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The semiotic roots of worldviews: logic, epistemology, and contemporary comparisons

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Abstract: The logic of worldviews provides a consistent method of comparison between multiple worldviews. The present paper connects the logic of worldviews to important historical and contemporary influences. Beginning with its roots in semiotics, an account of epistemology emerges which is mediated by a belief system. We show that Charles Peirce's pragmatistic theory of inquiry is the bedrock beneath the logic of worldviews. We formulate it as a generalized version of inquiry with underlying game-theoretic semantics. In this paper, we extend Peirce's triadic model of signs to cover knowledge mediated by systems of beliefs. Michael Polanyi's account of personal commitment includes a subsidiary/focal distinction that views theoretical frameworks as tools for interpreting orders of reality through actual practices of research. We also see how a precedent is set by Johan Georg Hamann's epistemology of belief, recovered by Ludwig Wittgenstein, using reason as an interpretation of God's speech in nature. We argue that Thomas Kuhn's theory of inquiry and worldviews (or paradigms) may be fruitfully contrasted with Peirce's theory, with reasoning by abduction, deduction, and induction occurring within the community of inquirers. The upshot is that although worldviews may be adopted for non-rational reasons, one can meaningfully *compare* worldviews through a method proposed by Alasdair MacIntyre: the proponent of a theory learns the language of competing theories and uses them as a metatheory to show how one's own theory may not have the resources to resolve certain problematic situations. Our result is a meta-linguistic falsification in the sense of Peirce's semiotics and pragmaticism: the competing theory may be used to show that the object theory does not have a strategy at its disposal to interpret the anomalous phenomenon.

Keywords: worldviews; Peirce; semiotics; pragmaticism; epistemology of beliefs; worldview comparisons

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1 Introduction

The question of worldviews became a central theme in late twentieth century and early twenty-first century scholarship, especially in the philosophy of science, the philosophy of language, and epistemology. This revival was preceded by Ludwig Wittgenstein's recovery of Johann Georg Hamann's thought in *On Certainty* (hereafter OC; see Halpern 2019; Snellman 2018), an influential book written in 1951 that introduced the connection between language and a worldview, as well as that of knowing and believing, into the commonplace and analytic epistemologies of science. Michael Polanyi (1958, hereafter PK) discussed the notion of "personal knowledge," arguing for the centrality of skills and personal commitments in gaining meaningful scientific knowledge. One can, indeed, define personal knowledge as commitment to certain theoretical tools (signs) and skills (habits) as a means to reach the truth, so that the commitment supplies researchers with frameworks and values that shape their outlook. Thomas Kuhn gave an account of seeing the world *as something* by discussing scientific revolutions and Gestalt-perception in his 1970 bestselling *The Structure of Scientific Revolutions* (hereafter SSR). Alasdair MacIntyre (1988: ch. 18) and Charles Taylor (1995: 3) subsequently worked on constructing dialectical theories of worldview comparisons in the 1980s and 1990s. Even contemporary formal epistemology has recently thematized worldviews and logic, and worldview disagreements are currently investigated under the topic of "deep disagreements" (Ranalli and Lagawaard 2021), among other recent cognate approaches and proposals.

However, the theme of worldviews has been a controversial topic in the human sciences, including the philosophy of language, the philosophy of science and their precursors in history. We wish to distinguish worldviews from primarily subjective convictions. Worldviews are sign-systems and frameworks for understanding the world, whereas conviction measures the intensity of a knower's holding a belief or a habit of interpretation. Similarly, worldviews were seen as overly relativistic, even self-defeating. As an alternative, philosophy began developing interests in systems of speculative and formal metaphysics relating to topics such as grounding and direct reference. These speculations were motivated by an opportunity to avoid appealing to worldviews. Hence, not turning to worldviews avoided potential contamination by the vagaries of cultures, non-epistemic values, personal or political attitudes, and the theoretical deadlocks that seemed to arise from the ensuing question of how to make sensible comparisons among worldviews. Donald Davidson (2009, Ch. 13) famously argued that the concept of a worldview, or a conceptual schema, or the totality of the ways of organizing experience, is fundamentally incoherent because the concept of the total breakdown of communication across the stated worldview boundaries, or the ways of organizing experiences, cannot be made comprehensible whenever the

interpreter's language functions as the privileged metalanguage for such attempted comparison, communication, or dialogue.[1]

The deep themes of the theory and logic of worldviews – the centrality of skillful action; its fundamentally pluralistic, non-epistemic, and non-propositional posture; the required comparison of frameworks dialectically by their fruitfulness and expediency; and ultimately that of the fundamental connection between action, language, and belief – are, however, well developed in the classical pragmaticist and pragmatist traditions of Charles Peirce (1839–1914) and William James (1842–1910). Pragmatism is a method of philosophy that emphasizes action and active inquiry in the constitution of knowledge. It was set up as a new and distinctly American philosophy by the classical pragmatists in the United States, originally by Peirce in early 1870s and later by Peirce's students John Dewey (1859–1952) and Josiah Royce (1855–1916). Popularized as a philosophy wedged between the traditions of rationalism and empiricism in the works of Harvard psychologist William James, Peirce kept on refining the details of his original theory throughout his life. Peirce's pragmaticism – which he typically spelled with the extra syllabus to highlight the precise and specific meaning of the term – is the original statement of that distinctly American philosophical method as it emerged in the late nineteenth century. Pragmaticism refers to a methodology by which to resolve disputes on meanings. It can overcome both foundationalist and constructivist positions in science. A priori principles are malleable outcomes of how mind evolves in the universe, and thought is an embodied, enactive, and extended semiotic phenomenon (see Pietarinen 2021; cf. Snellman 2023). Pragmatistic methodology prioritizes experimental and fallible constitution of knowledge and emphasizes the role of the past, present and future practices that contribute to the meaning of propositions, intellectual concepts, scientific terms, and generalizations. At bottom, it is the theory of meaning that contributes to the methods and theories that emanated from Peirce's logical investigations. The notable internal divisions in this uniquely American philosophy have been extensively explored elsewhere (see, e.g., LoF 3/1).

The fundamental connection between action, language, and belief in the formation of worldviews has certainly not gone unnoticed, and David Naugle even defines worldviews in the semiotic terms rooted in Peirce's theory and classification of signs as a "semiotic system of narrative signs that creates the definitive symbolic universe which is responsible for the shape of a variety of life-determining, human practices" (Naugle 2002: 330; see Davidson 1985; EP 2: ch. 14; Kripke 1980; Ladyman et al. 2007; Putnam 1999).

