LOOKING FOR BLACK SWANS: CRITICAL ELIMINATION AND HISTORY

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Abstract: This article examines the basis for testing historical claims and proffers the observation that the historical method is akin to the scientific method in that it utilizes critical elimination rather than justification. Building on the critical rationalism of Karl Popper – and specifically the deductive component of the scientific method called *falsification* – I examine his tetradic schema and adapt it for the specific purpose of historical analysis by making explicit a discrete step of critical testing, even though the schema is adequate as Popper expresses it and the elimination of error occurs at all steps of analysis. I also add a discrete step of critical elimination to Popper's schema even though the elimination of error occurs at every step of analysis. The basis for critical elimination history is the demonstrable counterexample. The study of history will never approach the precision of science – history deals with open systems that cannot be replicated like experiments guided by fundamental laws. But just because we cannot know something with the rigor of science does not mean that we cannon know it better than we do. There may be no objective truth in an absolute sense, but there is a distinction to be made between well-tested and poorly tested theories and therefore between history done well and history done with less analytical rigor. What I hope to show is how our historical knowledge may progress through good faith critical discussion – history is discussion – and the elimination of error.

Keywords: critical rationalism, Karl Popper, black swans.

> It is easy to obtain confirmations, or verifications, for nearly every theory – if we look for confirmations. (Popper 1965, 36)

> No number of sightings of white swans will ever prove the theory that all swans are white, but the sighting of just one black swan may disprove it. (Popper 1935, 27)[1]

Introduction: Back to Popper

What is the basis for preferring one historical theory or claim over another?[2] What is the dominant method in the selection and analyses of historical statements and conjectures? Is it the testing and critical discussion of competing ideas generally associated with science, or is it the partisan selection and defense of evidence

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[1] Another way of stating this is "no amount of observed instances can have the slightest bearing upon unobserved instances." (Miller 1985, 107)

[2] Popper asks a broader version of this question in *The Logic of Scientific Discovery* (1935/59, 108).

supportive or sympathetic to one's asserted position more typical of adversarial activities like forensics and litigation? If some historical discussions are merely contests of *verification* or *justification* rather than attempts to get to truer answers, then what might be done to transform such discourse into actual critical discussions? The purpose of participating in historical discourse should never be to engage in polemics, or trying to win for the sake of winning, but rather the attempt to arrive at truer and better-tested explanations and interpretations (Popper 1994, 160). There may never be a completely objective understanding of history in an absolute sense, but it is possible to progress toward it and there is a distinction to be made between theories that are well-tested and those that are less well-tested and therefore between history that is well done and history that is poorly done.

The study and writing of history, although in part an empirical endeavor, typically involves subjects with a greater degree of causal openness, thus allowing for a wider range of interpretations than do the more purely rational-empirical activities of the physical sciences.[3] It is also more difficult to limit – isolate – the parameters of historical events and therefore questions about them. As one of the humanities, the larger part of history – addressing the 'why' questions – is interpretive, valuative, rather than narrowly factual and quantitative like science, but its method, as with that of science, is critical-rational, as well as intuitive and interpretive.[4] Even with its dual nature, history is a part of the greater enterprise of the pursuit, increase, refinement, and testing of knowledge – of discovery. As with all empirical endeavors, and because we may never *justify* a claim with positive instances, there is only one method: the elimination of error, testing. Some interpretations are better – more rational, more accurate, better corroborated, more complete, more nuanced and insightful, better tested, more *true* – than others. On this point, I found my claims on Tarski's sophisticated realist definition of truth as the quality of theory-laden correspondence.[5]

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[3] Regarding causal openness, see Karl Popper, *The Open Universe* (1982) and "Clocks and Clouds" in *Objective Knowledge* (1972, 206-255). On *sense-qualia* and *quantia,* see A.J. Ayers, *Philosophy in the Twentieth Century* (1982, 66-67, 84-85, 88-90). See also Ayer, *The Central Problems of Philosophy* (1973, 71-72, 90-94, 101-102, 104, 118). Our sense perceptions tend to be more accurate in regard to quantities and in terms of quality. We may disagree on the color of a person's eyes, but not the number.

[4] Edward O. Wilson, among others, regards the humanities to be those fields that reveal truths about human nature, where science attempts to tell us what the truths are about humans and the physical world. See Edward O. Wilson, *The Social Conquest of Life* (2012, 268-284). Also, see generally Edward O. Wilson, *The Origins of Creativity* (2017). For Popper's discussion on history's affinity with science, see "A Pluralist Approach to the Philosophy of History" in *The Myth of the Framework* (1994, 130-153).

[5] "A true statement is one which says that a state of affairs is so and so, and the state of affairs is indeed so and so." See Alfred Tarski, *Logic, Semantics, Metamathematics* (1956/1983, 155). As Popper observes, the correspondence definition of truth is preferable to the two other definitions: truth as coherence and truth as pragmatic utility (consequentialism). (1972, 308-

The most fruitful function of history is to proffer and criticize new interpretations and to refine, modify, call into question, or refute existing interpretations via critical discussion. History *is* discussion. It is how we cull order from chaos, the cacophony of the aggregate of human interaction and the inaccessible motivations that underlie it. History is not a physical science, and it is an open question about the degree to which the component of critical elimination – the disproving of claims if incorrect, thus corroborating them if we fail to disprove them – so central to the scientific method which Karl Popper calls *falsification*[6], can be meaningfully applied as a component of the analysis of

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309) See Chapter 9, "Philosophical Comments on Tarski's Theory of Truth" 319-340 from *Objective Knowledge.*

[6] See generally Karl Popper, *The Logic of Scientific Discovery* (1935/1959). What I am describing here as 'academic history' is critical history. As one might expect, the philosophy of history and questions pertaining to the historical method and the craft of the historian have attracted both historians and philosophers and have resulted in a wide range of works on various aspects of how to approach history. These include serious philosophical treatments like R.J. Collingwood's *The Idea of History* and surveys like Peter Novick's *That Noble Dream.* There are also theories of singular causes of national character, like the Frontier Thesis of Frederick Jackson Turner's "The Significance of the Frontier in American History," and sweeping 'big picture' interpretations that borrow equally from anthropology, like Jared Diamond's *Guns, Germs, and Steel.* Among the more impressive refutations of a historical outlook is Popper's *The Poverty of Historicism,* which effectively dispatched the philosophical basis of deterministic programs like the idealistic vitalism of Hegel, the materialistic vitalism of Marx, as well as the cyclic models of Oswald Spengler (*The Decline of the West)* and Arthur Toynbee (*A Study of History)*. I agree with Popper and contend that historicist and eschatological programs – to include newer incarnations like the neoliberal 'end of history' thesis of Francis Fukyama – are fundamentally mistaken. John Gray's pugnacious *Black Mass* makes a strong case against such programs and the narratives on which they are based.

Works that embrace history as a basis for living include Nietzsche's famous Meditation, "On the Advantage and Disadvantage of History for Life," and Margaret MacMillan's *Dangerous Games.* I believe that all knowledge is retrospective, and reflective – historical – and therefore, it is necessary to apply lessons of the past in order to navigate through life. Given the disastrous route taken by Germany in the first half of the twentieth-century in part due to the historiography of Heinrich von Treitschke, (and in the American tradition the egregious distortions of the William Dunning School), I believe that it is also key to get history as 'right' as possible. As with George Kennan – a diplomat and statesman-turned-historian who successfully applied history to grand strategy – I believe that a broad and intimate understanding of history (as opposed to narrow, formal academic understanding and theory) is the most fruitful grounding for policy analysis. Some examples of works by prominent historians elaborating on the historian's craft or merely reflecting on their subject include Stephen E. Ambrose's *Personal Reflections of an Historian,* Bernard Bailyn's *Sometimes and Art,* John Lewis Gaddis's *The Landscape of History,* Edward Hallett Carr's *What is History?* Will and Ariel Durant's *Lessons of History,* Eric Foner's *Who Owns History?,* Barbara Tuchman's *Practicing History,* and Gordon Wood's *The Purpose of the Past.*

The purpose of history in my opinion is not to strike a balance among competing views, but to tell the truth. Looking at both sides, or multiple sides, and analyzing multiple points of view is a necessary part of being a historian. But eventually he or she must make a judgment, an opinion, reflecting the formulation of a mature interpretation. The job of historians is to tell the truth as

historical explanations. This is not to say that the study of historical topics is identical to the study of natural phenomena determined by fundamental laws and represented with formulas, as with physics. It is merely the Popperian idea that through the elimination of error, of incorrect, dogmatic, delusional, misleading/propagandistic, less accurate, or less complete conjectures, our historical understanding may progress. By better testing our ideas, we may thus interpret history more accurately. Unlike science, there is no formal prediction in the historical method other than the forward-looking aspect of critical elimination and the expectation of testing a theory or interpretation of the past.

