GILA SHER CHEN BO*

FOUNDATIONAL HOLISM, SUBSTANTIVE THEORY OF TRUTH, AND A NEW PHILOSOPHY OF LOGIC: INTERVIEW WITH GILA SHER BY CHEN BO (Ⅰ)

(To appear *Chinese Journal of Philosophy* (Blackwell, A&HCI)), 2018

ABSTRACT

This interview consists of four parts. The first part outlines Gila Sher's academic background and earlier research. Although getting strong intellectual influence from Kant, Quine, and Tarski, Sher tries to keep her intellectual independence. The second part discusses Sher's foundational holism. Among its distinctive features are: applicability to all branches of knowledge; a substantial grounding-in-reality requirement; focus on structural holism; sanctioning not only a rich network of connections among theories, but also a rich network of connections between theories and the world; and a fine-grained approach to circularity, including the introduction of "constructive" circularity. Based on her foundational holism, Sher puts forward a post-Quinean model of knowledge. This involves (i) a conception of reality that puts abstract and concrete features of objects on a par, (ii) a conception of intellect as central to empirical as well as to abstract knowledge, (iii) a conception of intellectual knowledge as *quasi* rather than fully apriori, (iv) a new paradigm of intellectual activity - "figuring out," and (v) a new conception of realism - "basic realism" - applicable to all fields of knowledge. The third part discusses Sher's substantive theory of truth. The theory sets forth three basic principles of truth: the "fundamental principle of truth," the "manifold correspondence principle," and the "logicality principle." The fourth part discusses Sher's new philosophy of logic, whose key idea is that logic is grounded both in the world and in humans' mind. Specifically speaking, logic is grounded on the formal facet of the world.

* GILA SHER, Professor, Department of Philosophy, University of California, San Diego. Specialties: epistemology, metaphysics, and philosophy of logic. E-mail: gsher@ucsd.edu
CHEN BO, Professor, Department of Philosophy, Peking University. Specialties: philosophy of logic, philosophy of language, analytic philosophy. E-mail: chenbo@phil.pku.edu.cn

Gila Sher, Ph.D, Professor at Department of Philosophy, University of California, San Diego. Her research centers on foundational issues in epistemology, the theory of truth, and the philosophy of logic. She is the author of two important books: *The Bounds of Logic: A Generalized Viewpoint* (1991) and *Epistemic Friction: An Essay on Knowledge, Truth and Logic* (2016). 2012-2017, she served as editor-in-chief of *Synthese*; 2017--, she serves as editor of *Journal of Philosophy*.

CHEN Bo, Ph.D, Professor at Department of Philosophy, Peking University, China. His fields of competence and research cover logic and analytic philosophy, especially philosophy of logic, philosophy of language, history of logic, Frege, Quine, and Kripke. He also does comparative studies on Chinese and Western philosophies.

CHEN Bo (hereafter, 'C' for short): Professor Gila Sher, I'm very glad to meet you and interview you at UCSD. So to speak, I 'met' you before by coincidence. In 2014, I stayed one year at Nihon University, Japan, as an academic visitor to do my own research. When writing a paper on Quine's conception of truth, I searched for relevant literature by google. Your name and papers jumped out. I downloaded some of your papers, read them, and loved them. In my view, we work in a similar direction in philosophy and have similar positions about some basic philosophical issues. I like your topics, positions, arguments, and even your academic style. I myself think that your research is very important and of high quality, and that your new book *Epistemic Friction: An Essay on Knowledge, Truth and Logic* (Oxford, 2016) is an essential contribution to epistemology, the theory of truth, and the philosophy of logic. That's the reason why I decided to invite you to visit Peking University and give five lectures over there in 2016.

Gila Sher (hereafter, 'S' for short): Yes, it was very nice to find a kindred spirit in China, and I enjoyed my visit to Peking University very much.

Ⅰ. Academic Background And Earlier Research

1. Sher's Early Years

C: Right now, my Chinese colleagues know almost nothing about you. Could you say something about, e.g., your background, education, and academic career, some general information about

yourself. Then, Chinese readers, perhaps also Western readers, can know you and understand your philosophy better than before.

S: I grew up in Israel. Israel was a young idealistic country then and there was an ethos of independent thinking and intellectual engagement in the population at large. Although I grew up in a tiny country, I always thought of myself as a citizen of the world. Books written all over the world were translated into Hebrew and I identified with Russian humanists and suffering American slaves as much as with people from my own country. I learned semi-theoretical thinking both at school and at my youth-movement (where we regularly discussed issues in applied ethics). But fully theoretical, abstract thinking I learned at home, from my father, who was an intellectual-cum-builder. Abstract thinking felt like an adventure, no less exciting than the adventures I read about in Mark Twain's and Jules Verne's novels. When I finished high school I served in the Israeli army for two years (in a unit attached to the kibbutz movement), and as soon as I finished my service I started my BA studies at the Hebrew University of Jerusalem, where I majored in philosophy and sociology. Studying philosophy was an intense experience for me. In my first year I was full of questions, for which I could find no satisfying answers. But when, in my second year, I studied Kant's Critique of Pure Reason, suddenly everything became clear. I felt as if I discovered something that I was looking for my entire life without knowing it. Kant remains my model of a true philosopher. But Kant was history and I wanted to do philosophy on my own. This was something that analytic philosophy, which I also encountered in my second year at the Hebrew University, offered. I was critical of analytic philosophy for being inordinately narrow and for neglecting the "big" philosophical questions, but I loved its spirit of actively posing problems and then actively trying to solve them. These two attractions, and the tension between them, were characteristic of the philosophy department at the Hebrew University during that period. The philosophy department was deeply divided, and the object of contention was philosophical methodology. How should we do philosophy? Should we ask the questions and use the methods epitomized by Kant and other traditional philosophers, or should we use the methods exercised by contemporary analytic philosophers with their emphasis on language? Two of my professors, Eddy Zemach and Yosef Ben Shlomo, had a public debate on this issue, and we, the students, were both the jury and the judges. It was up to us to decide which way to go, and to make the "right" decision we invited each professor to discuss his position with us, sitting with Yosef Ben Shlomo in a coffee house in Jerusalem and with Eddy Zemach at his home. This lively atmosphere and the encouragement to decide how to do philosophy on my own had a deep influence on me. My own personal choice was to keep the big, classical questions alive, but use new tools to answer them. At the Hebrew University I also discovered logic. I came to logic from philosophy, rather than from mathematics, and I needed to

learn how to read advanced texts in logic, which were written, for the most part, by and for mathematicians. The person who taught me how to do that was Azriel Levy, the renowned set-theorist. Levy gave a one trimester course on logic in the mathematics department, focusing entirely on sentential (propositional) logic. But his explanations were so deep and general that after taking this one course with him I could read any textbook in mathematical logic and related fields (e,g., model theory). Another significant influence was Dale Gottlieb. Gottlieb was an American philosopher of logic who visited the Hebrew University for one trimester. It was in his class on substitutional quantification that I first experienced the joy of logical creativity. Other professors who influenced me at the Hebrew University were Yermiyahu Yovel, Avishai Margalit, Haim Gaiffman, and Mark Steiner.

A few years after finishing my B.A. I moved to the United States and went to graduate school at Columbia University, New York City, where I worked with Charles Parsons. I wanted to work with someone who shared my interests in Kant and logic, whose philosophical integrity and acumen I respected, and who would not interfere with my independence. Parsons had all these qualities, and more. The other members of my dissertation committee were Isaac Levi, Robert May, Wilfried Sieg, and, replacing Sieg who moved to Carnegie Mellon, Shaughan Lavine. During my graduate studies I was a visiting scholar at MIT for one year. There I talked regularly with George Boolos, Richard Cartwright, and Jim Higginbotham. After finishing my dissertation I joined the philosophy department at the University of California at San Diego as an Assistant Professor. I am still there today, now a professor.

2. Intellectual Influence: Kant, Quine, and Tarski

C: I'd like to know which academic figures, including logicians and philosophers, have had strong intellectual influence on you and, in some sense, have molded you intellectually. I find that you often mention some big names, e.g., Kant, Wittgenstein, Tarski, Quine, among others. Right now, I want to know when you found Kant, what aspects of his work impress you deeply, what drawbacks you think his philosophy has, so you can make your own contribution to logic and philosophy?