The present article connects certain key ideas in Peirce's pragmaticistic and semiotic thought with the recent discussion on worldviews and their meaningful comparison. Our thesis has three parts. In the first part, we review and compare Peirce's semiotics with the insights into world views variously offered by Naugle, Hamann, and Polanyi. Second, the

1 Hence, the annihilation of any strong claim favouring conceptual relativism, see Davidson 2009.

concept of knowledge through commitment and a belief system, as in the concepts of "knowing by faith" and "personal knowledge," is put forth as a variance that can equally be characterized and understood in semiotic terms. We argue that Thomas Kuhn's highly influential description that takes worldview changes to be Gestalt shifts can also be accounted for by a turn to Peircean resources and especially his theory of meaning in the framework of game-theoretic semantics. We show how both Kuhn's concept of Gestalt and Alasdair MacIntyre's dialectical falsification are notions that can both be interpreted through Peirce's semiotics. Hence, they share Peirce's asymptotic concept of truth as a final opinion of inquiry; inquiry that could be pursued without indefeasible limitations by the community of inquirers.

In the third and final sections, Hamann's and MacIntyre's theory of worldview comparisons, which attempts to match competing languages and vocabularies, is argued to be a generalization of Peirce's combination of a game-theoretic conception of truth with his pragmatistic theory of inquiry, as soon as we recognize how important it is that the latter, the practice of the logic of inquiry, has to consist of the three interconnected stages of reasoning, stages that consist of reasoning by abduction, deduction, and induction. We do not claim that one first reaches a worldview by logical reasoning: indeed, Polanyi, Kuhn, and Hamann explicitly criticize such claims. What we are instead claiming is that the logic of Gestalts, language-constituted rationalities, and personal commitments, nevertheless give rise to a logic of dialectical worldview comparison. Worldviews may or may not be logically constructed, but their comparisons have logical characteristics.

To prevent misunderstandings, we make the following points at the outset: first, the proposal is an interpretational one: we posit the presence of certain additional truths that come to view from the suggested application of Peirce's semiotic blueprint, arriving at "one-and-a-half truths" malleable to a meta-theory about worldviews. Second, the proposed use of Peirce's theories of semiotics and the logic of inquiry, as well as the exploitation of ideas from which the theory and logic of worldviews is to be recovered, requires a pluralization of languages, vocabularies, research traditions, and scientific and scholarly agendas. This, in turn, calls for locating the activities of knowing in the life of an individual instead of a fully idealized, theoretical notion of the scientific community in the limit and in the long run.

The upshot is a broadly *action-first* epistemology – not the knowledge-first epistemology propounded in contemporary and mainstream epistemology – but one that comes with concessions to Peirce's original formulations. Peirce, as is well known, did not complete his architectonic designs and frameworks but left the details and loose ends to be worked out by posterity. Even the most mature and final formulations evoke conceptions that advanced throughout the decades in Peirce's intellectual life, without definite endpoints. Specifically, in the present paper, we highlight the need for certain modifications and submissions that seek not only to adhere to generic scientific methods

and attitudes but also to extend the received epistemology in the sciences to take personal commitments and the critical mass of value pluralism and viewpoint diversity of the community of inquirers into account – commitments that are broadly Jamesian and at least implicitly also Peircean – in character. With these, Peirce's general theory of signs and meaning befit Polanyi's approach of personal commitments.

2 Worldviews as systems of signs and personal commitment

Peirce connects his semiotics with his theory of universal categories, which he named Firstness, Secondness, and Thirdness. Firstness includes possibilities, qualitative experiences, and objects that can exist by themselves. Secondness includes factuality, reaction, and causal necessitation. Thirdness involves representation and law-like mediation by habits. Peirce introduces both game-theoretic semantics and mediation in his defense of his three categories. For example, the sentence "Some woman is adored by all Catholics" becomes true because the Utterer can point to Mary and then leave the Interpreter to pick a Catholic (e.g., Pope Francis). The sentence becomes true, no matter which Catholic the Interpreter chooses. The sentence "A was given by B to C" cannot be reductively analyzed into dyadic relations because A is a constituting and mediating factor between B and C in the complex fact that involves A, B, and C. Semiotics, we observe, makes two key commitments here. Specifically, thirdness is an irreducible part of sign interpretation, and such interpretation is constituted by habits of action that closely resemble the strategies of game theory.[2]

Semiotics thus subscribes to the mediation path described as {Object → Sign → Interpretant}. This path is conceived as an irreducible triadic structure, as the sign itself mediates the path from objects to interpretants, and the interpretant connects the sign with its object. Peirce defines a sign as something that "mediates between an object and an interpretant; since it is both determined by the object *relative to the interpretant* and determines the interpretant *in reference to the object*."[3] Three relevant trichotomies ensue from this, each involving a triadic division between classes of signs. The best known, though by no means the privileged triadism of choice for Peirce, is the trichotomy of icons, indices, and symbols. It is defined in reference both to Peirce's categories and to the parental mappings between signs and their objects. Roughly, icons are Firsts as they refer to their objects by resemblances of various kinds; indices are Seconds as they are caused by their objects and refer

2 See "The Categories Defended," EP 2: 160–178.

3 EP 2: 410. The example comes from PI: 197 and an earlier explication of Wittgenstein's Hamannian rule-following arguments (Pietarinen and Snellman 2006; Snellman 2018, 2023).

through physical and causal links and necessities, calling for attention and awareness both public and private; and symbols are Thirds as they refer through habits and practices that take symbols to be interpretable in reference to the generality of their objects.[4]

A sign stands for, points to, or refers to an object: "chess" refers to the game of chess as an institution as well as to its system of rules. Here, the sign is a lexical item in our language because it is used in the practice of playing chess that interprets it and makes it meaningful across a variety of contexts and circumstances. Practices interpret the word by assigning it a fixed meaning: practices connect words with chess games, rules of chess, tournaments, chess debates, chess research, computer algorithms, and other intellectual, cultural, and social activities associated with the classes of those combinatorial, perfect-information, zero-sum games we call "chess." Indeed, the word "chess" is a symbol that stands for the semiotic relationship {Object → Sign → Interpretant} = {Game of chess → "Chess" → Practice of playing chess} (see Bayer 2002; PI: 197; Pietarinen 2008).