More specifically I am positing the idea that falsification or something conceptually akin to it exists in the historical method as critical elimination by historical counterexample. Popper knew of this affinity and that the historical method can be illustrated by his tetradic schema – his general formula of how knowledge progresses through the criticism and the subsequent modification of historical theories, through the elimination of error (1994, 144-145). Although Popper's schema is sufficient as he expresses it, I am also modestly suggesting that it be honed, made more specific for the purpose of historical analysis. Here, the more specific activity of critical testing (or CT) should be considered a discrete element of the schema prior to critical discussion (or CD) or else, in another version of Popper's schema, replace the even more general category of the elimination of error (EE) altogether.[7] To be fair, historians test concepts in a less formal sense at all steps of the historical method, whether they realize it or not.

My intention then is not to blaze completely new trails, but rather to show how the ideas of critical rationalism and especially the methodological element of critical elimination are actually used in the study and analysis of history. In doing so, I hope to reintroduce critical rationalism to discourse on the method of history.

History as record is an accretion – an organic body of accumulated tentative knowledge, complementary and diverging theories, speculation, and information, rather than a singular system of analysis. It embodies a series of never-ending dialogs whose conclusions are always subject to revisiting, challenges, revision, and replacement with new interpretations. Where interpretations cannot be tested, history shares at least one of the weaknesses of the law as jury trial: it is an

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they see it and not to strike an unoffending balance when the truth of competing views is not equal. This kind of surrender to moral neutrality at all costs – a 'balanced' opinion in arenas where ideas and values clash – should be avoided. Historians make mistakes of judgment all the time, but it is better to be earnestly mistaken than to have never tried to tell the truth. I have long subscribed to the idea that human history has to be interpreted within the larger context of natural history. On this point, Edward O. Wilson observes, "[h]istory makes no sense without prehistory, and prehistory makes no sense without biology." See *The Social Conquest of Earth* (2012, 287). Such a reading is more than suggestive that, spite of our impressive aesthetic, scientific, and technological accomplishments, as an overpopulated plague species that is destroying the planet, the project of human civilization has been a colossal failure.

[7] For Popper's version of the schema in which CD is replaced with EE, see *Objective Knowledge* (1972, 119).

ongoing series of debates in which the most persuasive arguments often win out. The problem is that 'most persuasive' or 'most compelling' is not synonymous with 'truest.'

In another sense however, as an enterprise of interpreting and criticizing ideas, history is like a less rigorous version of science, although its initial conditions, assumptions, and models cannot be expressed or stated with the same degree of precision, and its predictive ability is far weaker, if extant at all. And of course historical events cannot be repeated like a scientific experiment. As with science, historical debate provides a forum for criticism and a clashing of assumptions and theories and the discussion of their consequences within a rational frame.

I hope that no one reading this will mistake my perspective for one of positivism, or conversely, postmodernist relativism or cognitive nihilist skepticism – it is a skeptical position, but one of rational rather than absolute skepticism, which is self-defeating, even in its own terms and one that Popper calls irrationalism.[8] I am offering a critical rationalist perspective and analysis in an attempt to apply Popper's ideas to the historical method. Beyond this introduction, I will not discuss broader ontological and epistemological questions on the fundamental nature and accessibility of the physical world and events in it and its amenability to empirical description, rational analysis, and linguistic expression (both realism and anti-realism are "neither demonstrable nor refutable" and therefore questions about them are closed). (Popper 1972, 38-39) Discussions on

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[8] Critical rationalism is a form of rational skeptical philosophy – an 'attitude' more than a specific school –framed as such by Karl R. Popper. See *The Myth of the Framework* (1994, 190-191). It is based on, among other things, the idea that we learn by correcting our mistaken beliefs and by testing our ideas, rather than by shoring them up with supporting evidence. Popper believes that the critical tradition – the idea of improving an existing idea through criticism goes back to the PreSocratic philosopher, Anaximander, who criticized a cosmological theory of his mentor, Thales. See Popper, "Back to the Presocratics" in *Conjectures and Refutations* (1965, 136-165). The primary focus of Popperian critical rationalism has been in the philosophy of science and the scientific method. See generally *The Logic of Scientific Discovery* (1935/1959). This form of sophisticated realism has been embraced by major figures of science to include Albert Einstein and at one time Stephen Hawking. See Stephen Hawking, *A Brief History of Time* (1988, 10), and *Black Holes and Baby Universes* (1993, 94). See also Michael White and John Gribbin, *Stephen Hawking: A Life in Science* (1992, 102-103). By his own account, Hawking became discontented with critical rationalism and for a time cautiously embraced a view resembling instrumentalism. See Hawking, "My Position" in *Black Holes and Baby Universes* (1993, 44). More recently, Hawking had adopted a position called model-dependent realism, which appears to embody qualities of critical rationalism and pragmatism. See Stephen Hawking and Leonard Mlodinow, *The Grand Design* (2010 45-51). In addition to the philosophy of science, Popper also contributed significantly to political theory with *The Open Society and its Enemies* (1994/1945), the philosophy of history with, *The Poverty of Historicism* (1957), and the mind-body problem with, *The Self and its Brain* (1977). Popper discusses irrationalism at numerous places in *Conjectures and Refutations, and Objective Knowledge.* For example see Popper, *The Myth of the Framework* (1994, 180). On irrationalism in political thought, see *The Open Society and Its Enemies* (1945/1994, 430-461).

noumena and *phenomena,* are either historical reenactments or else the fruitless parlor games of academic careerists.[9]

There is no objectively justified history, only history rigorously done or not in varying degrees, and I would argue that the 'objectivity question' is in large measure misplaced and distractive, a red herring. Objective truth exists as an epistemological possibility and the most we can hope for it to get progressively closer to it. Therefore the pertinent question should never be the authoritarian dun of "how do you know?" but rather "how did you test your theory?"[10] The objective basis for truth exists as physical reality as does a rational-empirical-linguistic frame by which to describe it. The ideational basis for describing objective facts exists, even if we are unaware of it.[11] In history as with science, the task is to discover or to move closer to truer theories and interpretations.

The methodological element in history is critical testing. One manifestation of this is critical discussion, and discussion proceeds from the proffering of interpretations. These we evaluate and test as rigorously as we can. We should resist the urge to *prove* a point or interpretation or try to *justify* a theory by its coherence with the existing state of knowledge (the coherence of a new theory with existing theories as a heuristic element is itself contingent upon testing by comparison and is the basis for the correspondence model of truth, but coherence in itself is not a basis for truth, something we might call the inductive fallacy of coherence).[12] Rather we should attempt to *corroborate* claims and interpretations

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[9] As Hume observes, absolute skepticism is an impossible position in that one would have to be skeptical of one's own skepticism, leading into an infinite regress. (1739/1888, 180-187) See also Hume's 1745 "A Letter from a Gentleman to His Friend in Edinburgh" in *An Enquiry Concerning Human Understanding.* (1993, 115-124) Regarding Popper's solution to "the not very deep methodological problem – the problem of historical relativism," see *The Myth of the Framework* (1994, 142-143).

[10] As Popper notes, "[t]hus the empiricist's questions 'how do you know? What is the source of your assertion?' are wrongly put. They are not formulated in an inexact or slovenly manner, but *they are entirely misconceived:* they are questions that beg for an authoritarian answer… And I propose to replace, therefore, the question of the sources of our knowledge by an entirely different question: *'How can we hope to detect and eliminate error?'*" (1965, 25). See generally 21-27. Similarly, Popper believes that the idea of proving or verifying theories is linked with authoritarianism in science. See Popper, *The Myth of the Framework.* (1994, 94) On a related point, Popper addresses the idea of pseudo-questions such as "What is truth?" and more generally "What is?" and "What are?" – all "verbal or definitional questions" in *Objective Knowledge* (1972, 309) Popper regards these kinds of questions as unfruitful. Regarding pseudo-questions, see also *Conjectures and Refutations* (1965, 72-73).

[11] For Popper's 'three worlds' ontological model, see generally *The Self and Its Brain* (1977/1986). He also discusses aspects of the Three Worlds throughout *Objective Knowledge* (1972).

[12] For Popper's discussion on theories of truth, to include coherence, see *Objective Knowledge* (1972, 308-309).

via critical elimination or a kind of *progressive* or *positive negativism* – the potential progress of knowledge by eliminating error.[13]

We learn more from our mistakes than from our successes; knowledge progresses by correcting our mistaken beliefs in light of more powerful and more rigorously tested explanations, by trial and error. When a conjecture is presented with greater or truer explanatory power, we must as honest and rational [14] investigators discard the discredited theory and embrace the new one rather than attempt to shore up the old one. My purpose then is primarily methodological. I am concerned with the question of how to test or better test theories; I am not interested in interpretive models. My assumptions are that the world exists as do other minds and that we may access, discuss, and come to know (or better know) aspects of it and ideas about it, however imperfectly, and how we may progress toward truer answers.[15]

In the spirit of critical rationalism, I would offer that history, when done well, is a process of testing through critical analysis and discourse, both internally by the individual historian and within the community of peers, reviewers, scholars, and students.[16] The fundamental method of history, like all other enterprises of discovery, is the testing of ideas and the elimination of error.