S: You are right. The philosophers who influenced me most were Kant, Quine, and Tarski. Wittgenstein was also an influence, as was Putnam. Among contemporary philosophers, I feel affinity to Williamson's substantivist approach to philosophy as well as to other substantivists. But Kant was special. He was my first love in philosophy, the first philosopher I felt completely at home with, and if I were asked to choose two philosophical works for inclusion in a capsule

capturing the essence of humanity for extra-terrestrials, they would be Kant's *Critique of Pure Reason* and *Groundwork for the Metaphysic of Morals.*

But my views on the content of Kant's philosophy are mixed. Let me focus on the *Critique*. I think that Kant's question "Is human knowledge of the world possible, and if it is, how is it possible?" is still the central question of epistemology. I think Kant is right in thinking that this question is in principle answerable, that the key to answering it is methodological, and that the main issue is how the human mind is capable of cognitively reaching the world and how it can turn such cognition into genuine knowledge. I agree with Kant that one of the crucial issues is the role of human *reason*, or *intellect*, in knowledge, and that knowledge requires both what I call "epistemic friction" and "epistemic freedom" (which I will explain soon). Furthermore, I think that Kant's question and answer are a paradigm of *substantive* philosophy. I also share Kant's view that the central question of epistemology requires a certain kind of transcendence, that such transcendence is possible for humans.

Yet, there is much about Kant's approach to knowledge that I am critical of. First, I think that both his conception of the world and his conception of the mind, as target and agent of human knowledge, respectively, are inadequate. Kant's bifurcation of the world into thing-in-itself and appearance has been widely criticized, and for good reasons. In particular, I think that his claim that the world as it is in itself is utterly inaccessible to human cognition is too strong and his claim that cognition is limited to the world of appearance too weak. I am also critical of Kant's rigid and static conception of the structure of human cognition. Moreover, although Kant emphasizes the element of freedom in human cognition, his conception of epistemic freedom is exceedingly weak. The role of freedom is largely passive, and active freedom seems to play no role in his conception of knowledge. This is especially clear in his account of the highest level of cognitive synthesis, the categories. There is no room in Kant's theory for the possibility that humans might intentionally change the categories they use to synthesize their representations. The categories are fixed once and for all, as are our forms of intuition, the basis for our mathematical knowledge. I also disagree with his view that both mathematical laws and highly general physical laws are grounded almost exclusively in our mind. Furthermore, I find Kant's rigid dichotomies — the analytic and the synthetic, the apriori and the aposteriori — extremely unfruitful (for reasons I will explain later on). Finally, I am critical of Kant's treatment of logic. Although Kant recognizes the crucial role logic plays in human knowledge, his attitude towards logic is largely uncritical, and he offers nothing like his Copernican revolution for empirical knowledge for logic. The problem is not that Kant did not anticipate Frege's revolution; the

problem is that he did not ask penetrating questions about the foundation and in particular the veridicality of logic.

3. ORIGIN AND MAIN IDEAS OF *THE BOUNDS OF LOGIC*

C: Now, we come to your first book: *The Bounds of Logic: A Generalized Viewpoint* (1991), based on your PhD dissertation. Could you outline the contents of this book: for instance, what central questions you are trying to answer, what new ideas you are putting forth, what important arguments you are developing for your position, and so on.

S: *The Bounds of Logic* develops a broad conception of the scope and limits of logic, based on a generalization of the traditional conception of logicality, and in particular, logical constants (logical properties, logical operators). As you mentioned, this book is based on my dissertation ("Generalized Logic: A Philosophical Perspective with Linguistic Applications"), so to explain how I came to write this book I have to start with my dissertation and graduate studies. I had always been interested in the question "What is the (philosophical) foundation of logic?," but I didn't know how to approach this question as a topic of a serious theoretical investigation. You cannot just ask "What is the foundation of logic?" and hope to come up with an answer. Or at least I couldn't. I needed to find an entry point to this question, one that is (i) definite, (ii) manageable, and (iii) goes to the heart of the matter. But how does one find such an entry point? The clue to such an entry point was given to me by my dissertation advisor, Charles Parsons. One day Charles mentioned to me a 1957 paper by Andrej Mostowski, "On a Generalization of Quantifiers," and said I might find it interesting. I don't know what, exactly, he had in mind, but for me, this paper was a revelation. This was in the mid-1980's. At this time many philosophers took it as given that core logic is standard 1st-order mathematical logic and that the logical constants of core logic − the "wheels of logic," so to speak − are the truth-functional sentential connectives (the most useful of which are "not," "and," "or," "if ... then ...," and "if and only if"), two quantifiers: the universal quantifier ("every," "for all") and the existential quantifier ("there exists," "some," "for at least one"), and the identity relation. The question why these and not others was rarely asked. For the sentential connectives, at least, there was a general criterion of logicality − truth-functionality. Nobody I knew of asked why this was the right criterion, but at least there was a general criterion about which the question could be asked. For the logical quantifiers and predicates there was not even a general criterion. All there was is a list. A list of two quantifiers and one predicate, possibly closed under definability (so a quantifier like "There are at least n things such that..." could also be considered a logical constant). The accepted view was that you cannot give a substantive answer to the question "What is logic?." Following Wittgenstein, philosophers thought that we can "see" what logic is, but we cannot "say" or

"explain" what it is. And following Quine, the accepted view was that logic is simply "obvious." There is no need to engage in a critical investigation of the nature of logic.

But Mostowski showed that we can generalize the traditional notion of logical quantifier by identifying a certain general principle underlying the recognized quantifiers, construct a criterion of logicality based on this principle, and argue that all quantifiers satisfying this criterion are genuinely logical. His criterion was *invariance under permutations (of the universe of discourse)*, and this criterion was later further generalized (most influentially, at the time, by Per Lindström) to *invariance under isomorphisms.* The question I raised in *The Bounds of Logic* was: Is *invariance under isomorphisms* the right criterion of logicality? Are the bounds of logic broader than those of standard 1st-order mathematical logic? Do they include all logics satisfying the invariance criterion of logicality? Why? The question "why?" was the main innovation of the *Bounds of Logic.* The question meant: Are there philosophically compelling reasons to accept or reject the invariance criterion of logicality? Does this criterion capture the deep philosophical principles underlying logic? What are these principles and why are they the right (or wrong) principles? I wasn't looking for a "mark" of logicality — for example, apriority. I was suspicious of the traditional philosophical dichotomies, and in any case I didn't see how apriority could go to the heart of logicality. Having formulated my question by reference to the Mostwoski-Lindström criterion, the challenge was to find a way to answer this question. At the time, there were only few influential articles on the notion of logical constant, for example, Christopher Peacocke's "What is a Logical Constant" (1976), and Timothy McCarthy's "The Idea of Logical Constants" (1981). Both of these rejected invariance-under-isomorphism as an adequate criterion of logicality, but their considerations were tangential to what I was looking for.

The catalyst for my own investigations was John Etchemendy's dissertation, "Tarski, Model Theory, and Logical Truth" (1982), which was later developed into a book, *The Concept of Logical Consequence* (1990). Etchemendy made a provocative claim: Tarski's definition of logical consequence failed because Tarski made an elementary mistake in his use of modal operators when arguing for its adequacy. And the same was true for contemporary logic. The semantic definition of logical consequence in principle fails, and where it works, this is just an accident. This provocative claim showed me the way to investigate the fundamental principles of logic. My first step was to re-read Tarski's classical paper, "On the Concept of Logical Consequence" (1936). Having re-read the paper, critically examined its claims, and connected it to the question I was asking in my dissertation, I saw where Etchemendy's analysis went astray. Tarski identified *two* pretheoretical features of logical consequence: *necessity (strong modal force)* and *formality*. For a statement to be a logical consequence of (or follow logically from) a

set of sentences (premises), the *truth* of these sentences (premises) must *guarantee* the truth of the conclusion with an especially strong *modal force* and be based on *formal features* of the sentences involved. Tarski defined logical consequence as a consequence that preserves truth in all models and claimed that this definition satisfies the necessity and formality conditions provided we have an adequate division of terms (constants) into logical and non-logical.