We next argue for two points: First, that Peirce's semiotics offer a good theoretical background for Polanyi's account of skills, and second, that semiotics portrays itself as an appropriate broader framework to subsume analyses of Hamann's proposed epistemology of "knowledge through faith alone" (see Betz 2008: 82–84; N II: 57–82; PK: 49–68). As to the first point, Polanyi's theory of personal knowledge has endorsed the importance of skills in cases that involve the use of subsidiary objects; an example of a subsidiary object is a tool, hammer, or any instrument or artifact that may be ready to hand and skillfully used to act on a focal object, such as a nail. The relationship between the focal object, the subsidiary tool and the skill is one of Object, Sign and Interpretant; schematically, {Object → Tool → Skill}. The point would instantly generalize to the uses of scientific instruments to advance frontiers of human knowledge (see Hacking 1992). Polanyi highlights personal knowledge and personal commitment that is necessary for using a theory or an instrument as a tool in scientific instrumentation. He summarizes his program with the slogan: "*I believe that in spite of the hazards involved, I am called upon to search for the truth and state my findings*." Polanyi's claim, thus, resonates with Peirce's claim that a reasoning is sound if it conforms to a habit that is directed towards the truth and rationality (EP 2: 242–257; PK: 49–68, 299–320). One can then define personal knowledge thus: it is one's making of a personal commitment to adopt a tool like a framework, a theory or an instrument, for the pursuit of truth and skillful interpretation of reality in terms of the semiotic relationship of {Object → Tool → Skill}.

4 EP 2: 5–9. See also the roughly corresponding division of kyriological/historical/hieroglyphic signs in Dickson 1995: 95 and H: 66. The other two triadisms, qualisign-sinsign-legisign and rhema-proposition-argument, mature in Peirce's theory in the later years (see, e.g., Bellucci 2017).

Hamann, who had taken a much earlier and distinct perspective, compares knowledge with dialogues with Apollo through oracles (e.g., {Apollo → Oracle → Socrates} or with dialogues with God through Nature {God → Nature → Reason}). Hamann notes that various cases are all conceptually similar, as they resemble the communication of an author to an interpreter through a book: "God, nature and reason have as intimate a relation to each other … like the author, book and reader" (ZH 5: 272, quoted in Dickson 1995: 388). Connections like {Apollo → Oracle → Socrates}, {God → Nature → Reason} and {Author → Book → Reader} are thus cases of sign-relations {Object → Sign → Interpretant}. They involve both an Utterer and a message the Utterer is expressing, a sign like an oracle or a book, and are habits of interpretation like Socrates' non-knowing or the rational interpretation of nature. Socrates and the rational knower then form practices of knowing by believing in the message's assertions. We, thus, observe that both Polanyi's and Hamann's accounts of personalized knowledge can be viewed through the semiotic channel {Object → Sign → Interpretant}, and both personal commitment and faith are beliefs, namely, habits of action, which come to be formed and modified as a response to problematic situations encountered in the course of inquiry. Likewise, the problematic situation may be a question, surprising matter, or anomaly that is submitted to further investigation (see Betz 2008: 82–84; Dickson 1995; N II: 57–82).

Similarly, Peirce links meaning, pragmatistic consequences, and habits and practices through his maxim of pragmaticism. The famous early formulation of the maxim is "Consider what effects, which might conceivably have practical bearings; we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of our objects" (EP 1: 132). There are variants and revised definitions of pragmaticism and its definitions in Peirce's later works (LoF 3/1); we will have to forego all the interesting nuances in the present paper. Generically, the maxim focuses on how objects would respond in certain types of interactions with them. According to Peirce, "the subject of predication would (or would not) behave in a certain way – that is, that it either would, or would not, be true under given experiential circumstances … certain facts would exist" (EP 2: 402).

Peirce's 1905 argument for pragmaticism uses the example of seeking and finding a solution to a math puzzle as a paradigmatic example of how logical interpretants are formed in the process of inquiry. One navigates the space of problematic situations and hopes to identify fruitful formulations of the issue by using one's background knowledge and common-sense beliefs as hints and clues to inform choices and decisions by which the modelling could proceed. The investigator appeals to clues to build alternative constructions and scenarios in the imagination in view of finding the most promising pathways toward gaining further clarity about the nature of the problem or even toward its solution. This is how strategy profiles are formulated in game theory. Peirce states this as "The real and living logical conclusion *is* the habit; the verbal

formulation merely expresses it."[5] Strategy profiles are not merely plans of actions but responses to interactive situations that would, could, or might arise in the future states of the plays of the games, "no matter how improbable they are" (EP 2: 402). Since our interlocutors (or nature's responses) are fundamentally uncertain, we must be prepared for all possible events – even the zero-probable contingencies – that could arise, or are anticipated or computed to arise, had the player played a certain move. The unpredictable element is commonly presented by small perturbations, such as the fellow player's potential to err, make an unintended mistake, suffer from trembling hands, or discover a genuine novelty that cannot be predicted or calculated by any other agent. Then, at the end of the play, an object is encountered whenever one's habits and practices of conducting the procedure have consistently been followed through. The outcome of these habits – which, in the game-theoretic sense, are the strategy profiles formulated partly through background knowledge and experience and partly through negotiation, anticipation, and intellectual guesses – is the living (logical) interpretant, or the meaning, of what we express with propositional signs and thoughts that are at our limited disposal.

Peirce's theory of signs and his notion of belief, as an elaboration of the famous idea from Alexander Bain as "that upon which we are prepared to act," is seen to define what we take practices theoretically speaking to amount. Practices respond to tendencies in reality that are not fully or reliably predictable. However, there are certain "definite tendencies of a tolerably stable nature" (LoF 3/1: 170) that characterize the local minima for the meanings of our concepts that propositions (or indeed what Peirce's generalized notion of propositions as "dicisigns" and "phemes," LoF 2/2, 3/1) represent. Therefore, the epistemology of semiotics can, or so we propose here, be applied in interpreting puzzles seemingly as varied as Hamann's famous Myth of Creation and Polanyi's Order in Nature.

Hamann argues that human signs, conceptual schemes, and ways of classifying experience are all responses in dialogue that are schematically {God → Nature → Reason}. Hamann articulates his view by narrating myths about the dialogue between God and Adam. In the dialogue, God creates the world through the Word, and therefore, every object is a sign, as its Utterer, for the mediation of God's ideas by the objects themselves. Every object is also a sign, as its Utterer, of systemic logic and God's ideas. Put differently, objects are natural elements of God's speech, the orders of Nature are its institution, and God acts through those institutionalized orders. Adam appropriates speech by interacting with objects through senses such as seeing and touching, as well as by recognizing, trusting, and internalizing nature's orders. With this, Adam builds a worldview-like system of signs and fixes their interpretants by using expressions in

5 EP 2: 398–433. For math puzzles, see also PK: 124–131. For seeking and finding, see Hintikka 1973, 2007.

certain ways in certain kinds of circumstances and thereby fixes the rules of one's language games of coming to recognize what the Orders of Nature truly are (Dickson 1995: 337–349; H: 108–109; Hein 1983; Snellman 2023).