In the first part of this article, I will examine the fundamental methodological categories of induction and deduction. In the second part, I will show how deduction as critical elimination can be – and in fact are – used as the decisive component of the historical method as critical discussion. I will then

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[13] I coined the term 'positive negativism' to characterize the progress of knowledge through critical elimination in an email correspondence with David Miller in 2012. See David Miller, "Missing the Target, The Unhappy Story of the Criticisms of Falsificationism" (2017, 13). The idea of negative empiricism was not invented by Popper, although he developed the idea more than anyone before or since. Charles Sanders Peirce and Victor Brochard both expressed this idea before him. See Nassim Nicholas Taleb, *The Black Swan* (2007, 56-57).

[14] On the growth of knowledge through the correcting of mistakes, see Popper, *The Myth of the Framework* (1994, 93). On the discarding of disproved ideas, see Popper, *Conjectures and Refutations* (1965, 33-65). In *The Myth of the Framework,* Popper gives a good definition of what might be called soft rationality (as opposed to the hard reason of logic and math): "Rationality as a personal attitude is the attitude of readiness to correct one's beliefs. In its most highly developed form, it is the readiness to discuss one's beliefs critically, and to correct them in light of critical discussions with other people." (1994, 181)

[15] Plato, Hume, and Kant all believe that the fundamental nature of the world is beyond our ken. Popper, often regarded to be an epistemological optimist, agrees with this. See Popper, *Conjectures and Refutations* (1965, 194-195). But just because we cannot know something with absolute certainty does not mean that we cannot know it at all. See letter of Oliver Wendell Holmes, Jr. to Harold Laski dated January 11, 1929 (de Wolfe Howe 1952, 1124-1125). As regards the linguistic description of the world, if we accept a scientific view of language, such as the generative grammar model of Noam Chomsky, we can see that, contrary to postmodernist dogma, human beings are able to communicate ideas, however imperfectly. See generally Chomsky, *Language and Mind* (2006), and *Syntactic Structures* (1957).

[16] Examples of internal testing would include Einstein's famous thought experiments.

suggest an additional step of critical testing as a dynamic intermediate element between the initial theory or interpretation and critical discussion of it. It should be noted that both critical elimination (attempts to disprove an idea) and subsequent critical discussion such as peer review, when done well, are both means of testing rather than confirming conjectures as embodied by historical interpretations. I will then provide and discuss examples of testing simple historical facts, the testing of historical understanding of concepts, and macro theories. I will also discuss what might be called a 'Heisenberg Principle' of historical understanding. But first I feel compelled to discuss the current state of the philosophy of the historical methods.

The State of the Debate

The reader will quickly discern that there is scant reference to the ideas of current critical theory and philosophers in this paper. This is by design. Although I am acquainted with the current state of the philosophy of history, the various debates, and the leading players, I must confess to finding precious little of interest among them as regards the historical method. The discussions today seem to be little more than a rehashing of old debates about skepticism and relativism, terms that modern scholars often confuse or conflate.[17] Some of these debates date from antiquity (debates on the centrality of language go at least as far back as Sextus Empiricus, while relativism and skepticism date back even farther to Protagoras – a Pre-Socratic philosopher – and Pyrrho).

Many recent discussions on historical methodology center around critical debates between the various incarnation of constructionism and realism.[18] I see these as a continuation of the dustups between the antirealism, relativism, and irrationalist skepticism of postmodernism on the one hand, and a traditional realist epistemology of inductivism on the other.

When we read contemporary realist philosophy of history, we see valiant, if often tortured defenses of adequacy, completeness, superiority, and clarity of explanations, linguistic and cultural neutrality, and the extent or limitations of description, and coherence of interpretations with the existing body of knowledge. All of this amounts to an inductivist position – justification – and often with a tone of defensiveness, conditionality, temporizing, or apology. These were the concerns of the positivists and pragmatists of the nineteenth-century. As Popper observes, clarity is a 'moral duty,' but it has no bearing on the truth ('obscurantism' is actually intellectual obstructionism).[19] Realist philosophers of history also

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[17] For the misuse of these words, see David Miller (2000, 156-173). Another word one hears a lot from irrationalists is subjectivism, which might be defined as relativism brought to the level of the individual.

[18] For a discussion of constructivism, see Tom Rockmore, "Interpretation as Historical, Constructivism, and History" (2000, 184-199).

[19] For an example of the concern for clarity among the Pragmatists, see Charles Sanders Peirce, "How to Make Our Ideas Clear" in *Philosophical Writings of Peirce* (1955/1878/1940, 23-41).

speak in terms of 'empirical justification' rather than rational-empirical corroboration and testing. I appreciate the efforts of members of the realist camp – thinkers like C. Behan McCullagh and Avirzer Tucker. [20] But in spite of the nobility of their efforts, some realists succumb to the problem of induction expressed by Hume 280 years ago.

As for the critics of the constructivist position who deny the possibility of truth as correspondence in history – that one's reality, to include history, is a construction of our perceptions rather than a reflection of an objective external reality – I find this claim to be immoral in a time when the liberal free press has been charged with accusations of 'fake news,' when extremist propaganda is accepted as true, and when even science is being called into question (it is also unclear how we may access ideational constructs that are external to the historian but not ideas about the external world). [21]

Curiously, both positions are wrong. Skepticism – the view that we cannot justify knowledge – is a true position, and therefore modern justificationist realists are wrong in their inductive methodology, but not in their realism. Constructionism, as a manifestation of the relativist/subjectivist position in its denial of the possibility of truth as correspondence (and therefore of truer/less true theories) is both incorrect, and in a time when the enemies of the open society are on the ascent, irresponsible. The subjective state of the investigator's mind or his or her intellectual background or outlook has no bearing on the correspondence of a theory to the external events it purports to describe. To think otherwise is to succumb to the fallacy of psychologism. [22]

As regards justificationist realism being a mistaken outlook, one may ask how is it possible that objective reality exists and yet we may not support theories about it with 'evidence?' [23] Popper's answer to the problem of induction is straight-forward: even though we cannot justify a theory, we may test it.

History, as with all of life, is about questions and problem solving. Questions of method imply assumptions about epistemology and knowledge (critical

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On Popper's view of clarity as 'a moral duty' and 'an intellectual value,' see *Objective Knowledge* (1972, 44, 58). Regarding Popper's disdain for intentionally unclear writing, see his comments on Theodor W. Adorno in "Addendum 1974: The Frankfurt School." in *The Myth of the Framework* (1994, 78-81) and his paragraph on Hegel's writing in *The Open Society and its Enemies* (1945/1994, 243).

[20] See generally C. Behan McCullagh, *Justifying Historical Descriptions* (1984), and Avirzer Tucker, *Our Knowledge of the Past* (2004).

[21] Popper expresses the dangers "of an epistemology that teaches that there are no objective facts" in his article "Source of Knowledge and Ignorance" in *Conjectures and Refutations* (1965, 5).

[22] See Popper, *The Logic of Scientific Discovery,* section 25 (1935/1959). See also Popper, *The Myth of the Framework* (1994, 168-169).

[23] How may we be realists and not believe in positive reasons for our beliefs? See generally "Conjectural Knowledge: My Solution to the Problem of Induction" in *Objective Knowledge* (1972, 1-31).

rationalism assumes an outlook of sophisticated realism). Therefore questions about method are questions of philosophy and not of criticism.

Questions of relativism and subjectivity in interpretations are matters of practical concern. They should be addressed by the historian as a matter of course through a wide range of equally practical/commonsensical heuristic measures to minimize subjective bias, evaluate ideas, and eliminate error. This is a part of the commonsense 'art' of history (Popper 1994, 139). But as regards attempts to 'prove' or shore up positions with 'evidence,' these represent a backslide into inductivism. From perusing the literature, one infers that few philosophers of history today even realize that Karl Popper solved this problem more than 90 years ago (1972, 1).

I am therefore not interested in trying to justify beliefs; I am interested in testing ideas. I am not interested in arriving at more 'balanced' interpretations. Although historians may present multiple perspectives, they must ultimately tell the truth. In matters where values and truth are at stake, *balance* is for cowards, cynics, and psychopaths. I am interested in arriving at truer answers. Like Popper (by way of E.M. Forster), I "do not believe in belief." (1972, 25) Let others engage in debates gamed-out long ago to inconclusive ends about the meaning of meaning and the criteria necessary for justifying belief. As an issue of method, I could not care less about such closed questions.