Tarski himself did not know whether it was possible to provide a systematic characterization of logical constants, and he ended his paper on a skeptical note. But I saw how the idea of invariance under isomorphisms enables us to tie up all the elements required to justify Tarski's definition of logical consequence: Invariance under isomorphism adequately captures the idea of formality. Logical constants need to satisfy this invariance criterion in order to be formal. Given the formality of logical constants, logical consequences can and should be formal as well. To achieve this goal we use a Tarskian apparatus of models. Tarskian models have the job of representing the totality of formally possible situations. Consequences that hold in all Tarskian models therefore hold in all formally possible situations. This, in turn, guarantees that Tarskian consequences have an especially strong degree of necessity. And for that reason, consequences satisfying the Tarskian definition are genuinely logical. (Etchemendy, in contrast, completely neglected the formality condition, and therefore could not see how necessity is satisfied.)

Acceptance of invariance under isomorphisms as a criterion of logicality has non-trivial results: it considerably extends the scope of mathematical logic − even that of 1st-order logic. 1st-order logic is a family of 1^{st}-order logical systems, each having a set of logical constants satisfying the invariance-under-isomorphism criterion as well as its extention to sentential logic which, I showed, coincides with the existent criterion of truth-functionality, and this provides a philosophical justification for this criterion as well. Among the non-standard logical constants are quantifiers such as "most," "few," "infinitely many," "is well-ordered," and many others. The book goes beyond the existent Mostowski-Lindström criterion in defining not just logical operators but also logical constants, offering additional conditions designed to explain how logical constants are incorporated in an adequate logical system. My conception of logical operators partially coincides with one proposed by Tarski himself in a 1966 lecture, "What are Logical Notions?." Tarski's lecture did not influence my thinking because it was first published only in 1986, and by the time I found out about it (about a year later) my ideas on logicality were already fully developed. As it happened, Tarski himself did not connect this lecture with the problem of logical consequence, saying that his lecture had nothing to say about the question "What is Logic?" and that the latter question is left for philosophers to answer.

4. BRANCHING QUANTIFIERS AND IF LOGIC

C: In *The Bounds of Logic*, you talked about branching quantifiers. This reminds me something about Hintikka. In 1997-98, I stayed one year with Georg Henrik von Wright as a visiting scholar at the University of Helsinki. Over there I met Hintikka many times. I know that based on branching quantifiers, Hintikka and Sandu invented IF logic (independent-friendly first-order logic) and game-theoretical semantics, and drew a series of astonishing-sounding conclusions. Hintikka himself wrote that IF logic would produce a revelation in logic and the foundation of mathematics. More than twenty years have gone. Could you comment on Hintikka's IF logic and game-theoretical semantics?

S: The idea of branching, or partially-ordered, quantification is based on another generalization of standard 1st-order mathematical logic − a generalization of the structure of a quantifier-prefix. In standard logic, quantifier- prefixes are linear − (∀x)(∃y)Rxy, or (∀x)(∃y)(∀z)(∃w)Sxyzw (read as "For every x there is a y such that x stands in the relation R to y" and "For every x there is a y such that for every z there is a w such that x, y, z, and w stand in the relation S"). Here y is dependent on x, z is dependent on y (and x), and w is dependent on z (y and x). In 1959 the distinguished logician and mathematician, Leon Henkin, asked: Why should quantifier-prefixes be always linearly-ordered? He proposed a generalization of quantifier-prefixes to partially-ordered prefixes, treating linearly-ordered quantifiers as a special case. Henkin's work was purely mathematical, but in 1973 Jaakko Hintikka argued that it has applications in natural language. From here on the study of branching or partially-ordered quantifiers developed in two ways. One of the developments, due to Jon Barwise, Dag Westerståhl and others, involved the combination of the two generalizations – the generalization of quantifiers begun by Mostowski and the generalization of quantifier-prefixes due to Henkin. This led to the creation of a theory of *branching generalized quantifiers*. An example, due to Barwise, of a branching generalized quantification in English, using the generalized-quantifier "most," is "Most of the boys in your class and most of the girls in my class have all dated each other." The linear version of this sentence says: "Most of the boys in your class are such that each of them dated most of the girls in my class." The branching version says that there are two groups of people: one containing most of the boys in my class and one containing most of the girls in your class and all the boys in the one group dated, and were dated by, all the girls in the other group. The branching reading requires that each of the boys dated *all* the girls in the group of girls whereas the linear reading does not require that.

But Barwise found it (technically) difficult to give the same interpretation to all branching quantifications. Barwise's interpretation worked for monotone-increasing generalized quantifiers (such as "most" and "at least two"), but not for other quantifiers (e.g., monotone-decreasing quantifiers such as "few," non-monotone quantifiers such as "an even number of" and "exactly two," and mixed quantifiers with respect to monotonicity). Barwise concluded that the meaning of branching-quantifier sentences depends on the monotonicity of the quantifiers involved, and some combinations of branching quantifiers yield meaningless sentences. This did not make good sense to me, and in my dissertation (and *The Bounds of Logic*) I showed how, by adding a certain *maximality* condition, we can give a unified interpretation to all branching quantifications, regardless of monotonicity. In a later paper (1994) I proposed a completely general definition of branching quantifiers based on this idea. The main challenge in formulating a completely general semantic definition of branching quantifiers is the lack of compositionality, which means that recursion is not readily available. But there are ways to overcome this problem.

The second direction that the study of branching quantifiers took was Hintikka's. Limiting himself to standard quantifiers, Hintikka, in cooperation with Gabriel Sandu, developed a game-theoretic semantics for branching quantifications, which they called "IF logic" or "independence-friendly logic," i.e., a logic in which some occurrences of quantifiers in a given quantifier-prefix may be independent of each other (or not in the scope of each other). Hintikka believed that the new logic was extremely powerful. For one thing, it could be used to provide a new foundation for mathematics − something that he pursued in his 1998 book, *The Principles of Mathematics Revisited.* He also thought that branching quantification could be used in fields like quantum mechanics, where there are non-standard relations of dependence and independence between objects. I can see why Hintikka thought this could be a fruitful application of IF logic, but I don't know how, exactly, this was supposed to work. It is unfortunate that Hintikka passed away before he further developed these ideas. I hope Sandu will continue this project.

5. PREPARATION FOR THE NEXT LEAP

C: From your first book, *The Bounds of Logic* (1991), to your second book, *Epistemic Friction* (2016), 25 years have passed. In the middle of this period, you co-edited a book, *Between Logic and Intuition: Essays in Honor of Charles Parsons* (2000). I know that you never stopped your investigation and research. Could you outline your academic work in this duration of time?

S: After finishing my first book, I started to develop my ideas on philosophical methodology, epistemology, and truth, as well as work out in more detail the philosophical aspects of my

conception of logic. My style of work is cumulative. My interest in epistemology preceded my interest in logic, and already at the Hebrew University I started working on Quine. As a graduate student at Columbia University I continued to develop my ideas on Quine, and this eventually culminated in a paper, "Is There Place for Philosophy in Quine's Theory?," which was published in the *Journal of Philosophy* in 1999. At UCSD I gave a few graduate seminars on Carnap and Quine and these led to further development of my ideas. My attitude towards Quine's philosophy was always mixed. On the one hand, I admired Quine for his philosophical courage, independence, and combination of original and common-sensical thought. In particular, I admired his rejection of the traditional philosophical dichotomies, which I saw as opening new possibilities for addressing the classical questions of epistemology. At the same time, I thought that in certain ways Quine had a very narrow view of philosophy, partly reflected in his deep empiricism and naturalistic methodology. This led me to developed a revised model of knowledge – a "neo" or "post" Quinean model – that would later be included in my second book.