Polanyi, on the other hand, presents a nontheological example of a crystalline structure. A crystal has a structure that can be expressed by charting its order-preserving transformations with mathematical symmetry groups. These ideal orders of the causal structure of nature can be empirically realized by samples of gemstones, as their crystal structures serve as models for the symmetry group (in the strict model-theoretic sense) owing to the chemical properties of the crystal. Then, the experience of the crystal recognizes, or spots, an order, which is abstracted into a universal free-floating mathematical theory that can be personally appreciated, for instance, through the mathematical beauty and simplicity of these symmetry groups. This example likewise illustrates the communication pattern {Order of crystal structures → Empirical crystals → Mathematical theory (sense of beauty, simplicity, credulity, or other personally appraised epistemic values)}. The empirical element of the crystals is a subsidiary means. The theory that unifies their properties offers activities of appreciating the beauty of the gemstone through practices of theoretical interpretation, which are means for perceiving the order. This, in Polanyi's view, takes place by forming a Gestalt of those orders between structures.[6]

Polanyi's example of a crystalline structure is curiously isomorphic to Hamann's example of creation. The investigator, in both cases, aims at recognizing an order in nature and interacting with it through a well thought-out and designed set of experimental practices. The order becomes the focal object of recognition. Furthermore, one must also trust subsidiary empirical means, such as looking at and measuring samples of crystals through suitable instruments, interpreting the results, and running confirmatory studies, to truly form a gestalt of reality. Nevertheless, one recognizes the underlying order by trusting the reality upon which one places the interrogations and questions through experimental design and instrumentation and with all the subsidiary empirical means needed: schematically, {Reality → Facts → Practices}. Empirical facts are subsidiary objects of epistemic trust, and they lead to a gestalt or an overarching vision, insight, or revelation of the nature and constitution of the object in question through the mediating practices of the belief system. Gestalt is expressed by constructing a conceptual scheme such as a mathematical model, pattern or diagram that appeals to the expression of rational relations using metaphors and tropes of language. One may then argue that the creation of conceptual schemes is the best way to reach the truth of the matter or at least the best response to the researcher's calling

6 PK: 43–48. Polanyi (PK: 1–10) argues that a scientific theory is correct to the extent it recognizes orders in reality.

that was present while framing the research questions put upon nature in the implementation of the experiment. The conceptual schema is successful when we recognize the order of the underlying phenomena through a personal commitment to a practice defined by values and experiences such as beauty, respect, economy, or awe that may all arise out of our engagement with the respective domain of investigation (Dickson 1995: 311–138, see ch. 3.3; PK: 43–48; Snellman 2024; ZH 7: 151–180).

In sum, Peircean semiotics is a theory of meta-schemes of how worldviews are interpreted as sign systems that respond to reality's answers to our chosen methods of interrogation. Naugle defines worldviews as systems of narrative signs that codify our practices of acting, reasoning, storytelling, and knowing. We suggest defining world views as a *meta-structure* that consists of a system of signs $\sum$ and a value framework M that responds to and captures fundamental truths about a domain or system S that has been appropriately framed with boundary conditions and initial parameters. These meta-structures make up an *agenda* or a *framework*, which, like world views, are built upon the theory of habits as their core: a framework now consists of four-tuples of ‹ persons, possible actions, habits, and goals. ›[7]

The use of signs, guided by habits of action and dialogues with reality, suggests that scientific, intellectual, cultural, and other human endeavors to understand the world are conceived as constructs of a pluralist theory of inquiry. The human condition makes the fundamental commitments and values of research a personal matter in the sense of Polanyi, allowing for multiple traditions and agendas of research to work in interplay and conversation with one another.

Peirce's categories of Firsts, Seconds, and Thirds resemble Hamann's theory of mediation by elements, institutions, and present realities. These two tables of triadicisms, both the Peircean categories and Hamann's (and Wittgenstein's) accounts of meaning in use, have a common core. One can meaningfully contrast them and thus also synthetize Hamann's and Peirce's triadicisms in the following manner:

(A) Charles Sanders Peirce:
   1. Firsts or possibilia: experiential qualities, icons, possible states of affairs.
   2. Seconds or causal necessities: causal relations, indices, facts.
   3. Thirds or mediations: habits, law-like associations, continua.

(B) Johan Georg Hamann:
   1. Element: an object or fact F in a context or system S of interaction – means with possible uses in S.
   2. Institution: a rule that sets up a function or a role for F within a larger system S – rules governing necessity or possibility.
   3. Present reality: A meaning, function, systemic logic, or role that F receives in the context of S by being governed by the institutions of S – a mediated reality.

7 The definition of a worldview builds on Naugle 2002; OC; PK; Stenmark 2021; SSR; and Taylor 1989.

An overlap of Peirce's and Hamann's accounts – closer to Hamann than to Peirce – is this:

1. Independent facts and objects: elements and possibilia.
2. Necessities given by causal relations and defining rules: inherent necessities.
3. A habit, meaning or function: mediating habits or laws establishing meaning and function.

Table 1 presents a summary of the Hamann-Peirce triadisms referenced above in terms of examples selected from the key areas of human sciences: culture, science and inquiry, religion, and institutions. The table is based on the common ground of Hamann's use theory and Peirce's categories as a starting point.[8] This table is not claimed to conform to Peirce's theory of signs, as it presents an interpretation of Peirce's triadisms motivated by Hamann's antedating account.

3 Paradigm shifts and games of seeking and finding

This section aims at establishing a link between logical interpretants, activities of seeking and finding and Gestalt-perception. Logical interpretants are habits of seeking and finding, which is illustrated with Peirce's example of a mathematical problem in "What Pragmatism Is" (1905). Sensuous habits of seeking and finding will then be associated with Gestalts with Wittgenstein's puzzle-picture example, and other examples from PI part 2, section xi. Thus, Kuhnian paradigms can be interpreted in terms of seeking and finding practices, as the Gestalts arise from theory-laden and experimentally mediated practices of scientific research (see EP 2: 398–433; PI: part 2, xi; Pietarinen and Snellman 2006; SSR: esp. ch. 10; Snellman 2024).

Peirce connects logical interpretants – those deliberate, final effects of signs that mediate and communicate forms of objects and utterances – with the activity of seeking and finding those objects as solutions to our questions put either to our minds (as in thought experiments) or to Nature (as in scientific experiments; EP 2: 414–418; Pietarinen and Snellman 2006). He argues that in problem solving and inquiry, the task is to construct the interpretant of, say a mathematical puzzle, by developing a strategy for solving it, then seeking and (perhaps) finding the solution. The strategy for solving the problem, namely for seeking and finding its solution, is the logical interpretant, because it is exactly what leads one from the puzzle to its solution:

8 See Bayer 2002 and ZH 7: 154–181 for Hamann, EP 2: 160 for Peirce, and also Snellman 2023: esp. ch. 4.1. and 5. These definitions are closer to Hamann than to Peirce, as Peirce connects laws and rules with Thirdness.