I have also found that many philosophers today are shockingly unaware of modern scientific language theory – the generative language program of Noam Chomsky – preferring instead to see language in skeptical terms set within an outdated conventional understanding of language. Even a cursory understanding of Chomsky's psycholinguism makes one realize that the 'radical' linguistic beliefs and paradoxes of critical theory are little more than anachronistic distractions.[24]

As for historians and philosophers of history offering epistemological explanations and analogs between history and science – scholars like McCullaugh and Tucker – in spite of their laudable efforts, I regard these to be foundationalist and justificationist (i.e. inductivist) in nature. As Popper observes, there are no, and can be no, ultimate foundations of knowledge, at attempts to justify beliefs are a part of "the mistaken quest for certainty." (1972, 42, 74-78)[25]

My paper is on method and is shorn of interpretive matters. If this seems like a throwback, it is also intentional. Sometimes we must take a step backward in order to go forward. I have noticed in recent decades a lack of analytical rigor and ideological dispassion in some of the writing coming out of academic history departments and hope to reestablish a few basics given the understanding of these ideas in our own time. Those who think that discussions on falsification are of a purely historical nature – that they betray a concern for ideas whose currency is limited to the thinking of the early-to-mid-twentieth-century – are mistaken. The

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[24] See Note 15.
[25] Popper attributes the term 'quest for certainty' to John Dewey (1972, 63).

first question we must ask about a philosophical concept is whether or not it is still productive. Critical elimination is one of the most productive concepts in the history of ideas and its importance is manifest in the boggling advances in the science of our time. To write-off falsification as the concern of another time would be like dismissing General Relativity or Hugh Everett's multiverse interpretation of quantum mechanics as intellectual antiques of the last century. The testing and elimination or corroboration of ideas as an element of analysis is timeless, although, like the ideas of the Presocratics or those of twentieth-century particle physicists, we may continue to build upon them. If the implications of falsification are still debated in theoretical physics, then it is certainly topical enough for the philosophy of history. If it was good enough for Einstein and Hawking, then it should be good enough for us. Popper notes that the ideas and inquiries of the early Greek thinkers are still with us today and find numerous modern analogs (e.g. models of the block, discrete, and ideational universe, the problem of motion, atomic theories, and evolution, to name a few). Because of this, Popper's exhortation 'back to the Presocratics' – also the title of one of his essays on the early Greek philosophers – is as pertinent today as ever before.[26] And so in a similar vein, I say 'back to Popper,' and make my case below.

I. Induction and Deduction: What We Think We are Doing Versus What We are Actually Doing

A. Induction

When we observe the world around us, we seem to be taking it in directly, literally. In fact just by thinking and observing, we are testing our assumptions and expectations. It is impossible to approach something without assumptions, and as Popper observes, just by considering a thing means that we already have "ideas and opinions about it."[27] In large measure, we even learn how to see.

The concept of induction for our purposes is perhaps best expressed by the cognitive model of Locke, stating that the mind is a blank slate, a *tabula rasa* and that all of our knowledge comes to us as unmediated information via the senses.[28] In Locke's model of simple or naïve realism, patterns and facts of the external world, expressed as law-like repetitions typical of behavior governed by laws of

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[26] See Popper, "Back to the Presocratics" in *Conjectures and Refutations* (1965, 136-165). See also Popper, *The World of Parmenides* (1998).

[27] Popper's solution to the problem of induction shows that there is no such thing as unmediated perception and therefore that all observation involves the testing of assumptions – deduction. See Popper, *The Logic of Scientific Discovery* (1935/1959, 40) and *The Myth of the Framework* (1994, 145).

[28] See generally John Locke, "Essay Concerning Human Understanding" 1690. The idea that all observation is theory-laden is a central concept in Popper's philosophy. See *The Myth of the Framework* (1994, 145).

physics, impress themselves directly on our consciousness as pure experience and without theory, or interpretive or cognitive frames.

The biggest problem with the inductive method and one of the greatest sources of confusion surrounding it is the fact that it does not exist even though for most of us it seems to. (Popper 1935/1959, 40) The fact that people intuitively believe in induction is known as 'the Psychological Problem of Induction' or H_{PS} in Popper's formulaic shorthand; the fact that induction does not really exist as a method is known as 'the Logical Problem of Induction,' or H_L.[29] Induction in logical terms means an assumption of deriving generalities from specific instances (Hurley 1988, 537).[30]

Post-behaviorist cognitive theory tells us there is no such thing as unmediated perception.[31] Our perceptions are routed through cognitive networks of the brain before we are even aware of them, which means, as my friend, David Isenbergh observes, we live consciously in continuous reaction in the immediate past (and therefore *all* knowledge is historical – we are blind to the future until it becomes the past), not a small consideration.[32] It is through this routing that we become aware of and interpret our perceptions. Therefore all knowledge is interpretive – informed by existing knowledge and theories processed through psychological matrices – even when the interpretations are narrow, as with logic, applied mathematics, and simple sensory observations like seeing three pebbles in a jar.[33] As Popper writes in his essay, "On the Sources of Knowledge and Ignorance," "Knowledge cannot start from nothing – from a tabula rasa – nor yet from observation. The advance of knowledge consists, mainly, in the modification

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[29] See Popper, *Objective Knowledge* (1972, 1-31). Popper's model shows that traditional empiricism and inductive model of perception – what he calls "the bucket theory of the mind" – in fact leads to an infinite regress. For Popper's description of the bucket theory, see *Objective Knowledge* (1972, 60-63). How this model leads to an infinite egress, see *Conjectures and Refutations* (1965, 22-23).

[30] See also Popper's discussion of the use of the word 'induction' by Aristotle and Bacon. (1965, 12-13)

[31] As Popper notes, "[m]oreover, there is no such thing as an uninterpreted observation. All interpretations are interpreted in light of theories." (1994, 145) See note 34.

[32] The idea that human perception is eternally in the immediate past was suggested to me by David Isenbergh.

[33] If knowledge derived from perception was simply about pure and unmediated observation without psychological matrices to interpret and test such information, then animals with greater senses, such as dogs and cats, would presumably have a much greater understanding of the world. It would be they who dominate the world with science and abstract ideas, which is obviously not the case. Although they can commune with the natural world in ways which we cannot, we have far greater abstract knowledge of it. Regarding theories of generative grammar, see generally, Chomsky, *Language and Mind* (2006). For Popper's theory of the mind, see generally Karl Popper and John C. Eccles, *The Self and Its Brain* (1977/1986). For a critique of generative grammar theory, see Edward O. Wilson, *The Social Conquest of Earth* (2012, 225-235).

of earlier knowledge." (1965, 27-28) In other words, problems, theory and theoretical frameworks always precede perception.[34]

The consequence of there being no direct perception is that there can be no unmediated interpretation of anything, including events, ideas, and texts (and people do not read texts, we read language). Therefore, deductive reason – whether it is the hard reason of formal systems of truth, the soft reason of simple open-mindedness (Popper 1994, 181) and good faith discussion, or the intermediate form of falsification in science and, in limited instances, in the study and practice of history – is the only true means of deriving knowledge. All methods, despite their distinctive disciplinary trappings and subject matter, involve the testing and criticism of ideas – and the question of academic disciplines is how to test ideas, given the character and dictates of the particular field and its constituent subjects.[35] They are all forms of testing and are therefore deductive.

What are the implications of the critical rationalist critique of induction on the practice of history? Unlike physicists, historians do not (and should not) look empirically for law-like patterns of the physical world in order to form their conclusions. As Popper observes in his essay, "On the Sources of Knowledge and Ignorance," there are numerous non-scientific programs that attempt to justify their tenets 'by *positive* reasons,' and which are just as likely to be rationalist in nature as they are to be empirical.[36] Many of these programs are in the social sciences and include Freudian psychoanalysis, feminist critical theory, and Marxism. On this point, Popper quotes Bertrand Russell: "that no man's authority can establish truth by decree; that we should submit to truth; that truth is above human authority" to include appeals to ideological premises.[37] (1965, 29-30)

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[34] Popper writes, "[y]ou cannot start from observation: you have to know first what to observe. That is, you have to start from a problem. Moreover, there is no such thing as non-interpretive observation. All observations are interpreted in light of theories." (1994, 145)

[35] On the idea that methodologies are determined by academic disciplines, Popper writes: "The belief that there is such a thing as physics, or biology or archaeology and that these 'studies' or 'disciplines' are distinguishable by the subject matter which they investigate, appears to me to be a residue from the time when one believed that a theory had to proceed from a definition of its own subject matter. But subject matter, or kinds of things, do not, I hold, constitute a basis for distinguishing disciplines. Disciplines are distinguished partly for historical reasons and reasons of administrative convenience (such as the organization of teaching and of appointments), and partly because the theories which we construct to solve our problems have a tendency to grow into unified systems. But all of this classification is a comparatively unimportant and superficial affair. We are not students of some subject but students of problems. And problems may cut right across the borders of any subject matter or disciplines." (1965, 66-67)

[36] See "On the Sources of Knowledge and Ignorance" (Popper 1965, 3-30).