Truth was not a topic I was planning to write about. I was led to it by two circumstances. First, it was a natural continuation of my interest in logic and in particular in Tarski's approach to logic. Tarski's approach to logic is largely semantic. In particular, he treats logical consequence as a semantic notion. But what is a semantic notion? Tarski has a clear and definite answer to this question: A notion is *semantic* if and only if it has to do with the *relation between linguistic expressions and objects in the world*. Semantic notions are, therefore, essentially *correspondence* notions, and this is supported by Tarski's account of his notion of truth (in his 1933 paper) as a correspondence notion in the Aristotelian sense. But if semantic notions in general are correspondence notions, then the semantic notion of logical consequence is also a correspondence notion, i.e., a notion grounded not just in language but also, and significantly so, in the world. Tarski himself never indicated that he regarded logical consequence (and the associated notion of logical truth) as a correspondence notion. But then, Tarski was a minimalist in his attitude to philosophical discussions. He thought of himself as a philosopher-logician, but he preferred to limit his detailed discussion to technical and mathematical issues. This, however, is not true of me, and I set out to investigate the topic of truth and its relation to logical consequence.

Another impetus for studying truth came from the increasing dominance of deflationism, and in particular that brand of deflationism that says truth is a trivial notion and there is no room for a substantive theory of truth. The popularity of deflationism surprised me. Why would anyone be interested in being a philosopher if all a philosopher could do is develop trivial, non-substantive theories? And the idea that deflationism is appropriate only for some philosophical theories,

specifically the theory of truth, made no sense to me. My reaction to the increasing popularity of truth-deflationism, as advanced by Horwich's 1990 book *Truth*, for example, was to try to understand what led contemporary philosophers to espouse this view. I found their explanation unconvincing, but I thought there might be something below the surface, something about the subject-matter of truth that made substantive theorizing about it especially difficult and explained why philosophers despaired of the possibility of a substantive theory of truth. So I decided to investigate whether there was such a difficulty. My investigations led to the conjecture that it is the enormous breadth and complexity of truth that leads to such difficulties. And this, in turn, led me to look for a strategy for dealing with these difficulties. My approach has some affinity with contemporary pluralists about truth, such as Crispin Wright and Michael Lynch, but it differs from their approach on two significant points: (i) the appropriateness of giving "platitudes" a central place in the theory of truth, and (ii) the scope of the plurality of truth. I started to develop a new, non-traditional, correspondence theory of truth, one that rejects the naive features of the traditional theory and allows a plurality of forms (patterns, "routes") of correspondence. The task of the theorist of truth is to investigate how truth (= correspondence) can, does, and should work, both generally and in particular fields, and develop a substantive account of truth based on these investigations. I published 14 papers on truth, including "On the Possibility of a Substantive Theory of Truth" (1999), "In search of a Substantive Theory of Truth" (2004), "Forms of Correspondence: The Intricate Route from Thought to Reality" (2013), and others.

During the interval between my two books I also continued to develop my theory of logic. My goal was to develop a full-fledged philosophical foundation of logic, a theoretical foundation guided by logic's role in acquiring knowledge. This led to the publication of 16 papers on logic, from "Did Tarski Commit 'Tarski's Fallacy'?" (1996) to "The Formal-Structural View of Logical Consequence" (2001), "Tarski's Thesis" (2008) and "The Foundational Problem of Logic" (2013, recently translated into Chinese by Liu Xinwen and published in three parts in *World Philosophy*). It was in this paper that I began to develop a new methodology of grounding or foundation, "Foundational Holism," that makes a substantive grounding of logic possible.

All these publications paved the way to my second book. In 2001 I taught a graduate seminar on John McDowell's book, *Mind and World* (1994), and this book gave me the idea of focusing my new book on "friction" in the epistemic sense. In 2010 I published a paper that foreshadowed my book, "Epistemic Friction: Reflections on Knowledge, Truth, and Logic." Other topics I explored during that time include branching quantification, indeterminacy and ontological relativity, and free will.

Ⅱ. FOUNDATIONAL HOLISM

C: Now, we come to your second book, *Epistemic Friction* (2016). I love this book and evaluate it very high. I appreciate your intellectual courage. Today, it has become fashionable in philosophy to dislike big questions, to reject the foundational project, to reject the correspondence theory of truth, and to regard logic as being irrelevant to reality, being analytical, being fixed forever. You bravely stand out and speak loudly: No, I have another story to tell. In my view, your new book develops three systematic theories: foundational holism, a substantive theory of truth, and a new philosophy of logic. This is why I choose the title of this interview. I'd like to discuss with you the three theories carefully. First, could you outline your foundational holism? Your motivation? Main claims? Basic Principles? What open questions are there still waiting to be answered? What further work is there still waiting to be done?

S: Thanks. *Epistemic Friction* is indeed an attempt to construct an integrated account of knowledge, truth, and logic. The general principles that tie these topics together are the principles of *epistemic friction* and *epistemic freedom*. The underlying idea is that knowledge requires both freedom and friction (constraint). Two central principles of friction are: (a) Knowledge, qua knowledge, is knowledge of the world (or some aspect of the world), and therefore, *all* knowledge, including logical and mathematical knowledge, must be constrained by the world, in the sense of being veridical, i.e., true to the world. (b) To be theoretically worthwhile, our body of knowledge, and each discipline and theory within it, must be substantive (explanatory, informative, rigorous, interesting, deep, important) throughout. But friction alone is not sufficient for knowledge. Knowledge requires epistemic freedom as well, the freedom to be actively involved in setting our epistemic goals, deciding how to pursue them, and actually pursuing them: designing research programs, conducting experiments, making calculations, figuring out how to solve problems, etc. Friction and freedom are not disjoint. Epistemic norms, in particular, lie in the intersection of freedom and friction, they are freely generated and imposed on us by ourselves; yet they are instruments of constraint. The norms of truth, evidence, explanation, and justification, are especially important for knowledge.

1. GENERAL CHARACTERIZATION OF FOUNDATIONAL HOLISM

The first topic of *Epistemic Friction* is, as you noted, *foundational holism.* This is a proposal for a new epistemic methodology, which is both part of my account of knowledge and used in my pursuit of a foundation for knowledge, truth, and logic within the book. The motivation for developing a new epistemic methodology is partly due to the failure of the traditional methodologies, foundationalism and coherentism. This naturally leads to a search for an

alternative methodology, one that will be both universal (i.e., applicable both to empirical and highly abstract disciplines) and with focus on a robust and substantive grounding of knowledge in reality. The coherentist methodology fails to satisfy my first friction requirement: a robust grounding of all knowledge in the world. Even when it conceives of knowledge as knowledge of the world, coherentism's focus is on the agreement *between our theories* rather than on the agreement *of our theories with their target, the world*. Foundationalism does insist on the grounding of knowledge in the world, but it insists that this grounding be rigidly ordered. The grounding relation must be a strict partial-ordering (anti-reflexive, anti-symmetric, and transitive) with minimal elements. This requirement is one of the main sources of its downfall. Three of its central principles are: 1. The grounding of our system of knowledge is reduced to the grounding of the basic units. 2. To ground X we can only use resources more basic than those generated by X. 3. No unit of knowledge (or combination of such units) can generate more basic resources than those generated by the basic units. It follows that no unit of knowledge, or combination of such units, can produce resources for grounding the basic units. I call this "the basic-knowledge predicament." Foundationalism's success in grounding our system of knowledge depends on its success in grounding the basic units; but due to the strict ordering it imposes on the grounding relation, it has no resources for grounding those units. And the few attempts to overcome this problem (e.g., by allowing the basic units to be self-grounding) have come upon great difficulties.

The failure of the foundation*alist* methodology has led many philosopher to give up on the foundation*al* project altogether. One of the main claims of foundational holism is that this reaction is unjustified. This reaction is based on an identification of the foundation*al* and foundation*alist* projects, but the two are not identical. The foundational project is a general philosophical project, designed to provide an explanatory justification of humans' ability to provide genuine theoretical knowledge of the world. But the foundationalist method is just one method for carrying out the foundational project. What we need is a different method, a method of "foundation without foundationalism" (to use the title of a book on 2nd-order logic by Stewart Shapiro). *Foundational holism* is such a method. It says that we can achieve the foundational goal by using holistic rather than foundationalist tools, where holism is *not* identified with (nor implies) coherentism, but stands on its own. Foundational holism puts holistic tools in the service of a *robust foundational project*, one which is informed by both friction and freedom.