Table 1: A summary of semiotic triadisms of world views, across the board.

Mediated knowledge	Object	Sign	Interpretant	Element/1st	Institution/2nd	Mediated presence/3rd
Language-game formation	Reality (as a structure of *would-bes*/habits of action)	Facts	Language-games	Facts, expressions	Laws setting up functions/*would-be*s, habits of action, linguistic rules	Objects, logic of underlying system
Reality (PK: 3–10)	Structure	Theory	Confirmation	Theoretic signs	Confirmation rules, epistemic values	Form, pattern, structure
Pattern (PK: 43–48)	Model (logic)/ structure	Phenomena	Theory, sense of beauty	Phenomena	Paradigmatic rules	Model
Skills (PK: 49–65)	Focal	Subsidiary	Skill	Tool, action with means	Skill, ability, intellect	Activity and its goal
Gestalt (PK: 49–65)	Meaning	Parts	Tracing the relationship	Parts	Tracing the relationship	Meaning
Faith (PK: 59–62)	Objects and relationships of a theory	Intellectual signs, beliefs	Use of framework, use of its presuppositions and resources, learning from others	Signs	Use in a language-game that includes the objects, adopted norms, values	Objects of belief (objects, relational structures)
Revelation (ZH 5: 272)	God	Nature	Reason	Facts, expressions	Divine orders and institutions, linguistic precepts	Divine communication
Literature (ZH 5: 272)	Author	Book	Reader	Expressions	Linguistic practices and actions	Creation, the world of a narration
Vision (ZH 5: 272)	Light	Eye	Revealed nature	Events of photon detection	Practices of looking	Seen objects, relationships, forms
Prophecy, trinity (Jenson 1997: 75–89)	God	Prophet/Word/ God's presence	Action by the addressed (Israel, man, world)	Message	Communication/language-games god/world	God's will, plans and presence

> In every case, after some preliminaries, the activity takes the form of experimentation in the inner world; and the conclusion (if it comes to a definite conclusion) is that under given conditions, the interpreter will have formed the habit of acting in a given way, whenever he may desire a given result. The real and living logical conclusion *is* the habit; the verbal formulation merely expresses it. (EP 2: 418; see Pietarinen and Snellman 2006)

For example, Peirce understood the standard logical quantifiers of "there is" (existential quantifier) and "for all" (universal quantifier) in terms of practices of seeking and finding their objects in the interactive setting: "that though a sign cannot express its Object, it may describe, or otherwise indicate, the kind of collateral observation by which that Object is to be found." The collateral observation Peirce mentions here is an important, multidimensional phenomenon facilitating the inquiry and includes things such as possession and accumulation of relevant and adequate background knowledge, the development of right approached to how the question is to be framed, our awareness of potential bias, noise, and other distortions to one's decision-making abilities, the procedures needed for debiasing and noise audits, and the assessment and fixing of the initial parameters and boundary conditions for the domains of systems under investigation, and finally, the setting up of the relevant conceptual and cognitive frameworks to cater for collateral observation to take place. When the competences, resources and parameters for collateral observation are set forth, the seeking of solutions in our cognition or in Nature through our considerate and criticized interrogation becomes an easier task than it otherwise would be.

Notably, Peirce's formulation of the meaning of quantifiers is explicitly a game-theoretic one: He states that the expression "Any man will die" will leave it to the interpreter to pick any man in the universe of the discourse. The proposition then becomes "If you take any individual you please from the universe … and that individual is a man, it will die." On the other hand, the proposition "Some Old Testament character was translated" leaves it up to the Utterer to select a suitable individual. From these and a wealth of other similar textual evidence for the interactive, strategic, and dialogical nature of the meaning of one's central logical nomenclature,[9] one can continue to give rules for Peirce's games of seeking and finding in intellectual inquiries:[10]

1. The players are the Utterer (the Proponent) and the Interpreter (the Opponent).
2. The objects are the objects of model M and their relationships (M, I).
3. The game G(ϕ) in the model M begins with the sentence ϕ and the interpretation {}.
4. If $\phi = \neg\psi$, the Utterer and the Interpreter exchange turns and winning conditions, and the game continues from ψ.

9 Further evidence is examined in LoF 3/2.

10 The definition is in Pietarinen and Snellman 2006: 279. See also Hintikka 1973, 1997: 103–104; EP 2: 308.

5. If $\phi = \psi \wedge \chi$, the Interpreter chooses ψ or χ, and the game continues from the chosen subformula.
6. If $\phi = \psi \vee \chi$, the Utterer chooses ψ or χ, and the game continues from the chosen subformula.
7. If $\phi = \exists x_n \psi x_n$ and the interpretation is s, the Utterer chooses $a \in$ M, and the game continues from ψx_n and the assignment s $\bigcup \{(x_n,a)\}$.
8. If $\phi = \forall x_n \psi x_n$ and the interpretation is s, the Interpreter chooses $a \in$ M, and the game continues from ψx_n and the assignment s $\bigcup \{(x_n,a)\}$.
9. If ϕ is atomic and the assignment is *s*, the utterer wins if, and only if, the interpreter loses, if, and only if, ϕ is true in M on the assignment *s*.

These Peircean games of seeking and finding constitute the background for our discussion of the key problems in our proposed logical theory of worldviews: How do we account for worldview changes as important Gestalt shifts, and how are meaningful comparisons among worldviews possible? These problems are at the epicenter of earlier charges that any thesis formulated about worldviews is bound to lead one into the morass of relativism. Can we escape such dire consequences?

With the above preliminaries at hand, in this section, we resort to Kuhn's notion of gestalts, from which we move on to MacIntyre's dialectical account of the comparison of worldviews. We argue that both Kuhn and MacIntyre built their perspectives upon a generalization of what Peirce came to express in terms of the logical activities of seeking and finding. We further argue that one does not need to be worried about charges of collapsing into relativism under either approach.

Sense-perception means sensuously mediated practices of seeking and finding. It serves as an example of mediated practice but not the be all and end all in the spectrum of such human intellectual activities. Alva Noë argues that one can see a rose pattern on a wallpaper, even though the pattern is not clear in the center of the visual field (Kusch 2020; MacIntyre 1988; Noë 2004; SSR). Seeing and observing here refers to the possibility of looking at the target from certain perspectives and discerning the pattern of the wallpaper. Certainly, one can see the pattern on the wallpaper, although it is not in one's field of vision because one has developed the habits of seeking and finding patterns via practices of looking at the object in question. One can "see" a cube as a geometric construct, although one never sees all sides of the cube at the same time from a single individual's vantage point. Clearly, sensations are sensuously mediated instances of seeking and finding.