[37] Not only is truth above human authority, but Popper notes that "[t]here are no ultimate sources of knowledge" in general. (1965, 29) This tenet of Popper's is conceptually related to Oliver Wendell Holmes' observation that "[c]ertitude is not the test of certainty." (1918, 40) As with advocates in the law, adherents to various ideological programs read observed evidence

The Problems of Induction then, are manifest in non-scientific programs as *justification.* Like scientists working under the assumptions of the Baconian inductive model, adherents to such programs look for repetitions of law-like patterns, such as 'laws of history' usually based on ideological assumptions. Unfortunately, human behavior and events arising from it preclude the predictive regularities of applied science. Unlike physics, there are no fundamental 'laws' of history.[38] Therefore when historians or social scientists who adopt a historicist approach look to what they perceive to be deterministic or rationalist regularities and patterns – often represented by misled attempts to apply probability and frequency ratios to human behavior – as analogs to physical laws, they err badly.[39] Historicists mistake human propensities for 'laws' of history or else as being reflective of the law-like predominance of reason in the human mind. They look for past examples of behavior upon which to base present conclusions as if the past truly is a historicist, or historically deterministic prologue. But the

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and interpret such information as support of, or justifications of, their theories and when the evidence contradicts the theories; they simply modify them to accommodate such information. See Popper (1965, 33-65). Needless to say, we should only accept truth as the result of testing and criticism and not by the command of authority. After all, power is a characteristic of truth rather than a synonym; truth is powerful, especially when demonstrable, but not all power is truthful.

[38] See generally Popper, *The Poverty of Historicism*. On a broader note of historical determinism, it is probably trivial whether the world is one that includes unpredictable deterministic chaos or unpredictable indeterministic randomness.

[39] Various rationalist schools in the social sciences – 'rationalist' used here to mean an outlook assuming that reason is a dominant human trait or that there is a rationalist narrative to history, and as opposed to the 'weak' rationalist claim that it is simply better to be reasonable than unreasonable, but that reason is not a dominant human trait – make the curious assumption that people will generally act in their own perceived self-interest (examples would include Hegelian vitalism, Lockean libertarianism, Marxism, and the Law and Economics School). Human acts may or may not fall into general patterns of species-based behavior (to include an elasticity of behavior), but this tells us little about how individuals will act, which also varies on a cultural or social basis. What it does tell us does not have the predictive or explanatory power as the patterns of the physical world that can be tested in science. See Edward O. Wilson, *On Human Nature* (1978, 2-3), and *The Future of Life* (2002, xxi-xxii). The human brain is the product of evolution, but even if it is based on deterministic fundamental laws, human behavior is unpredictable as a chaotic phenomenon. The British philosopher and historian, John Gray, believes in behavioral determinism as did Stephen Hawking. Without entering into a discussion of free will, it would seem to be an open question about whether or not human beings can rise above their biology, their animal nature, via reason and moderation. See John Gray, *Straw Dogs* (2002, 3-17), and Stephen Hawking and Leonard Mlodinow, *The Grand Design* (2010, 30-34). Regarding fundamental laws in physics, see Max Tegmark, *Our Mathematical Universe* (2014, 134), and Roger Penrose, *The Road to Reality* (2004, 1020). On falsification itself, Penrose believes that Popper's idea that "the scientifically admissibility of a proposed theory, namely that it be observationally refutable… is too stringent a criterion, and definitely too idealistic a view of science in the modern world of 'big science.'"

past is not necessarily prologue. At best, history is an incomplete and partially obscured roadmap to a blind intersection.[40]

As with inductivists in science, historicist historians look for confirmations and dismiss or explain away contradictions or inconsistencies, thus *insulating* or *immunizing* their position from criticism rather than inviting it in instances when it would risk calling their outlook into question. In doing so they embrace an attitude that is the exact opposite of critical rationalism.

In science probabilistic outliers can often be factored out. But in human events, outliers – Napoleon, Karl Marx, Thomas Edison, John Wilkes Booth, Albert Einstein, Adolph Hitler, Franklin Roosevelt – are often more influential on the course of history than individual people in the great aggregated mean of behavior. In a historicist scheme, evidence is seen as 'proof' of what one already believes, or else it is rejected or minimized. Needless to say, this approach to analysis has huge ramifications on the study and analysis of history.

The non-scientific nature of history is not in itself a fatal flaw. As Popper notes in *Conjectures and Refutations* and in other discussions on the Problem of Demarcation, just because a program is not scientific does not mean it cannot be important as an activity, theory, or body of ideas.[41] As regards our topic, it simply means that the practice of evaluating historical interpretations is not a scientific means of discovery, although it is related to it.[42] Popper believes that non-scientific programs, such as Freudian psychoanalysis or Darwinian evolution prior to later discoveries in genetics, are oftentimes of great importance and are perhaps even true in their claims, but they are not scientific.[43]

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[40] Regarding Popper's views on historical determinism generally, see Karl Popper, *The Poverty of Historicism* (1957) (refuting the idea that there are determinist laws, cycles, or a narrative plot to history).

[41] Popper gives Marxism and Adlerian psychoanalysis as examples of programs that utilize non-scientific justification (1965, 37).

[42] See "The Problem of Demarcation," in *Popper Selections* (Miller 1985, 118-30). Popper specifically notes that Freudian and Adlerian psychoanalysis may contain true ideas, even though they are not scientific programs. See also *Conjectures and Refutations* (1965, 37-38).

[43] Although Popper believes that disciplinary lines are largely artificial, there is a real demarcation between science and non-science. On the illusory nature of disciplinary distinctions, see *Conjectures and Refutations* (1965, 66-67). On Popper's demarcation between science and non-science, see chapter 11 "The Demarcation between Science and Metaphysics," in *Conjectures and Refutations* (1965, 253-303), and "The Problem of Demarcation" in *The Logic of Scientific Discovery* (1935/1959, 34-39). Popper also believes – correctly, I think – that some disciplines may straddle this demarcation between science and non-science and fall into both categories. Biology, for instance, if defined broadly enough to include both genetics and the study of animal behavior, would encompass activities that include both hard science and something closer to the social sciences. Popper likewise notes in *The Poverty of Historicism,* that evolution is an overarching meta-theory, organon, or 'historical statement' that characterizes the development of life on Earth and not a theory characterized by a singular 'law of evolution' to be tested. Even so, some aspects and claims of evolutionary theory as a body of theories as it now stands – laws of heredity or the existence of genetic mutations for example – can be tested

Michael F. Duggan

B. Deduction: Black Swans and Dead Roosters

How then do we progress toward more truthful interpretations?[44] Although there is no such thing as non-theory-laden observation, empiricism still plays a role. The critical rationalist solution is the idea that truthful knowledge of the physical world – especially scientific knowledge – comes from the proper amalgam of inspiration – including intuition and the rare counter-intuitive creativity that yielded ideas like Special and General Relativity and quantum mechanics – theory-laden empirical observation, and reason in the form of deductive testing.[45] From the critical rationalist model we can see that the historical distinction between the empiricism of the Anglo-American philosophical tradition and the rationalism of the Continental tradition is an artificial one. In practice, analysis of the external world requires both reason and observation. (Popper 1965, 54-55)[46]

We learn not by justifying what we already believe, but by correcting our mistaken ideas and beliefs through critical analysis and discourse and in light of

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and corroborated scientifically (Popper 1957, 106-107). In addition to the amenability to testing and prediction via falsification, there are other differences between science and non-science. Most prominent of these, is that history (for example) involves phenomena generally not subject to and guided by physical laws, but rather involve situations subject to the ultimate disordering factor in history: the interaction of human volition and therefore, caprice.

[44] As indicated in the introduction and in Note 5, 'true' and its variations ('truer,' 'truest,' 'truthful') are used here according to Tarski's definition of truth as correspondence. For Popper's views on the other two theories of truth – the coherence model, and the pragmatic model – see Popper, *Objective Knowledge* (1972, 308-309). Popper holds that correspondence is the only real theory of truth. Aristotle, and even the great skeptical empiricist, David Hume, also give definitions of truth as correspondence. See Aristotle, *Metaphysica* (1908, 7, 27); Hume, *A Treatise on Human Nature* (1739/1888, 3).

[45] Regarding Popper's idea that theories – even scientific theories – are the ineffable products of the human imagination whose origins are irrelevant to their validity, see *The Logic of Scientific Discovery* (1935/1959, 31. A good example of the irrelevance of how a concept is inspired can be found in the example of the nineteenth-century German organic chemist, Friedrich August Kekule (1829-1896). Working with benzene cores – the central substance of many organic chemical compounds – Kekule mapped out the hexagonal model from an initial conjecture of organic molecular structure that supposedly came to him in a vivid daydream while on a London bus (presumably a horse-drawn 'omnibus') in 1858. The dream was of a folk dance that had a hexagonal configuration geometrically akin to the form he then hypothesized for the benzene molecule. Einstein's imagining of riding a beam of light that helped him arrive at Special Relativity is a similar example of the creative origins of scientific theories. See *The Cambridge Encyclopedia of Scientists* (Millar et. al 1996, 180-181).