It is important to distinguish foundational holism from another type of holism as well: total holism or one-unit holism, namely the view that our system of knowledge is one huge atom, devoid of inner structure, and we can grasp it only as a whole. Foundational holism, in contrast,

is a structured holism, one that emphasizes the inner structure of our system of knowledge as well as its structured connection to the world. Among the basic principles of foundational holism are:

1. In pursuing a foundation (grounding) for knowledge, we can, and indeed ought to, make full use of our cognitive resources, initiative, and ingenuity, in whichever order is fruitful at the time.
2. There are multiple cognitive routes of discovery as well as justification from mind (including theories) to the world, some strictly-ordered, others not. The foundational/grounding project sanctions the use of multiple routes of this kind.
3. The grounding process is a dynamic process, modeled after the holistic metaphor of Neurath boat. To ground a given theory in the world we use whatever tools are available to us at the time, then use the grounding we obtain, together with other resources, to construct better tools. We use these tools to improve the grounding of the given theory (or find flaws in it and revise or replace it), extend the grounding to new theories, and so on.
4. In grounding a given theory we may use resources produced by other theories. What matters most, however, is not coherence with these theories, but rather using their (partial) success in reaching the world to ground the given theory.
5. In grounding a theory there is neither a possibility of nor a need for an Archimedean standpoint.
6. Although a certain degree of circularity/regress is inevitable, it need not undermine the grounding. We are responsible for avoiding vicious circularity, but non-vicious circularity is acceptable. Indeed, some forms of circularity are constructive, and these make a positive contribution to the grounding project. (I will say more about this in response to your next question.)

While foundational holism is more flexible than other methodologies, it is also more demanding. By allowing greater flexibility in grounding knowledge in the world it enables us to extend the grounding-in-the-world requirement to all fields of knowledge, including logic, something that more rigid methodologies cannot do. The more rigid the method of grounding, the more limited it is, in the sense of forcing us to limit the grounding-in-reality requirement to certain disciplines, leaving others (e.g., logic) outside this requirement.

There is much to say about these principles, but I will leave it at that. In the book I use the foundational-holistic method to construct a model of knowledge, develop a theory of truth, provide a detailed foundation for logic, and a skeleton of a joint foundation for mathematics and logic. This, however, does not exhaust the uses of the foundational holistic method, and there is much work to be done in exploring its use in various branches of philosophy as well as other

fields of knowledge. In the course of this work, some open questions are likely to arise, as well as opportunities to spell out in more detail, critically examine, and further improve the method.

2. Circularity, Infinite Regress, And Philosophical Arguments

C: For a long time, circularity and infinite regress have had a very bad reputation in all disciplines. By appealing to your foundational holism and the Neurath-boat metaphor, you argue that circularity is not so bad, sometimes even inevitable. You distinguish between destructive and constructive circularity. Could you explain more about the role of constructive circularity in philosophical arguments?

S: I suspect that the reason circularity and infinite regress were considered fatal flaws in traditional philosophy had to do with its foundationalist conception of justification and argumentation. In accordance with this conception, all types of circularity and regress were banned. But with the rejection of foundationalism in the 20th-century, the situation had changed. The advent of holism, in particular, contributed to the legitimization of some forms of circularity and infinite regress (see, for example, Keith Lehrer (1990)). But many holists are coherentists, and as such do not emphasize the grounding-in-reality requirement. Foundational holism, in contrast, rejects coherentism. It is as intent on a genuine grounding of knowledge in the world as foundationalism is. From the point of view of foundational holism, we can distinguish 4 types of circularity: (i) Destructive circularity, (ii) Trivializing circularity, (iii) Neutral Circularity, and (iv) Constructive circularity. Destructive circularity introduces errors into our theory. Examples of such circularity include cases of self-reference that lead to paradox, as in the Liar Paradox (a sentence that says of itself that it is not true). Trivializing circularity includes cases of circularity which are valid yet trivializing (for example, “P; therefore P”). An argument that rests on this type of circularity is worthless. Neutral circularity is the circularity involved in, say, writing a book on English grammar in English. It makes no difference to the adequacy of the book whether it is written in English or, say, in Chinese. Finally, we have constructive circularity. This is the most interesting case of circularity. The main idea is the Neurath boat idea: we use what we already have to make new discoveries, or create new tools, which we then use to make still newer discoveries and newer tools, and so on. In the Neurath boat metaphor, the sailor patches a hole in the boat temporarily using resources she has on the boat. Then, standing on the patch hole, she finds new resources – not just resources found on the boat, but resources she finds in the sea and its environs – to create better tools that enable her to repatch the hole in a better and more lasting manner. The key is that we don’t just repeat what we did before, but we do new things using new resources we obtained by doing what we did earlier. Two examples of constructive circularity are Cantor’s diagonal method and Gödel’s use of arithmetic syntax to

define arithmetic syntax. Constructive circularity is constantly used in *Epistemic Friction.* For example, logic is used in constructing a foundation for logic, but it is used critically and with added elements: philosophical reflections, new discoveries, knowledge borrowed from other disciplines, and so on. These provide us with tools for critically evaluating the logic we started with. For example, if the theory of formal structure demonstrated that the basic structure of reality is not bivalent, this might lead us to replace our initial bivalent logic by a non-bivalent logic. The dynamics of constructive circularity is clearly demonstrated in my (schematic) account of the emergence of logic and mathematics: Starting with a very basic logic-mathematics (say, a theory of boolean structure), we build a very simple logic. Using this logic as a framework (as well as other resources), we build a simple mathematics (say, naive set theory). Using this naive set theory (plus other resources), we build a more sophisticated logic (say, standard mathematical 1^{st}-order logic). Using this logic (and other resources), we build a more advanced mathematics (say, axiomatic set theory). Using this (and other resources), we can construct a more powerful logic (say, 1^{st}-order logic with generalized quantifiers), and so on.

3. COMPARING FOUNDATIONAL HOLISM WITH FOUNDHERENTISM

C: In 2002-2003, I stayed one year with Susan Haack as a visiting scholar at the University of Miami. Haack developed foundherentism in her *Evidence and Inquiry* (1993). She argued that foundationalism and coherentism – the traditionally rival theories of justified belief – do not exhaust the options, and that an intermediate theory, i.e. foundherentism, is more plausible than either. Foundherentism has two crucial claims: (1) A subject's experience is relevant to the justification of his empirical beliefs, but there need be no privileged class of empirical beliefs justified exclusively by the support of experience, independently of the support of other beliefs; (2) Justification is not exclusively one-directional, but involves pervasive relations of mutual support among beliefs. She appeals to the crossword puzzle analogy to show that we have to go back and forth all the way down the justification process. She also tried to show that the foundherentist criteria are truth indicative. Could you compare your foundational holism with Haack's foundherentism?

S: Haack's foundherentism makes a significant step in the right direction. Foundational holism shares some themes with foundherentism, but diverges on others. Among the shared themes are the two features you mentioned: (i) experience is relevant for empirical justification, but justification involves connections with, and support from, other theories; (ii) justification is not a linear relation, but rather a relation that can take multiple forms, including forms that involve back and forth, bi-directional connections between theories, and there is an important element of figuring out, including figuring out of the kind involved in a crossword puzzle. But there are

also significant differences between foundational holism and foundherentism. Two of these concern the *scope* of the methodology, and the significance of coherence.

1: *Scope*. The foundherentist methodology is limited to empirical knowledge; it does not apply to, say, logical knowledge. Foundational holism has a far broader scope. It applies to all branches of knowledge, from the most mundane and experimental to the most abstract and theoretical, logic included. Moreover, its treatment of the different disciplines is highly unified. It applies the same general principles to all disciplines, from experimental physics to mathematics and logic. At the same time, it also accounts for their differences, by recognizing a rich and diverse array of cognitive resources, sufficiently rich and diverse to accommodate, and explain, the differences between different disciplines. I will return to this in a moment.