The sensuously mediated activities of seeking and finding underlie seeing-as and aspect phenomena. Wittgenstein described aspect-perception as "half visual experience, half thought." Aspects involve seeing meaning and order in an object of experience, such as a picture, and distinct aspects correspond to different sensuous activities of seeking and finding. One can see a puzzle-picture as a tree by tracing the

organization of the trunk and the branches or as a face by tracing the organization of the features of the face by pointing face-like structures in the branches. Similarly, seeing a double cross as a white cross on a black background involves tracing and pointing the white cross, and vice versa. Additionally, aspectual identification takes place against a context. Jastrow's duck-rabbit sketch is seen as a duck when placed in a (only imagined) picture with ducks and as a rabbit when placed in a picture that prompts rabbit-related images in our minds. A background narrative, as in framing phenomena, can lead to wildly different interpretations: the letter H may be legalese by imagining that lawyers had written it or as shoddy and childish by imagining that a child had scribbled it. Framing, scripting, and scheming of the stimulus matter and important parts of such processing in reasoning begin at the pre-neural levels of sensory organs and tissues and, importantly, involve the processing of non-visually imparted stimuli. Wittgenstein notes how "you search in a figure (1) another figure (2), and then find it, you see (1) in a new way. Not only you can give a new kind of description of it, but by noticing that the second figure was a new visual experience" (PI: part 2, xi; Snellman 2023; see also PK, SSR). (Surely Wittgenstein's example can, and must, be generalized to meanings that we get from aspectual phenomena for all 'sensing-as' circumstances, and not only for 'seeing-as'.) Gestalts correspond to and are constituted by sensuously mediated activities of seeking and finding solutions in our open, curious, and reasoned cerebration.

Kuhn links gestalt shifts with paradigm shifts in science and worldviews and argues that a change in basic assumptions effectuates a revolution – a kind of phase transformation – in the conduct, fashions, and agendas by which science is being practiced in relevant institutions and organizations. Paradigms are a matrix of a variety of phenomena; schematically represented, they comprise the tuple < laws, metaphysical assumptions, epistemic and non-epistemic values and regulative principles, ingenious examples that generalize well > (PI: xi; SSR: X, appendix; Snellman 2023, 2024). With a transformation in paradigm, a scientist ends up inhabiting a different world that is quite unlike the previous one: although the structure of reality has not changed, the inquirer sees the reality in a new light, and typically, in a staggeringly new light. Kuhn compares a paradigm shift with a gestalt shift: a duck/rabbit can be a duck or as a rabbit through the exertion of different habits and practices of looking at the sketch. A paradigm shift compares with new ways of coming to terms with an anomalous playing card (e.g., a black Queen of Hearts) or relearning to navigate in the world once one has put on inverted goggles. Lavoisier's discovery of oxygen led to viewing nature in fundamental terms, as scientists learned to build new models and design experiments that helped solve wholly new classes of problems. The shift in the life-worlds of scientists is prompted by the adoption of a new theory that resembles learning a new language, designing a new notation for representing information, or developing new patterns of reasoning. Scientists adopt paradigms as practical expedients supplanting

those that have led to increasing problems, anomalies, and unresolvable quarrels – they are intended to offer promise in coming to terms with problematic phenomena. A theory supported by new predictions, experiments and explanations is a sign of hope because there are novel ways of seeing things in a new light. Theories serve as an invitation to imagine a lifeworld to be inhabited as the theory gains ground and support. Regardless of the experience that the inquirer initially had and shared with others, it needs to be interpreted against the background of current and suggested improvements to the theory, as it is the theoretical framework alone that shoulders the task of shaping and grooming the human practices of looking at things and interpreting them in novel and unexpected ways.[11]

Kuhnian paradigm shifts are cases of the theory-ladenness of experience. We can learn to appreciate them by interpreting them in terms of Peirce's semiotics, including his games of seeking and finding in the epistemology of signs as the means and mediators of knowledge. A crucial further and related point that we do not want to pass over concerns the role of metaphors and models in the advancement of inquiry. Models and metaphors are intricately linked to one another: a metaphor establishes a morphism between the vehicle of the metaphor (a sign) and the object via common and shared knowledge. Parts of the vehicle are functional elements of the object, and the functional relationships of the vehicle correspond to the functioning of the object. These morphisms are formally the isomorphisms of model theory, or we can take them to be the functors of category theory. Either way, for metaphors Peirce's preferred formulation[12] was that they are signs that "represent the representative character of a representamen by representing a parallelism in something else" (EP 2: 277, 1903). What this intricate definition means is this. Metaphors bring simple qualities (Firsts) and diagrammatic relationships (Seconds) into a generalized relation (Thirds). They contribute to the communicability of organized mental objects and thus serve as important aids in externalizing the essence of complex ideas, while at the same time not losing their generative qualities that can bring forth fertile consequences of one's hypothetical assertions. Metaphors thus carry out two aims. First, they make mathematical and similar exactly formalizable ideas better understood by transferring their representations into other media. This is science communication at its best. Second, they present hypotheses in which further solutions and proofs may be found. This can speed up inquiry, as metaphors contribute to the fruitfulness of mathematical thought in evaluating conjectures. Here, again, the relationships between qualities and observed relationships (or indeed the "parallelisms" in Peirce's lingo) are established by the

11 SSR: X. For paradigms, see ch. 3.4. For Gestalt-perception, see ch. 3.3; PI: xi; and Snellman 2023.

12 Not knowing category theory does not mean that Peirce did not anticipate or entertain similar core ideas, indeed Peirce did develop an intriguing array of relational and diagrammatic logics that have categorical interpretations; see, e.g., LoF 1.

interpretative practices of seeking and finding: the nucleic acids are compared with letters, while the dynamic process of DNA reading and RNA protein production are compared with encoding messages on a hard drive, sending bits across the Internet, or printing the file by sending it to the printer.

The comparison highlights the function of DNA by showing a correspondence between the dynamics of data processing and DNA reading and model DNA through metaphoric comparison. The theory allows one to generalize one's habits of action and conduct to perceive and interpret genes as entities that operate at the cell's hardware organization levels by allowing one to seek and find codes and information transmission within the phenomena of a cell through evolving empirical practices.[13] Examples of such Gestalt switches abound in the history of science and are indispensable elements of real discovery.