[46] Popper also quotes Russell's famous defense of empiricism as "[i]t is therefore important to discover whether there is any answer to Hume [Problem of Induction] that is wholly or mainly *empirical*. If not, *there is no intellectual difference between sanity and insanity.* The lunatic who believes he is a poached egg is condemned solely on the ground that he is in a minority." (1972, 5) This not only explains Hume's despair at the end of his *Treatise* but Popper's apparent pride at the beginning of his essay, *Conjectural Knowledge*, where he claims to have solved the problem of induction. See also Bertrand Russell, *History of Western Philosophy* (1946, 673).

more powerful explanations. (Popper 1994, 181)[47] Likewise, we do not 'prove' a point by finding a sufficient amount of evidence or 'positive reasons' to support or verify our position, but rather we may corroborate a theory by rigorously testing it, thus disproving and discarding it if shown to be untrue. Although some historical interpretations are stronger than others on their face, as Popper famously notes, no number of confirmations will ever prove a claim, while a single counter instance to the contrary may disprove it.[48] He writes:

> There is no criterion for the truth, but there is something like a criterion of error: clashes arising within our knowledge or between our knowledge and the facts indicate that something is wrong. In this way, knowledge can grow through the critical elimination of error. This is how we can get nearer to the truth.[49] (Popper 1994, 143)

In the terms of logic, deduction is defined as a form of reasoning in which a specific conclusion must necessarily follow certain specific premises.[50] Deduction includes the syllogisms and enthymemes of logic, equations in mathematics, and in terms of physical testing, scientific falsification. A useful rule-of-thumb distinction between induction and deduction is that as a methodological process, the former is retrospective or backward-looking, while the latter is forward-looking to often unexpected results.[51]

To illustrate the difference between induction and deduction as tools of discovery let us consider two birds. The first is Popper's famous black swan – the ornithological metaphor for elimination by counterexample. To illustrate induction, let us consider another well-known metaphor, that of a crowing rooster

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[47] See also: "We cannot justify our theories, but we can rationally criticize them, and tentatively adopt those which seem best to withstand our criticism, and which have the greatest explanatory power." (1972, 265)

[48] For Popper's famous black swan, see *Popper Selections* (Miller 1985, 110). By contrast, the view that we can justify beliefs is a form of simple empiricism sometimes called positivism, and the view that we cannot justify our knowledge is called skepticism. See "Sokal & Bricmont: Back to the Frying Pan" (Miller 2000, 156-173). Critical rationalism can be characterized as a form of sophisticated realism and an outlook of rational skepticism. Admittedly, some realist, as opposed to phenomenalist, positivists embrace forward-looking experimentation and therefore – whether they knew it or not – falsification. The American philosopher Chauncey Wright may serve an example. See *Chauncey Wright and Forward-Looking Empiricism* (Duggan 2002). Wright's student, Charles Sanders Peirce, actually articulated the concept of falsification, and Hillary Putnam suggests that Peirce anticipated falsification decades before Popper. See Hillary Putnam, *Pragmatism, an Open Question* (1996, 71) citing Charles Sanders Peirce, "Pragmatism and Pragmaticism," (Hartshore, Weiss and Burks 1943, 443). Economist and historian Nassim Nicholas Taleb also notes that Peirce hit on the idea of negative rationality in empiricism, but believes that Victor Brochard happened on it even earlier (1879). (2007, 57)

[49] See also *Objective Knowledge* (1972, 318).

[50] A deductive argument is defined by Patrick J. Hurley as one "in which we expect the conclusion to follow necessarily from the premises." (1999, 535)

[51] For a definition of forward-looking empiricism and the forward-looking nature of deductive processes, see "Max H. Fisch: Rigorous Humanist" (Madden 1986, 375-396).

relative to the rising of the Sun. Suppose that by faithful observation we know that each morning a rooster crows and then minutes later the Sun rises in the east, something that is confirmed by 100% of observed instances on non-overcast days. We infer from these repeated observations (and without bringing in additional theories or knowledge of basic astronomy and physics) that the rooster's crowing causes the sun to rise. Here we can transform the rooster from a tool of induction into a tool of deduction, a black swan. If we are inductivists we would compile our findings that reinforce our erroneous conjecture; if we are critical rationalists, we would kill the rooster and then wait to see if the Sun rises the next morning. If it does, we would rightfully discard the conjecture of the causal rooster.

This might seem to be a frivolous illustration, but those historians who compile inductive evidence to support a premise are engaging in an approach that is conceptually identical to that of a person who believes that the crowing of a rooster causes the Sun to rise.[52]

II. Testing Hypotheses: Popper's Tetradic Schema

In science, as with the interpretation of historical events, texts and ideas, we must choose between competing theories and critical argument, the weightiest of which are ones that can be tested or falsified (Popper 1935/1959 and 1994). A scientist begins by framing a premise, a conjecture, which is first and foremost a creative endeavor and a product of the human imagination. How and where a theory originates is insignificant.[53] The more narrowly-framed a theory is – the more it

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[52] For the illustration of the crowing rooster, see Rothman and Greenland (2005, 51-52). The satirical television cartoon program, *The Simpsons*, succinctly illustrated the 'specious reasoning' of inductive justification in the episode, *Much Apu About Nothing* (FOX television broadcast May 5, 1996). In that episode, the following dialog occurs between Homer Simpson and his daughter, Lisa: Homer: Not a bear in sight. The Bear Patrol must be working like a charm! Lisa: That's specious reasoning, dad. Homer: Why thank you, honey. Lisa: By your logic, I could claim that this rock keeps tigers away. Homer: How does it work? Lisa: It doesn't work; it's just a stupid rock! Homer: Uh-huh. Lisa: But I don't see any tigers around, do you? Homer: Hmm... Lisa, I want to buy your rock.

[53] On the view that theories are products of the imagination, Albert Einstein writes, "Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world." (Barlett and Kaplan 2002, 683) Einstein's theories of Relativity may or may not turn out to be the last word on the physics of the macro levels of the physical universe, but, like Linus Pauling's single helix theory of genetics or Lamarck's theory of evolution, the theories are, at the very least, wonderful creations of the human mind, beautiful ideas, and important chapters in the history of ideas. Often the phenomena studied by science are as beautiful as the ideas themselves. The great American physicist of light, Albert Abraham Michelson, famous for the Michelson-Morey experiment that disproved the idea of the ether, thus setting the stage for Einstein and Special Relativity, was a scientist who appreciated the aesthetics of his subject. In the first of his collection of lectures, *Light Waves and Their Uses*, Michelson writes, "If a poet could at the same time be a physicist he might convey to others the pleasure, the satisfaction, almost the reverence, which the subject inspires. The aesthetic side of the subject is, I confess, by no means the least attractive to me." (Michelson 1903, 1-2) See

forbids – the potentially stronger the test of it may be.[54] We then attempt to test or falsify it by setting up an experiment, a true-or-false physicalization of deduction that will refute the premise if untrue and corroborate it if true (experiments are also products of human inspiration). We then submit our findings for rigorous critical discussion or peer review. The experiment can be explained and then replicated, even by people who disagree with the original conjecture. If the conjecture passes this muster, we can accept it as a conditional truth until it can be further refined or disproved or until a new theory with greater explanatory power is devised and tested. Scientific knowledge therefore, progresses by vigorously testing – corroborating a theory by attempting to disprove it or find flaws with it, and failing – which also underscores the difference between the self-critical attitude of science when done well and the selective advocacy and defense of a position typical of contests like litigation and debate. Of course the most solid knowledge of the external world is that which describes phenomena based on or guided by physical laws that can be externally framed and inter-subjectively tested. The result of this critical process is what Popper calls *objective knowledge* (1935/1959, 44; 1994, 70, 93).

To what degree can the method of science be applied to the testing of historical theses? As Popper observes in *The Myth of the Framework*, analysis and criticism may progress even in areas of investigation where the harder analytical reason of science is not possible through softer means of criticism and testing (1994, 137-153). Knowledge progresses by testing premises via rigorous critical discussion, a process he spells out in a simple formula he calls the *tetradic schema*.[55] On the progress of knowledge generally, Popper writes:

> In both [science and non-science] we start from myths – from traditional prejudices, beset with error – and from these we proceed by criticism: by the critical elimination of errors. In both the role of evidence is, in the main, to correct our mistakes, our prejudices, our tentative theories – that is, to play a part in the critical discussion in the elimination of error. By correcting our mistakes, we raise new problems, we invent conjectures, that is, tentative theories, which we submit to critical discussion directed to the elimination of error. The whole process can be represented by a simplified schema which I may call the tetradic schema:
>
> $P_1 \rightarrow TT \rightarrow CD \rightarrow P_2$

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also, Norman McLean, "Billiards is a Good Game; Gamesmanship and America's First Nobel Prize Scientist" (2008, 78-92).

[54] On the relationship of the narrowness of a theory relative to its testability, see Popper *Conjectures and Refutations* (1965, 36, 3). Narrowness in terms of limiting or framing a conjecture should not be confused with the narrowness of a sample under investigation.