2. *Attitude to coherence*. Although foundational holism incorporates some of the elements characteristic of coherentism — non-linear justification, interconnections between theories, denial of both the need for and the possibility of an Archimedean standpoint, tolerant attitude toward circularity and infinite regress — it denies the central place foundherentism assigns to coherence in justification. The view that coherence can be viewed as a mark of veridical justification is an old view, found, for example, in Kant's *Critique of Pure Reason* (B848), but this does not turn Kant into a coherentist (as I explained in my recent paper, "Lessons on Truth from Kant" (2017)). Nor does the use of coherence as a "mark" play a central role in Kant's theory of justification. The problem with putting coherence at the center of justification is the fact that false theories can cohere as much as true theories, i.e., that coherence is not correlated with veridicality. Clearly, foundherentism is superior to both coherentism and foundationalism, but the role of coherence is still too central. By approaching the problem from a third, independent perspective, coherence can be given its due limited role. Foundational holism offers such an independent perspective. It affirms the existence, in principle, of multiple, and interconnected, cognitive routes from mind to world, both routes of discovery and routes of justification. But the key question, according to foundational holism, is whether these routes lead to the *worldly targets* of our theories, not whether they cohere with *each other*.

Furthermore, although foundational holism, like foundherentism, sanctions other cognitive resources besides sensory perception as central to knowledge – in particular, *intellect* – and although its paradigm of intellectual activity is *figuring out*, an activity that includes the kind of solving that Haack equates with solving of a crossword puzzle, its conception of figuring out is far broader than that of a crossword puzzle and puts much more emphasis on connection with the

world. (For example, the foundational holistic explanation of Gödel's discovery and proof of the incompleteness of arithmetic focuses primarily on veridicality.)

I would like to reiterate, however, that Haack made an extremely important step forward in the development of a workable philosophical methodology. As it happens, I arrived at my own methodology not through Haack, but through my investigations, in the 80's and early 90's, of the foundations of logic and Quinean epistemology. These led me to a view that has some significant similarities with Haack's views, thought also significant differences.

4. A POST-QUINEAN MODEL OF KNOWLEDGE

C: By adopting your foundational holistic methodology, you delineate a dynamic and structural model of knowledge. Sometimes you call it a post-Quinean model of knowledge. Could you spell out the main points of the model and its significance in epistemology?

S: Having developed a methodology that balances the principles of epistemic friction and freedom while avoiding the pitfalls of both foundationalism and coherentism, I set out to construct a model of knowledge using this method. All disciplines, in this model, would be subject both to high standards of truth, objectivity, and veridical justification, and to high standards of conceptualization, unity, and substantiveness. This model would differ from existent models by setting the same high standards of truth, explanation, veridical justification, and grounding-in-reality on all disciplines, including highly abstract disciplines such as logic and mathematics. One of the distinctive characteristics of the model would be rejection of the traditional bifurcation of knowledge into factual and non-factual, where the latter – being analytic and/or apriori – is grounded exclusively in language, concepts, or more generally the mind.

A natural starting point is Quine's model of knowledge in "Two Dogmas of Empiricism" (1951). This model, with its holistic structure and its rejection of the traditional bifurcation of knowledge into factual and conventional, is highly promising. But Quine's model is as problematic as it is promising. In particular, there is a serious tension, first noted by Dummett (1973), between Quine's rejection of the traditional bifurcation of knowledge into factual knowledge and non-factual (conventional, linguistic, conceptual) knowledge and his Center-Periphery model, which brings back this bifurcation. It is true that the boundary between center and periphery is gradual rather than sharp. But having sharp differences between the factual and the non-factual is one thing, and having deep differences between them is another. Logic, in Quine's model, never lies in the periphery, and this creates a significant gap between the degrees of factuality of logic and

empirical science. To the extent that the periphery represents the *interface* between our system of knowledge and *reality*, logic is devoid of such interface. Logic may be changed indirectly in response to difficulties faced by empirical science in the periphery, but such changes are based on pragmatic or instrumental considerations rather than on factual or veridical considerations pertaining to logic itself. There is no sense in which logic is true-to-the-world or false-to-the-world in Quine's model, no possibility that logic is changed due to a conflict between what it itself says and what is *in fact* the case (concerning its subject matter, logical truth and consequence). This, I argue, is a result of Quine's radical empiricism. As a radical empiricist, Quine recognizes only an *experiential* interface between theory and world; hence, it is impossible for logic to interface with the world as deeply as physics does in his model. There is nothing in the world, on Quine's empiricist picture, for logic to interface with (to be true about or be substantially grounded in), and in any case, it is impossible for humans to have any cognitive access to abstract features of the world according to radical empiricism.

My solution to the inner tension in Quine's epistemology is to render the Center-Periphery model thoroughly dynamic. Center and Periphery are job descriptions rather than locations. One of their jobs is to represent the interface of all fields of knowledge with both world and mind (through the periphery and center, respectively). Each discipline lies in the periphery as far as its truth and grounding in the world are concerned; in the center, as far as its conceptual resources and grounding in the mind are concerned. Accordingly, disciplines move freely between center and periphery along two dimensions: context and time. Factual development takes place in the periphery; conceptual development in the center. This results in a model of knowledge that is flexible and dynamic yet highly demanding: Each discipline is subject to robust veridicality requirements as well as to conceptual and pragmatic requirements. Each discipline requires a substantial grounding both in the world and in the mind. Our system of knowledge reaches the world through a rich, holistic network of cognitive routes, both perceptual and intellectual, both direct and circuitous, targeting both experiential and abstract features of the world. There is a significant role for active freedom in all branches and stages of knowledge. And so on.

C: I'm also interested in the two faces of language you mentioned, that is, semantic ascent and objectual descent. Could you further clarify them and their uses in philosophy?

S: This is one aspect of the dynamic structure of the model. The basic idea goes back to medieval philosophy, but I arrived at it through Tarski and Quine. There are many ways of talking about a given subject-matter, two of which are (i) objectual and (ii) linguistic. The first way is more direct: to say that snow is white we attribute to the object (stuff) snow the property of being

white. The second way is less direct: Instead of saying that the object snow has the property of being white ("Snow is white") we say that the sentence "Snow is white" has the semantic property of being true ("'Snow is white' is true"). Quine calls the move from the objectual mode of speech to the linguistic mode "semantic ascent." I call the opposite move "semantic descent." What enables us to switch from one mode to the other is the systematic connection between the truth of a sentence and its object having the property it attributes to it. This correlation is reflected in Tarski's T-schema (one instance of which is "'Snow is white' is true if and only if snow is white"). You may ask: What determines which mode of speech we use? My answer is: context, interest, etc. The same content can be expressed in different ways in different contexts. This is one aspect of the dynamic structure of our system of knowledge.

5. Intellect And Figuring Out

C: When talking about the dynamic model of knowledge, you use two special words, "intellect" and "figuring out," but you do not clearly say what they mean and how they are relevant to apriorism and empiricism. Could you further clarify these notions? By the way, you blame Quine for neglecting the role of intellect or reason in theory–building, but I think this is not fair. Quine holds the thesis of underdetermination of theory by experience: "we can investigate the world, and man as a part of it, and thus find out what cues he could have of what goes on around him. Subtracting his cues from his world view, we get man's net contribution as the difference. This difference marks the extent of man's conceptual sovereignty – the domain within which he can revise theory while saving the data."[1] Man's conceptual sovereignty is just where man's intellect or reason, imagination, creative power, etc., play significant role! Hence, Quine does give a big enough space for man's intellect or reason to play its role. What do you think about this point?

S: The question of intellect's or reason's role in knowledge is an important question that, in my view, has been sidelined in analytic philosophy, where it has been largely limited to a small number of traditional issues, such as apriority, pragmatic conventions, and rational or mathematical intuition. I think it is time to go beyond the traditional paradigms and rethink the role of intellect in knowledge. In *Epistemic Friction* I make a few steps in this direction. One of these steps is a consideration of a new paradigm of intellectual knowledge, far broader than the earlier paradigms. I call this paradigm "*figuring out*."

