

End Note of Chapter 4

1. In his letter to Lakatos (dated 20 April 1973), Feyerabend asserted that he took incommensurability to mean the anthropological aspect of theories rather than the logical relation between theories (Mottierlini 1999, 328).
2. For Kuhn, communication breakdown is partial. Translation and comparison between rival paradigms/theories are still possible.
3. This broadest sense of incommensurability—incommensurable world—was adopted by some of the sociologists of science, e.g. Bruno Latour. In *Reassembling the Social*, Latour applies incommensurability to the world-making activities (Latour 2005, 24); further, he discusses the incommensurable worlds against a unified nature in his *Politics of Nature* (Latour 2004, 48).
4. The transition from the broader sense of incommensurability—incommensurable worlds, to the narrower linguistic sense is mediated by Kuhn's notion of meaning change of the scientific terms, which can be found in his "Reflections on my critics" in 1970.

In the transition from one theory to the next words change their meanings or conditions of applicability in subtle ways. Though most of the same signs are used before and after a revolution—e.g. force, mass, element, compound, cell—the ways in which some of them attach to nature has somehow changed. Successive theories are thus, we say, incommensurable.

(Kuhn 1970b, 266-267)

5. Leibnizian possible worlds are incommensurable in the sense that they are isolated from each other, which is called "windowless monads" by Leibniz. Leibnizian possible worlds are immaterial worlds.
6. Lewisian possible worlds are real and exist in a parallel universe (Brock and Mares 2007). The possible worlds, according to David Lewis, contain more things than our actual world and not differ in the kind of thing (Loux 2006, 167).
7. For example, one cannot say that the rabbit-pattern of observation is truer than the duck-pattern, and vice versa.
8. MacIntyre argues that Kuhn is indebted to Michael Polanyi's writings of scientific tradition (MacIntyre 1980). Jacobs takes it further to show that Polanyi's view of conceptual framework presages Kuhn and Feyerabend's version of incommensurability thesis (Jacobs 2002).
9. Carnap's failure in his formal construction of ordinary language has led some philosophers to ask how to warrant the truth. The alternative view is, according to Uebel, Schlick's wittgensteinian answer: "What cannot be 'said' (expressed propositionally) must be 'shown' (demonstrated ostensively)" (Uebel 2007, 158).
10. Systems biology is a new discipline that emerged in 2000s. The research is normally carried out by a group of scientists whom are trained in different backgrounds, such as physics, biology, computer science and mathematics.
11. One of the famous representatives is Kitcher, who has argued against the view that molecular biology is the fundamental theory to which other biological sub-

- discipline could be reduced. He aims to show that molecular biology, nevertheless is indispensable, is not the whole of contemporary biology (Kitcher 1999). Notably, Nancy Cartwright, who against the realist theory of fundamental laws, holds the similar anti-reductionist view. She writes against the funding policies which favor the gene-based cancer research proposal over the evidential-based breast cancer research proposal (Cartwright 2005, 17-18). She claims that genetics is not the fundamental theory from which the medicine is derived.
12. Some anti-reductionist, such as Frost-Arnold, argues that reduction of one biological theory to another may be plausible holistically, but implausible at the details. For example, Frost-Arnold has asserted that some statements about spatial configuration (e.g. “left side of the organism”) are not reducible to molecular scale (Frost-Arnold 2004, 86).
 13. The latest research shows that oxidative phosphorylation is the major source of energy production during respiration (Sologub et. al. 2009). Cell obtains most of its energy from mitochondria through oxidative phosphorylation, which is a mechanism to add a phosphate group to ADP to generate energy in the form of ATP (Verny et. al. 2011).
 14. Not all scholars agree that non-corresponding prediction is the consequence of incommensurability. Those who do not recognize incommensurability in terms of semantics would not see how non-corresponding prediction plausible. Munévar, who understands incommensurability merely as an epistemological consequence of the analysis of the history of science, claims that the change of the meaning of scientific terms has no great philosophical significance (Munévar 2000). With his understanding of incommensurability without semantical lens, Munévar probably would not accept non-corresponding prediction as a consequence of incommensurability.
 15. The rationality of set theory was not recognized until the publication of Cantor’s *Contributions to the Founding of the Theory of Transfinite Numbers* in 1895. (Burton 2006, 669-670)
 16. The review of Wittgenstein’s *Philosophical Investigations* was written in 1952 in German and translated into English by Anscombe, a student of Wittgenstein. It was republished in Feyerabend’s *Problems of Empiricism: Philosophical Papers Volume 2*, with the title “Wittgenstein’s *Philosophical Investigations*” (Feyerabend 1995)
 17. Notably, Wittgenstein does not take certainty in mathematics as provability. (Steiner 2001)
 18. Though Feyerabend’s relativism has invited an enormous criticism, he is not without adherents. Paul Churchland being one of them, who has claimed that Feyerabendian incommensurability thesis is not a threat to science (Churchland 1991). Further, he has claimed that Feyerabend’s principle of proliferation of theory is desirable (Churchland 1991), for it can save us from being a victim of the failure of knowledge (Churchland 2007, 112).
 19. Robert Brandom distinguishes two versions of pragmatisms. The narrow version of pragmatism is outcome-oriented which “centered on evaluating beliefs by their tendency to promote success at the satisfaction of wants”; the broad version “centered on the primacy of the practical” (Brandom 2005, 40).

20. Some scholar has recognized pragmatism in Feyerabend's thought. For instance, Brentano recognizes Feyerabend's pragmatism as an alternative to rationalism (Brentano 1991). Oberheim and Hoyningen-Huene (2000) has recognized that Feyerabend's observability is determined by pragmatic rather than observational criteria. However, there were scholars who thought that Feyerabend has against pragmatism, such as Margolis (1991).