[55] Popper, "A Pluralist Approach to the Philosophy of History" in *The Myth of the Framework* (1994, 140-142). Popper also discusses his schema in other contexts in "Epistemology Without a Knowing Subject" in *Objective Knowledge* (1972, 119), and in "Of Clouds and Clocks" in the same volume at 243-244.

> This schema is to be understood as follows. Assume that we start with some problem *P1* – it may be either a practical, or a theoretical, or a historical problem. We then proceed to formulate a tentative solution to the problem: a conjectural or hypothetical solution – a *tentative theory, TT.* This is then submitted to *critical discussions, CD* in light of evidence, if available. As a result, new problems, *P2* arise. (1994, 140-142)

Where Popper believes science differs from non-science, in addition to the fact that physical phenomena are directly subject to fundamental laws,[56] is with the inclusion of falsification as an element of critical discussion (*CD)*, even though discussion is a part of testing a scientific theory at all points in the process. The unvarying nature of physical laws also allows for precise prediction in physics, something that also sets it apart from history.

A. An Added Component: The "Black Swan" (Critical Testing)

Popper's famous adage and the inspiration for the title of this paper well illustrates this method. To paraphrase: if we want to test the conjecture that all swans are white, we should not look for white swans – no number of white swan sightings will ever 'prove' this conjecture – but rather black ones. A single confirmed sighting of a black swan will disprove the hypothesis. A statement that has been corroborated (such as "not all swans are white" to build on Popper's example), can be regarded as a conditional truth if it can pass muster of a replicable true-or-false experiment, assuming there is risk of being shown to be untrue if it is untrue. It must then survive critical discussion and peer review.

Popper's illustration of the black swan (and the dead rooster) as the elimination of an untrue statement applies as much to history as it would to any kind of testing of ideas: in order to test a historical premise, we should not attempt to shore it up by finding sympathetic 'white swan' or 'crowing rooster' support and justifications, but by 'black swans' or counterexamples that will disprove it if untrue, thus corroborating it if true. As such, documentation is not 'proof' or evidence to be used in support of a position, but sources to be evaluated themselves and then a basis against which to test the hypothesis. This may result in the corroboration of the conjecture or else by its elimination. The possibility of elimination is what Popper calls the 'risk' of testing a theory.

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[56] Popper believes that because science, physics for example, is based on fundamental laws, that there is a difference of kind between science and non-science, to include history. He notes: "[w]hen we speak of success in physics we have in mind the success of its predictions: and the success of its predictions can be said to be the same as the empirical corroboration of the laws of physics." (Popper 1957, 35) He also writes, "[i]f we were to admit laws that are themselves subject to change, change could never be explained by laws." (1957, 103) Even with the Problem of Demarcation, Popper believes that there are affinities between science and history. He notes, "[b]ut my thesis has been for many years: *all those historians and philosophers of history who insist on the gulf between history and the natural sciences have a radically mistaken idea of the natural sciences."* (1994, 139)

Popper's schema is a simplified illustration that we might flesh out to provide even greater clarity about how knowledge progresses in history. We may do this by adding the element of critical testing (*CT*) to the schema between the tentative theory (*TT*) and critical discussion (*CD*) the formula is rendered as $P_1 \rightarrow TT \rightarrow CT \rightarrow CD \rightarrow P2$, thus formally distinguishing the critical testing of the historical counterexample and subsequent critical discussion, which the tetradic schema implicitly combines.[57] One could counter that because testing is implicit in both the formulation of the tentative theory and again in the critical discussion/error elimination phase of the process, the additional critical test is therefore redundant or extraneous. To this I would say that the critical test between the tentative theory and critical discussion would formalize and make plain the key step of falsification as manifest by experimentation in the scientific method. This addition is intended just to make the illustration clearer in terms of how the process actually works. 'Testing' implies an actual operation of elimination rather than a general assertion that elimination should occur at this point. Like the historian, the scientist also tests ideas just by thinking about them both informally and as thought experiments. Moreover, critical discussions – although having elements of testing and elimination – are less singular and formal and may include discussion groups and peer review, rather than experimentation, per se. Moreover, it is conceivable that a critical discussion could be based on probability or inductive arguments. Therefore formal deductive testing can be regarded as a discrete step or element of the schema as applied to historical analysis.

How would this work in practice? If to simply consider an idea is to test our opinions and expectations about it, then the additional step would be a test of a more formal, demonstrable nature. It would be a counter-hypothetical or counterexample that would risk disproving the conjecture if shown to be untrue (subsequent counterexamples will likely arise and be a part of critical discussions). We must test interpretations by rigorously seeking the equivalent to Popper's black swans to test our tentative theories.

B. Refutation and Simple Factual Claims

Negative rationality in history can be easily illustrated in regard to simple factual claims addressing historical 'what' or 'how' questions as the 'on point' counterexample or counterclaim. For example, if such-and-such a historical personage is believed by some to have been gradually poisoned by arsenic, but a test of that person's hair shows no trace of the poison, then we can dismiss the

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[57] See Popper's "Epistemology Without a Knowing Subject" in *Objective Knowledge* (1972, 119). It is a fair point that both critical discussion and experimentation both involve the testing of ideas, but it is important to distinguish the two as distinct, interrelated phases of the process of testing ideas. In another expression of the schema, Popper uses the even more general *EE* (elimination of error) in the place of *CD.* See *Objective Knowledge* (1972, 119-122, 243-244).

premise. Of course this example actually involves the use of scientific testing. Similarly, if a historian makes the claim that the image of a shadowy bearded figure in a Daguerreotype taken in Peterborough, New Hampshire on a known date in 1860 is that of Abraham Lincoln, but it is known from photographs of Lincoln from that time show him to be beardless, or if Lincoln was in Washington D.C. on the same day, we can discard the claim.[58]

For a strongly empirical example, let us suppose that a skeptic makes the claim that the Apollo Moon landings were faked in a film studio. If that person is taken to an observatory with a telescope powerful enough to allow an observer to actually see the boot prints and the flag left by the astronauts at one of the landing sites, then the claim can be considered refuted.

This would not 'prove' that men walked on the Moon in an absolute sense, but it would strongly corroborate it. One could only deny such an observation with elaborate, tortured attempts to insulate the original claim from such powerful empirical refutation. If a person does not accept a claim intersubjectively demonstrated to be truer, we must ask him or her "what refutation of your position would you accept?" (and then be ready to answer the same question if posed to us).[59] If the skeptic replies that he or she will accept no position refuting their own, then this person can be considered to be ideologically deluded or wedded to the position, or else irrational. In practical terms, there is little difference between the two (Popper 1994, 180-181).

Just as many trivial objective statements can be corroborated or eliminated through documentation (the time and place of the Lincoln assassination, for example), a large class of more important historical statements can also be tested.

C. Testing Metatheories and Concepts

Although narrowly-tailored, fact-based conjectures are more testable than broad and complex explanations addressing 'why' questions, there is no reason why counterexamples cannot be used to evaluate the historical usage, development, and understanding of ideas and even macro and meta-conjectures that are more

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[58] See Stefan Lorant, *Lincoln, a Picture Story of His Life* (1979, 87). Coincidentally when Lincoln was a practicing attorney, he used negative rationality to defend a neighbor of his, Duff Armstrong, against a charge of murder. A witness claimed that even though it was night, he could see the face of the accused because of the nearly full moon. Lincoln discredited the man's testimony by producing an almanac with a lunar table showing that the moon had already set by the time of the murder. Mr. Armstrong was acquitted. See David Herbert Donald, *Lincoln* (1985, 150-151). I am obviously not the first person to hit on the idea of the counterexample as a means of testing historical ideas. The idea of a counterexample – 'proof' or a claim that disproves an existing claim – should not be confused or conflated with the idea of the counterfactual – a kind of hypothetical causal thought experiment. Historians who have embraced the idea of counterfactuals as means of testing historical hypotheses include Marc Bloch and Niall Ferguson. See John Lewis Gaddis, *The Landscape of History* (2004, 100-102).
[59] "What conceivable facts would I accept as refutations or falsifications of my theory." (Popper 1976, 41-42)

interpretive than simple empirical facts. The range of theories that can be evaluated this way might be thought of as existing on a spectrum from most narrow to the most broad (again, the more a theory forbids, the potentially stronger the test of it), but for the sake of convenience, let us postulate the categories of simple, almost archaeological, facts (to include narrow conceptual counterexamples as well as empirical counter-examples), and broadly interpretive and speculative theories and explanations.

a. The Forest and the Trees. A "Heisenberg Principle" of History: Testing Macro Interpretations

Large events and historical currents involving innumerable facts, bodies of facts, and theories, necessarily involve a greater element of interpretation. This macro, or 'big picture' approach to large but distinctive events also involves the testing of premises, although it also implies an apparent paradox, a kind of Heisenberg principle of historical understanding. The paradox goes like this: the broader the event being described and therefore the broader the interpretive theory (the more it attempts to explain or bring together), the potentially more interesting and important, but the inherently less knowable the subject and the less powerful the explanations of it. By contrast, the smaller, more limited and more fact-oriented a conjecture, the more solid it may be, but also the less interesting. As Arthur Schlesinger observes (echoing Popper), the more a theory explains, the less it explains and that a theory that "explains everything, explains very little." (1986, 141)[60]

