn, and Toulmin: scientists who accept different theories cannot see the same things. 1

II. I consider Hanson's position in detail. For Hanson scientists in different traditions see different things in the sense of 'see' relevant to science. I reconstruct and evaluate his argument. 3

A. I summarize his position and reconstruct his argument. Two cases: 'sees that' means 'knows that' or 'believes that'. 3

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A. Revision of beliefs as to the essential properties of experience would be precluded. Progress would thus, in this sense, be precluded. 21

B. Different traditions could not be rivals or alternatives. 22
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D. Observations presuppose, and are laden with, the particular theory of the time. Therefore, no theory could be tested or falsified. 25
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III. Another argument for meaning change is similar to II. However, we will weaken the conclusion; we will not interpret it as concluding that there has been a *radical* change of meaning or as assuming a distinction between essential and inessential relations. It employs a criterion to determine meaning change. 42

A. The antecedent of the criterion requires a consistency condition. If one adds it, however, the result is merely a sufficient condition for *either* a change in the meaning of the terms *or* the mutual inconsistency of the theories employed. 43

B. The criterion, further, leads to a logical contradiction assuming it has been used to affirm a change in the meaning of a term. 43

IV. Feyerabend has proposed a recent criterion of radical meaning change which hinges on category change and change of extension. 44

A. The application of the criterion rests on being able to refer to unique rules which allow an unambiguous classification of the objects involved. Yet, such rules, in general, vary with the context and our purposes and are not unique. Indeed, the criterion does not support Feyerabend's conclusion that a radical change of meaning occurred in the transition from classical mechanics to general relativity. 44

B. Further difficulties with this criterion: 46

1. One of its implications is untenable in that a sufficient condition for meaning change entails stability of meaning. 46

2. A more viable modification of Feyerabend's criterion. It meets my objection of IVB1 but first, does not support one of Feyerabend's historical conclusions and second, neglects operation and magnitude terms. 47

Conclusion: The proposed arguments and criteria for radical meaning variance have failed. 48

Chapter 3: The Methodological Undesirability of Adopting a Position of Radical Meaning Variance 50

The radical meaning variance position has several methodologically undesirable consequences which are not avoidable.

I. An examination of some examples, which have been put forward to illustrate and suggest the radical meaning variance position, points up difficulties. Instead of confirming, these examples instead suggest the falsity of the radical meaning variance position. Hanson's discussion of Brahe versus Kepler is incorrect for two reasons. For the same reasons similar examples adduced by Feyerabend, Kuhn, Toulmin, and Smart, are implausible. 50

II. The first methodologically undesirable consequence of the doctrine of radical meaning variance: no theory could contradict or agree with another; two different theories could be neither consistent nor inconsistent with one another. 52

A. This consequence has revisionary, not descriptive, implications for the history of science: Bohr, Lavoisier, Priestley. Most radical meaning variance theorists claim, however, to be descriptive in such matters. Many scientists would have to be held not to have

understood the terms they used. The consequence we draw in this section is in opposition to Feyerabend's principle of proliferation which motivates him to hold radical meaning variance in the first place. The consequence also destroys a second reason for espousing radical meaning variance. 52

B. Neither of Feyerabend's two replies to such criticism succeeds in being able to establish a special sense of disagreement between two incommensurable theories without appealing to some shared meaning between their respective terms. 55

III. The second methodologically undesirable consequence: true communication, in any sense, between holders of different theories would be impossible. Two different theories could be neither rivals nor alternatives nor be in competition. This consequence is at odds with one of Feyerabend's reasons for espousing radical meaning variance. 58

IV. The third methodologically undesirable consequence: one could not *learn* a new theory. 59

V. The fourth methodologically undesirable consequence: no theory could be tested or falsified by any observations or observation reports. 61

A. All assertions of a scientific theory would, given the radical meaning variance view, be either true in virtue of the meanings of the terms employed, or presuppose the theory. In either case falsification of a theory is impossible. And in either case observation reports could not lead to the rational acceptance of a new theory which is mutually inconsistent with the old. 61

B. These consequences are directly opposed to Feyerabend's own methodological model and to one of his principal reasons for advocating radical meaning variance. 65

C. Kuhn presents three reasons from the behavior of scientists to the effect that these consequences would not be undesirable because testability or falsifiability is a myth. His reasons fail and his conclusion is inconsistent with the positive part of his own methodology. 66

VI. The fifth methodologically undesirable consequence: If it were true scientific change could not constitute *progress*. 70

A. How the doctrine gives rise to this consequence. Kuhn's view provides an illustration. The consequence is also incompatible with Kuhn's positive position as to the resolution of paradigm disputes. 70

B. Kuhn has arguments (other than those discussed in Chapter 2) which would presumably demonstrate the impossibility of scientific progress and cross-revolutionary communication. Kuhn claims that because all justifications of paradigm change involve paradigms no paradigm change can be justified. This claim is incorrect. For evaluative purposes paradigm change, contrary to Kuhn, can be viewed as a deliberative process which occurs because of features shared by competing paradigms. 73

C. Toulmin has a (1961) redefinition of 'scientific progress' to which my claim in A is presumably not extendable. His redefinition is inconsistent with the radical meaning variance position. 74

D. Kuhn (1962), and Toulmin (1967) have another redefinition of 'scientific progress' and they advocate a purely descriptive methodology for this purpose. Their attempt fails. Among other things it is either logically untenable or else leads to an unjustified dualism. 75

VII. The sixth methodologically undesirable consequence: it is either logically untenable or else leads to two mutually incompatible dualisms each of which are unjustified and 'neo-positivistic'. 78

Conclusion: The radical meaning variance position is unreasonable. 82

Chapter 4: The Comparability of Scientific Theories 85

I. Several problems have motivated the radical meaning variance account of scientific transitions. This account does contain significant merits. Yet it also gives rise to serious problems; e.g. it would preclude the possibility of comparing different theories. 85

II. I begin an account of scientific change; it preserves the merits of the work of radical meaning variance theorists *and* permits different theories to be compared in various ways. The latter can be attained if there exists non-trivial invariance of various sorts with respect to scientific change. I examine 'first-level' invariance and argue that it in fact has occurred in scientific transitions. 89

A. Extension is a significant aspect of the meaning of a term; and if some observation is invariant then some extension is invariant. 90

B. I argue directly and indirectly that there is some non-trivial object invariance and thus some non-trivial meaning invariance with respect to several scientific transitions. Radical meaning variance theorists have denied this with respect to these transitions. In establishing object invariance I do not presuppose meaning invariance. 90

III. I sketch an account of observation in science aimed to provide a better understanding of how and why observational invariance occurs. The account I present proceeds in good part along lines suggested by Margenau. It both preserves the merits and avoids the shortcomings of the radical observational variance position of Hanson, Feyerabend, Kuhn, and Toulmin. It lends additional support to my previous claim that there usually exists some significant observational invariance and therefore some significant meaning invariance with respect to scientific transitions. On our account scientific change is a justifiable process because of invariant first-level features and elements (observation, meaning) with respect to scientific change. Our account enables us to ensure the possibility of the relation 'is a rival of' as used to compare different scientific theories. 100

IV. I suggest that rival theories can also be compared through appeal to sharable norms and a-historical standards appropriate to second-order discussion. Kuhn argues that the sharing of second-order standards is impossible. His argument is fallacious. I then briefly sketch several regulative second-order standards which are needed and used in the business of accepting, rejecting, and evaluating rival scientific theories.

I argue that each of these need not, and usually does not, change when particular scientific theories change. Taken together, first-level and second-level invariance enable us to get at the relation 'is better than' as used to compare different scientific theories. 104

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