4 Dialectical testing of worldviews and the pragmatistic cycle

Peirce's pragmaticism, we summarize our argument, solves the problem of Kuhnian paradigms and Gestalt shifts with its game- and model-theoretic account of the theory-ladenness of perception. The second argument that we now go ahead to offer concerns the conceptual assets in Peirce's pragmaticism in approaching another and seemingly relativistic theme in the topic of worldviews: the possibility of meaningful comparisons between contrasting, and possibly contrary or even contradictory, conceptual systems and schemas that organize knowledge. Specifically, Alasdair MacIntyre's account of the dialogue between languages is, we surmise, a Peircean, pragmaticistic account of worldview comparisons and management of deep disagreements. Therefore, the contrast between different worldviews becomes the question of how to generalize the pragmaticistic cycle of inquiry and its logic of abductive, deductive, and inductive reasoning.[14]

Johan Georg Hamann, as we noted, made an early argument in 1759 that one needs to compare different languages and processes of inquiry as a totality for realizing the meaningful assessment and comparison of different conceptual schemes. He expressed this view in the following illuminating words:

> Everybody understands his language and not those of others; Descartes has understood his reason, Leibniz his, and Newton his. Do they understand themselves better through mutual

13 This account of models as metaphors is based on Ziman 2000; Black 1981 and is developed further in Snellman 2023.

14 This argument on scientific methods in metaphysics is further developed in Snellman 2024.

> conversation (*untereinander*)? We must learn their languages, in order to analyze their concepts; we must test their materials; we must investigate the designs of their doctrinal constructions, their grounds, their ends and the conclusions. This must not be according to their promises and presuppositions that they burden us with by offering them as axioms, empirical facts, and conclusions. (N I: 30–31, 1759)

The question of inter-translatability between technical vocabularies and their definitions is, of course, also a very contemporary issue in the methodology of transdisciplinary research and in the aims of such research to realize scientific progress by meaningful combinations of multiple domains and objects of inquiry. Here, we propose Hamann's argument to be interpreted by generalizing Peirce's pragmatic cycle in the logic of inquiry, namely, those of abductions, deductions, and inductions, and that this cycle is also an essential procedure in the interconnected chains of reasoning in the logic of worldviews. In brief, abduction involves guessing good explanations of phenomena according to human cognitive faculties: minds illuminated with what Galileo called the "natural light of reason" (*lume naturale*). Indeed, all inquiry begins with abduction, which is the only mode of reasoning that introduces a new idea or a new concept by which one looks at things from different points of view. Deduction draws necessary consequences of the hypotheses, such as predictions, and induction evaluates the consequences by sending them to severe tests accompanied by systematic and statistical methods of reasoning.

The three-tier inquiry process of {Abduction → Deduction → Induction} has a close contrast at the framework level in terms of the process of {Worldview → Interpretation → Application and Testing}. The axioms, postulates, assumptions, and other materials, such as the boundary conditions of systems and worldviews, correspond to general conceptual schemes internal to worldviews. The empirical facts, predictions, and actualities correspond to the practices of drawing concrete interpretations from the worldview. Scientists then assess the conclusions through a comparison of multiple world views to decide their fitness with experience. This, however, means that the Leibnizian, Cartesian and Newtonian circles of {Conceptual scheme → Interpretation → Application} run in parallel and are assessed by dialectical methods of comparison to interpret reality.[15]

MacIntyre's perspective on the possibility of meaningful comparisons among different, or even radically different worldviews incorporates both the Peircean and the Hamannian elements of the generalized procedure. MacIntyre imagines the situation where the two research agendas or scholarly traditions, A and B, are composed of their own key texts, sources, and core beliefs; they have their respective practices of interpretation; and they both meet series of open problems and

15 Cf. Bhaskar 2008; EP 1: 186–199; EP 2: 440–445; N I: 30–31; Naugle 2002: 310–321. This characterization of the pragmatistic circle is gotten from the folklore of Finnish philosophy.

problematic situations. It is a safe assumption that the researchers of tradition A can learn the lexicon of tradition B, and vice versa, with sufficient and sustained effort and exchange. (This is what we currently ask transdisciplinary researchers to do first: to establish a meaningful dialogue and argumentation across vocabularies.) Although the criteria and strategies for interpreting phenomena are local to each of the two traditions A and interpretations of A are public and nonprovincial, they can be used to describe and assess interpretations of B and vice versa. Whenever A can point out an anomaly *x* that B alone cannot solve but can indeed solve *x* from using A's resources (or vice versa), A is shown to be a stronger and more promising method and strategy for advancing inquiry than B is (MacIntyre 1988: ch. 18; see also Snellman 2024).

MacIntyre also considers the scenario in which A cannot only solve B's anomalies *y* but also proves that B does not have the adequate resources to solve them, interspersed with an explanation of why B's resources are indeed believed insufficient. This amounts to a falsification of B in the broader Peirce–Hintikka sense of falsification of a research agenda, tradition, or intellectual tenet. If A can show (i) that the interpretative strategies of B are not sufficient for pointing out and interpreting some phenomenon and (ii) that the expectations that those attempts at satisfactory interpretation are instead recurrently defeated, then B is indeed false because it has no successful interpretative strategy at its disposal for recognizing the presence of the capacities for explaining the essential phenomenon in question. Thus, the insufficiency of the categories of B can be shown by using the methods of A to show that B has no matching method or strategy at its disposal to recognize the relevant phenomenon (cf. MacIntyre 1988: ch. 18).

The key Peircean premise that MacIntyre introduces at the framework level of such imagined meta-inquiry is the definition of truth as the asymptotic notion of what *would* arise as a final opinion *should* the inquiry be brought to its ultimate and indefeasible issue. This premise is the key part of the pragmatistic theory of truth, but it is not a relativistic one. In pragmaticism, the correspondence theory of truth is also used as a component, although it by no means reduces to the notion of correspondence, whether some tradition or model A is presumed to have the means at its disposal to point out that the interpretations of B do not truly work. Here we use the concept of truth from the point of view of a meta-theory of inquiry. The concept of truth fundamentally connects to the concept of inquiry, its conduct and progress, and it has two essential Peircean characteristics. First, a true conception is one that can solve the problems and challenges that have been, or will be encountered, within the ideal and indefinitely extendible, temporal continuum of inquirers, but only in the limit and in the long run, that is, only asymptotically and approximatively, and independently of any considerations of whether that conception might be upheld at the present moment or is one that actually is going to be converged upon and agreed upon by the continuum of inquirers any time in the

future. This overtly Peircean premise embraces confessing our limited, inaccurate, and probational characterization of transient abstract statements throughout his writings on truth and scientific inquiry:

> Truth is that concordance of an abstract statement with the ideal limit towards which endless investigation would tend to bring scientific belief, which concordance the abstract statement may possess by virtue of the confession of its inaccuracy and one-sidedness, and this confession is an essential ingredient of truth. (CP 5.565, 1901)

Second, one cannot know in advance that a theory will not be falsified. Fundamental uncertainty thus haunts us at every turn as to whether the promising theory stands the test of indefinitely extended criticism and systematic probing. Methods of statistical testing aim at keeping the likelihood high that, if false, such hypothesis would be caught out by a consistent application of these systematic methods before long. Reasoning will, as Peirce asserts in one of his last pieces he ever wrote, "carry us toward the truth" (MS 682: 9, 1913).