By "intellect" I mean the totality of human cognitive capacities playing a significant role in knowledge other than sensory perception. This role, I believe, is far from being exhausted by conceptual analysis, pragmatic conventions, and/or mathematical (or rational) intuition – the roles commonly associated with intellect in the existent literature. Nor is intellect's role limited

to mathematical, philosophical, and logical (or more generally inferential) knowledge. I especially emphasize the crucial role played by intellect in discovery – discovery in all fields, both theoretical and experimental. Consider experimental science. Sensory perception clearly plays a role in experimental physics, but this role is largely passive, and by itself cannot generate the kind of knowledge that experimental science provides. Nor do pragmatic considerations, mathematical intuition, and inferential capacities suffice. How do you get from passive perception to hypotheses about nature? How do you decide what particular activity counts as an experiment for a particular hypothesis, what activity, among the unbounded number of possible activities, tests the correctness of a particular empirical hypotheses? You have to *figure out* these things. But figuring out is neither a perceptual activity nor is it purely pragmatic. There is a question of correctness here. Nor is conceptualization by itself sufficient for figuring out which activity will test a given hypothesis. And the operation of figuring out need not be fast (immediate), as mathematical/rational intuition is supposed to be. Nor is figuring out apriori – isolated from sensory perception. In figuring out what hypotheses to make given the empirical data and how to test these hypotheses we use everything we have, including all the knowledge we have already obtained. We don't isolate intellect from empirical knowledge or data. And to the extent that the world has features that cannot be detected by our sensory capacities, figuring out using our intellect is an available means of getting to know, or at least making progress toward getting to know, some of these features.

What do I mean by "figuring out?" At this initial stage in developing a theory of figuring out I use the expression "figuring out" largely in its everyday sense: configuring, working out, putting two and two together. Figuring out is not mysterious. It is something we do in all stages and areas of our life, both practical and theoretical. Babies figure out things all the time. Farmers constantly engage in figuring out how to solve problems arising in their farms, how to improve their crops, and so on. Computer technicians figure out what went wrong with our computers and how to fix them. Copernicus figured out that the earth revolves around the sun rather than the other way around. Darwin figured out the (or some of the) principles of evolution. Einstein figured out many things about the physical structure of the world using thought experiments. Crick and Watson figured out the structure of the DNA. Gödel figured out *whether* mathematics is complete and *how* to prove that it is not. Wiles figured out whether Fermat's last theorem is true and how to incorporate various mathematical theories in order to prove this. Kant figured one way to meet Hume's challenge, namely by changing our epistemic gestalt. And so on.

A few distinctive characteristics of figuring out we have already seen: It has to do with discovery and not just justification, it is different from sensory perception although it can be combined with

it, it is not primarily pragmatic although it is used in pragmatic considerations, it is not constrained in the way that rational intuition is: it does not have to be immediate, quick, perceptual-like, apriori. It has an enormously broad scope.

But this is just the beginning. There is much more to be done to develop a systematic theory of intellect's role(s) in knowledge. This includes further development, including critically examining, the activity of figuring out. This is something I hope to work on in the near future, and I especially hope other researchers – philosophers, psychologists, cognitive scientists – will participate in these investigations.

Now, to the second part of your question. You make a good point. In *Word & Object* Quine does acknowledge that sensory cues from the world do not suffice for theorizing about the world: the rest is due to "man's net contribution." Furthermore, in "Epistemology Naturalized" (1969) he talks about the gap between our "meager" sensory "input" and "torrential" theoretical "output", implying that much more than mere sensory perception is involved in knowledge. But Quine says virtually nothing about what "man's net contribution" is, how the gap between sensory input and theoretical output is filled. He has a placeholder for a constituent of knowledge that goes beyond sensory perception but this place holder is remains empty: a black box. In particular, Quine never considers the possibility that our net contribution includes anything beyond pragmatic-conceptual organization of the sensory data. Even in the passage you cite from *Word & Object* all Quine has to say about "man's net contribution" is that it is "conceptual." In some places, for example, "On Empirically Equivalent Systems of the World" (1975), he characterizes everything that goes beyond observation as "foreign matter," "trumped-up matter, or stuffing, whose **only** service is to round out the formulation" of observation statements (my emphasis). The heart of the matter is that Quine never considers the possibility that our intellect too, and not just our sensory organs, are tuned to the world. Quine's own contribution to our understanding of intellect's role in knowledge, and especially in discovery, is thus very meagre.

6. Comparing Foundational Holism With Quine's Holism

C: Could you systematically explain what similarities and differences there are between your foundational holism and dynamic model of knowledge and Quine's holistic conception of knowledge? In his early writings, Quine presented his holism quite radically (1950): "The unit of empirical significance is the whole of science." Later on (1975), he moderated his holism: "Science is neither discontinuous nor monolithic. It is variously jointed, and loose in the joints in varying degrees. Little is gained by saying that the unit is in principle the whole of science,

however defensible this claim may be in a legalistic way." Thus, for Quine, our body of knowledge is a whole with different levels and internal structure.

S: In "Two Dogmas of Empiricism" (1951) Quine presents two distinct types of holism (which I mentioned earlier). The first type I call "one-unit holism" (and Dummett calls "total holism"); the second type I call "relational," "structured," or "network" holism. One-unit holism is the kind of holism you talk about in your question. The idea is that the smallest unit of knowledge is our system of knowledge as a whole, and that means that our system of knowledge is treated as a huge atom, having no inner structure. Relational holism, in contrast, views our system of knowledge as an open-ended network of distinct units, intricately interconnected. One-unit holism was criticized by many philosophers, including Grünbaum (1960, 1971), Dummett (1973), and Glymour (1980), on various grounds. In response to Grünbaum's criticisms, Quine significantly qualified his one-unit holism in his later writings, as you indicated.

I myself reject Quine's one-unit conception of holism on the ground that inner structure is essential both for the acquision of knowledge and for its understanding. (This was Dummett's main ground for rejecting Quinean holsim). But I do accept Quine's relational conception of holism, with its emphasis on a rich network of connections between disciplines. This is a point of central similarity between my holism and Quine's. The similarities extend to rejection of foundationalism, rejection of both the possibility of and the need for an Archimedean standpoint, recognition that not all cases of circularity and infinite regress should be rejected, etc. But, within the common framework of relational holism there are some significant differences between my holism and Quine's: (a) For Quine, as for most relational holists, holism is exhausted by interconnections between theories and disciplines, i.e., interconnections within our system of knowledge. For me, it is not. There is an added dimension of interconnections: a rich and highly intricate network of connections between our theories and the world. There are multiple cognitive routes from mind (theories) to the world, and these are often interconnected, exhibiting highly complex patterns and using the resources of diverse theories. (b) My holism is more dynamic than Quine's. Since this is your next question, I will discuss it in my response to that question. Other differences concern the role of intellect in the holistic system of knowledge, and more. I should also mention Michael Friedman's (2001) criticism of Quinean holism. Friedman attributes to Quine's (relational) holism another feature, namely treating all units of knowledge in the same way (any two theories are interconnected in the same way and to the same degree as any other two theories), so it is epistemically impossible to differentiate either the role or the behavior of one unit of knowledge from that of another. If, and to the extent that this is true of Quinean holism, foundational holism differs from Quinean holism in this respect too.

Foundational holism is not simply a relational holism, but it is a highly structured holism, differentiatiating between different units of knowledge both with respect to their roles in our system of knowledge and with respect to their behavior and interconnections with other units.

C: I think your dynamic model of knowledge is right, but your comments about Quine's model are not so fair and well grounded: "Elements in the center are manipulated using pragmatic standards, elements in the periphery – using evidential standards. Elements located in the periphery stand in a privileged relation to reality that elements located in the center are excluded from." Quine clearly asserts that empirical content is shared by all the elements in our body of knowledge, no matter whether they are located at the center or at the periphery; there is no difference of "all or nothing" for empirical contents of statements but only difference of degree: more or less, close or distant, direct or indirect. In our system of knowledge, any statement, including a logical law, is revisable in response to "recalcitrant experiences," and any statement, including an observational report, can be saved based on methodological consideration. Since the center and the periphery are interchangeable, I do not think that Quine believes there is a fixed, rigid, and sharp cleavage between the center and the periphery. As you point out, Quine dislikes any bifurcation in philosophy, and holds sort of gradualism. What do you think about my comments?