There is thus both an inevitable error-correction and meaningful direction that our pursuits of seeking and finding solutions in our thoughts with our interrogative engagements with nature will inevitably involve. The first characteristic amounts to the meaning of a true belief as one that allows inquirers who play the game of putting questions to nature to both systematically seek and rest hopeful to be fated to find solutions to problematic situations, but only in the limit. The final solutions are not actually achievable. A true belief asks players of the interrogative game to have patience to wait and, in fact, indefinitely so. The second amounts to the statement of fallibilism, namely, it lays out epistemology of science according to which all hypotheses may in principle be false, while not all of them can turn out to be false in one go (EP 2: 457; MacIntyre 1988: ch. 18). Both characteristics should increase our trust in the method, not diminish it, despite deep and seemingly irrevocable disagreements.

Peirce's game-theoretic concept of truth can offer fruitful and novel starting points for our engagement with meaningful dialectical comparisons of different and opposing worldviews. At this point, we simply conclude by putting forth the conjecture that Peirce's philosophy, which may give an impression of an overly realistic, even monolithic, phrasing of terms such as 'truth', 'knowledge', and 'scientific method', 'constitution of knowledge, and 'community of inquirers', is in fact a pluralistic framework to address and compare multiple methods of inquiry.[16] Peirce held that the interpretation of signs, by which we look of objects with the aid of collateral

16 EP 2: 380, 441–445. For a multiplicity of competing language-games and worldviews in the worldview tradition, see, e.g., SSR on scientific revolutions, PI: 18, 23 on changing language-games and N I: 30–31 on competing rationalities in the Enlightenment. Polanyi holds a position between Kuhn

information, depends both on our common sense attitude toward some shared, basic beliefs, especially as regards scientific background beliefs and attitudes shared by all disinterested inquirers. The possibility of success of all our abductions depends on the inquirers' abilities to figure out the truth if truth is indeed to be found. Hence, Peirce lays out a universal framework of sign interpretation, in which only one scientific community is at play – a collective community of actual and possible inquirers that extends through both time and space. This collective is the ultimate reviewer of the validity and strength of the proposed conjectures, hypotheses, and interpretations but before us by creative abductions.

Peirce's definition of truth as a final opinion of boundless and interminable research would collapse into relativism of truth-in-a-paradigm only if frameworks, with their own communities and convergence points for research, were allowed to function as arbiters of meanings of one's scientific assertions. The logic of worldviews holds, instead, that countless competing but comparable worldviews are ever present. As we have argued in the present paper, such starting points for moderate pluralistic explorations of methods of inquiry are available both in Polanyi's emphasis on personal dimensions of commitment in the constitution of knowledge and MacIntyre's neo-Peircean meta-theoretic view of the comparison of languages. Not altogether, different vantage points are also available in William James's variety of pluralism, which we acknowledge in the present paper. James' thought offers an inexhaustible source for further insights into how a pragmatist theory of inquiry, including the pragmaticist theory of meaning as Peirce would originally conceive and state that position to be, can be brought to bear on important and irreducible elements of human condition and commitment beyond its original conceptions. In James's ever so elusive but not incorrect words, the grounding idea of all science and human inquiry is that we must "live to-day by what truth we can get to-day, and be ready tomorrow to call it falsehood."[17]

Table 2 summarizes the main characteristics of the frameworks of Peirce (monism, relationalism), Kuhn (pluralism, relativism), Polanyi (pluralism, relationalism), and MacIntyre (pluralism, relationalism).

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and Peirce: he denies scientific revolutions but argues that changes of framework take place against the background of a shared scientific culture (PK: ch. 6).

17 James 1975: 107. That holds just as much in the human as in natural sciences – recall the anecdote quoted in Gardner (1994: 129) about a graduate student in physics at Princeton who came bursting out of their research seminar: "How did it go? Wonderful! he said. Every thing we knew about physics isn't true!".

Table 2: A summary of the frameworks of Peirce, Kuhn, Polanyi, and MacIntyre.

	Monism: single framework	**Pluralism: multiple frameworks**
Criterialism: criteria are prior Relationalism: signs, dialogue with object	*Enlightenment*: reason autonomous *Pragmatism* (Peirce): continuum of inquirers as arbiter and referee of truth	*Relativism* (Kuhn): finds only incommensurable criteria *Logic of Worldviews* (Polanyi, MacIntyre, extended Peirce): dialogue with reality, interframework discourse possible; critical mass of view-point diversity

5 Conclusion: pragmaticism as a logic of worldviews

We have shown that Peirce's philosophy of science, including his theory of semiotics (philosophy of signs) and pragmaticism (the theory and philosophy of meaning explicating the meaning of intellectual concepts with a philosophy of habits of action), offers notable conceptual resources from the past toward the development of a modern, nonrelativistic logic of worldviews and their comparisons for the future – a logic that can overcome the usual charges of relativism and remoteness from actual scientific practices. In addition, semiotics and the associated pragmaticistic theory of habits add to the plain story that we usually garner from the mainstream philosophy of science an emphasis on personal commitments and values in the connection between action, belief, and knowledge. The epistemology of scientific inquiry that appears from Peirce's work is 'action-first' (and not knowledge-first) epistemology that underscores the dynamic interplay between belief, action, and knowledge, highlighting the role of human agency in the continuous pursuit of truth. Drawing from the seminal works of Peirce, Polanyi, Kuhn, and MacIntyre, we constructed a framework for understanding and comparing worldviews. By integrating Peirce's semiotics and pragmaticism with Polanyi's emphasis on personal knowledge and commitment, and juxtaposing these with Kuhn's paradigm shifts and MacIntyre's dialectical approach to worldview comparison, we have outlined a non-relativistic logic of worldviews that not only acknowledges the plurality of scientific and metaphysical perspectives but also provides a structured method for their critical evaluation and interrelation.

We have moreover argued in the present paper that sensuously mediated activities of seeking and finding underlie gestalt perceptions and thus associate a scientific practice of interpretation with an experiential lifeworld. We have thus shown that worldviews are meaningfully comparable through metatheoretical reasoning by using one worldview to assess whether the activities of other worldviews are successful. The

resulting pragmatistic logic of worldviews emphasizes the human activities of seeking and finding objects, patterns, influences, and relationships that underlie the phenomena under investigation. The logic of worldviews also generalizes Peircean themes, including his triadic semiotics, game-theoretic semantics, and pragmaticism's habits of action, with the important dimensions that the critical mass of values, viewpoint diversity and personal commitment brings to scientific investigation.

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