S: I agree with you that compared with earlier empirical models of knowledge Quine's model is more dynamic. Elements in the center may be affected by recalcitrant experiences in the periphery and elements in the periphery may be saved based on methodological considerations. The difference between center and periphery is a matter of degree. But I don't think that this significantly affects the depth of the differences between disciplines lying in the center and disciplines lying in the periphery in Quine's model. Disciplines lying in (or around) the center, such as logic and mathematics, are significantly farther away from the periphery than observational/experimental disciplines and their connection to reality is far weaker than that of experimental disciplines. Logic's tenets are not experiential, and therefore they themselves cannot conflict with experience. Conflicts with experience can substantially involve only experiential units of knowledge. Experiential units of knowledge can be revised because of a conflict between their own content and experience. But logical units can be revised only in response to conflicts between *other units* with experience (or else based on purely pragmatic considerations). Now, my claim is that these differences are very significant. Most importantly, disciplines lying in and around the center of Quine's model are subject to significantly weaker veridicality standards than disciplines lying in and around the periphery. You are right that the boundaries between center and periphery are not sharp, but big differences do not need sharp

boundaries. (For example, there is no sharp boundary between being a child and being an adult, but aside from borderline areas there is a very big difference between them.) Finally, the fact that Quine's model is only modestly dynamic is reflected in the fact that in his model logic and mathematics never lie in the periphery (cannot reach the periphery) and experimental science never lies in the center.

In my model, none of this is the case. The periphery is not limited to sensory experience but extends to non-sensory interface between our system of knowledge and the world. And logic, therefore, can be, and is, bound by periphery norms – essentially veridicality – just as much as experimental physics. All disciplines move between center and periphery, each being required to forge robust contacts with reality (through the periphery) as well as with the mind (through the center). In Quine's model, mathematics is grounded in reality only through its connections to physics (indispensability considerations), but in my model it is grounded in reality independently of these connections as well. This is made possible by the fact that my conception of reality, as well as of humans' cognitive interface with reality, is far broader than Quine's. Reality (world) has abstract as well as concrete features, and human's cognitive interface with reality involves not just sensory organs but also intellect (figuring out). Compared with my model, though not with more traditional models, Quine's model of knowledge is quite static.

7. EVALUATION OF QUINE'S PHILOSOPHY

C: I am still a fan of Quine's philosophy: it has had great influence on my philosophical outlook. Could you give a general characterization and evaluation of Quine's philosophy? What are its most valuable contributions? What are its obvious drawbacks? Right now, how do we evaluate the place of Quine's philosophy in 20th century philosophy?

S: I have also been greatly influenced by Quine and am still a fan. But I am a critical fan. I cannot offer a definitive characterization or evaluation of Quine's philosophy and its place in the 20th century, but let me tell you how I see it from my perspective.

I think of Quine as one of the most important, influential, and revolutionary analytic philosophers of the second half of the 20th-century. He revolutionized analytic philosophy at least twice. His first revolution is centered on "Two Dogmas of Empiricism" (1951) and related papers, and its two most important contributions are, in my view: (a) Rejection of the traditional philosophical dichotomies, in particular, the analytic-synthetic dichotomy and the related conventional-factual dichotomy. (b) Rejection of epistemic foundationalism and its replacement by a (relational) holistic methodology. Quine's second revolution is Naturalism, or the

naturalization of philosophy. Its most succinct expression is found in "Epistemology Naturalized" (1969), and it was a central theme in Quine's philosophy until his death in 2000.

In my view, Quine's first revolution is more valuable than his second. But his first revolution is often misunderstood. This is not surprising, in light of the fact that Quine devoted very little space to a presentation and discussion of the central issues involved in this revolution, devoting most of "Two Dogmas of Empiricism" to reasons for rejecting the analytic-synthetic distinction that have very little to do with the valuable aspects of his revolution. Quine's arguments against analyticity largely revolved around issues of unclarity and circularity, but his circularity objections are incompatible with his own holism. The most important problem with analyticity, in the context of Quine's first revolution, is, in my opinion, epistemic. Not in the sense that his real focus is, or should have been, on apriority (as suggested by Putnam), but in a different sense. Although the analytic-synthetic dichotomy is a linguistic or semantic dichotomy, it has important epistemic ramifications. Specifically, it induces a bifurcation of statements, theories, and fields of knowledge into factual and non-factual, and this, in turn, implies that, epistemically, some fields are subject to challenges from the world, while others are not. This leads to what I believe is a false sense of security with respect to fields like logic and mathematics: here we don't have to worry about veridicality, we don't have to take any measures against the possibility of factual error. (In my book, I liken this approach to the establishment of a "Maginot line of defense.")

By rejecting the analytic-synthetic dichotomy, Quine opens the way to a new approach to knowledge: all fields of knowledge are subject to robust veridicality requirements, including substantial requirements of *factual* justification. No field of knowledge is exempt. This, I believe, is a veritable revolution in philosophers's attitude to non-empirical knowledge, and in particular to logical knowledge. It is important to note that this does not render logical knowledge empirical. It renders it *factual*, but *not* necessarily empirical. We need to establish the veridicality of logic, as well as of mathematics, philosophy, etc., in its own right, and not just based on their indispensability for, connections with, or applications in empirical science. I would say that Quine's first revolution opened the door to a new approach to philosophy. On the one hand, we may go back to the classical philosophical questions of Kant and others. On the other hand, we are free to put aside the traditional dogmas that guided past philosophers' approach to these questions. We are free to develop new tools and methods for answering these questions. This openness has not been fully realized by the philosophical community. But it is there, ready to be discovered and made use of.

Quine's second revolution is his naturalistic revolution. This revolution has two faces: an open-minded face and a closed-minded face. Its open-minded face says that there is no good reason or need to draw a sharp line between philosophy and other sciences, including the empirical sciences. All disciplines are in principle interconnected, and the dogmatic boundaries between them – the idea of "philosophy first," of philosophy as a privileged field of knowledge, isolated from all other fields – should be toppled or rejected. This face of Quine's naturalist philosophy is in line with his first revolution, and it is best seen as continuing and further strengthening that revolution. But Quine's naturalistic revolution has another face as well. This is a rigid and narrow face, whose main message is that there is no place for philosophy as an independent discipline, but all philosophical questions should either be thrown away or be reformulated as empirical scientific questions. This face of Quine's revolution is sometimes summed up in the slogan "Philosophy should be reduced to, or replaced by, empirical psychology." This aspect of Quine's second revolution expresses his radical empiricist tendencies, tendencies that created an inner tension in his first revolution, and are discussed at some length in my book. In "Epistemology Naturalized" the dogmatic character of this face of Quine's second revolution is expressed in his unquestioning adherence to Humean empiricism. Quine takes Humean empiricism for granted. He never questions or tries to justify this extreme form of empiricism. He completely disregards criticisms of this radical empiricism (by Kant or others), treating Hume's empiricism as written in stone. The only alternative to Humean empiricism that Quine considers is Carnap's positivism. And finding faults with this alternative, he concludes that the Humean direction is the only way left for philosophers to go. Quine's lip service to the mutual inclusion of philosophy in psychology and vice versa makes no difference to his call to reduce philosophy to empirical psychology (or to replace it by the latter), and the result is an exceedingly narrow and one dimensional conception of philosophy. The openness of the first face of Quine's naturalism is overshadowed by its close-minded and radical face. As far as the actual impact of Quine's naturalist revolution on philosophy in the late 20th and early 21st century analytic philosophy goes, I think there is a continuum of positions from an open-minded, enlightened naturalism to a close-minded, overly restricting one.

(To be continued)

University of California, San Diego, USA
Peking University, China

Acknowledgement

This article is supported by the major research project “Studies on the Significant Frontier Issues of Contemporary Philosophy of Logic” (No. 17ZDA024) funded by the National Foundation of Social Science, China.

[1] Willard Van Quine, *Word and Object* (Cambridge, MA: MIT Press, 1960), 5.