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[60] Schlesinger notes that an overly broad thesis about the Open Door Policy actually cuts against our understanding of it. He writes "[t]he Open Door Thesis is evidently not falsifiable. Because it explains everything, it explains very little. It is not a testable historical hypothesis at all. It is theological dogma." That said, a 'big picture' outlook is more important in order for history to be useful, say as a basis for foreign claim than a 'down in the weeds' view with no idea of the bigger picture. A very general philosophical claims like the statement "war is a function of human irrationality and denotes a failure of policy" may be true and may form a partial basis for a realistic sensibility upon which to build a historical outlook, but does not go very far to understand or explain the proximate causes of an event like the First War. Schlesinger on Popper: "theories that attempt to explain everything in fact explain nothing." The Heisenberg principle of history underscores the fact that both detail and circumspect are necessary – details may be hard and factual, and a generalized view – a historical sense (or 'historical consciousness' in Gaddis's words) – is what a historian builds over a lifetime of study. It should be noted that although the very nature of history precludes precise prediction, a broad and intimate (as opposed to a remote and formal) understanding of history is perhaps the best grounding one can have in terms of formulating effective policy. Although there are no guarantees, a policymaker with historical understanding to inform his or her intuitions has a better chance of adumbrating the chances of a policy's success or failure based on what has worked in the past and what has not, and why. In terms of foreign policy, George F. Kennan was this kind of intuitive 'Cassandra.'

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The broader a historical trend, the more *open* it is as a system and therefore the less testable, unless simply to disprove it.[61] The more open a system is, the less solid our knowledge of it. This is especially evident of simple explanations of large and complex historical currents. Here counterexamples are also highly interpretive. Hegel and Marx posit historicist programs based respectively on a vitalistic unfolding of human events based on reason and historical necessity. To test these we might find any number of counterexamples showing that humans are as much of a randomizing element as they are an ordering factor, perhaps even more so.

Open systems by their very nature are not only less predictable, they are also less knowable in retrospect, and counterexamples here are more interpretive than a simple factual elimination. For example, the claim that United States policies toward the Soviet Union were justified by a relentlessly expansionist policy on the part of Stalin during the early Cold War – 'World Communism' – could be countered by the following falsifying examples: 1). Stalin's ideological and personal opposition to Trotsky's vision for world revolution ("Socialism in One Country"); 2). Stalin's unwillingness to provide much help for communist movements in either Greece or China, and his lukewarm support for North Korea's plans to invade the South in 1950. These counter-observations carry a certain weight and provide a compelling basis for criticizing the initial claim, but none are definitive in refuting it.

A more testable example might involve a simple or generalized interpretive statement applied to a large category. For instance, some historicists claim that civilizations follow a life cycle like that of an organism with successive phases of birth, infancy, immaturity, adolescence, maturity, prime, decline, and death.[62] Let us also assume that this claim is not suggesting a common trend or tendency,[63] but rather a process guided by 'laws' of history and the subsequent claim that all societies follow this pattern. Let us also suppose that the 'death' of a civilization does not mean the eventual extinction of the human species, but rather the demise of a distinct civilization while others continue to arise and decline in lifecycles of their own.

If we are able to find long term counterexample trends of rise and decline beyond the perceived 'death' of a civilization – as with the examples of China, India, Italy, and Ireland – we may considered the claim to be falsified, and therefore the general hypothesis of life cycles should be discarded as an absolute principle. The careful scholar of Chinese or Indian history will note that these civilizations have been through numerous cycles of rise and decline rather than a singular pattern

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[61] Regarding Popper's views of open systems see generally "Of Clouds and Clocks" in *Objective Knowledge* (1972, 206-255). See also Karl R. Popper, *The Open Universe, an Argument for Indeterminism* (1982).

[62] See for instance Arthur Toynbee, *A Study of History* (1946/1953) and *The New Science of Gambattista Vico* (1744/1976).

[63] As with Arthur Schlesinger's *Cycles in American History.*

akin to the lifecycle of a discrete living organism. Admittedly these counterexamples are open to debate: is modern Italy a part of the same lineage that includes that Etruscans and Romans, or is the modern West a continuation of the Classical West? – and lifecycle historicists may use all manner of counter argument to insulate their position from criticism.

If we look for examples that support our premises, we will certainly find them, but rather than look for white swans, we should be looking for black swans.

b. Testing Concepts: Ideational Comparison

The testing of ideas is conceptually similar to the testing of simple facts, although as with large events, the means are more interpretive in that here we are dealing with the comparison of concepts rather than the empirical corroboration of the correspondence of subject to object. The primary difference is that qualitative ideas are framed by metaphysical – not necessarily meaningless or false – rather than scientific or deductive statements. We may not objectify – externalize – such statements. In the language of engineering, the analysis of concepts is a machine with less precise tolerances than that of phenomena guided by fundamental laws.

For example, if a historian or philosopher makes the claim that the Greeks had no understanding of the idea of consciousness, and then we come across Socrates' distinction between subjective experience and nothingness in the death scene in the *Apology* (which are actually translated as 'consciousness' and 'unconsciousness' in modern English editions) we may conclude that they understood this idea.[64] This premise is weaker than the empirical example of the Lincoln photograph, and as a refutation, is more interpretive than the simple factual refutation of the arsenic and photograph examples. It is an interpretive comparison and the basis for a position in a critical discussion.

Here too when choosing the 'black swan' counterexample, we must therefore do so with the goal of maximizing risk to our theory. This said, we must acknowledge that the testing of historical ideas is a heuristic tool involving the comparison, contrasting, and discussion of concepts. It is not a hard deductive operation.

The great danger in discussions of ideas is that they will devolve into fights over definitions. In scientific discussions, definitions are virtually irrelevant. In activities like the law and historical analysis, definitions have an unfortunate importance. Thus participants in good faith critical discussions should minimize the distraction of definitional arguments and insofar as possible, they should agree upon the meaning of concepts beforehand. Popper loathed the quibbling

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[64] See Plato, *Apology* (1942, 59). Plato reports Socrates as saying: Let us reflect in another way, and we shall see that there is great reason to hope that death is good; for one of two things – either reason to hope that death is a state of nothingness and utter unconsciousness, or, as men say, there is a change and migration of the soul from this world to another. Now, if you suppose that there is no consciousness, but a sleep like the sleep of him who is undisturbed even by dreams, death will be an unspeakable gain.

over definitions and believed that the discussion of concepts was unfruitful and to be avoided.[65] As Popper observes, we should focus on problems and questions rather than concepts. With ideational testing we are actually asking questions about a historical state of understanding. The only way to prevent such discussions from devolving into fruitless debates is for both sides to enter into discussion in good faith.

Regardless of the solidity of critical elimination in historical discussions and related activities like the adversarial process of the law, and the fact that they are sometimes logical and empirical in nature, their theories are usually not based on testable physical laws like those used of physics or chemistry. They are based on often contested historical facts that cannot be replicated. In this sense they rely more on rational explanation and interpretation of events than on the objectively testable nature of phenomena represented by physical laws. The most solid of refutations in history are those of ideas that are shown to be logically or physically impossible.

c. Coherence as Testing

In *Objective Knowledge,* Popper explains that there are 'three main theories of truth.' Of these,

> The oldest was the correspondence theory, they theory that a statement is true if (and only if) it corresponds with the facts, or if it adequately describes the facts. This is the theory which I think Tarski has rehabilitated.Second is the co-called coherence theory: a statement is regard as true if (and only if) it coheres with the rest of our knowledge. The third theory is that truth is pragmatic utility or pragmatic usefulness. (Popper 1972, 308)

In history we are interested in truth as correspondence. Falsification to determine truthful correspondence should never be confused with coherence – which for our purposes is the confirming of historical claims with the existing state of accepted knowledge. This is conformity and not correspondence. Although historical coherence takes the form of a test – that of comparison – it is a form of justification and therefore tells us nothing new (at best, it is testing against tested knowledge). A theory must correspond with an event in the real world rather than cohere with what is merely accepted. In this sense, we may think of coherence as the 'lateral' testing of ideas (the comparison of one idea with another idea or ideas believed to be true), and correspondence as 'vertical' testing of idea against object. As we have seen, the object may be a physical event or an idea.

This is why historical research using secondary sources is a justificationist activity, unless we add the element of *evaluation* or the process by which historians constantly test their claims in an informal sense. As such, the evaluation of sources involves the testing of both the existing source and the new claim.

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[65] For Popper's comments on the discussion of definitions, see *Objective Knowledge* (1972, 28, 58, 124, 310-312, 327-328.

Evaluation is testing and therefore saves research from being just another form of justification. Even here we must concede that the process of evaluating primary and secondary sources is still closer to coherence than to correspondence and is therefore inherently weaker than purely empirical corroboration. Secondary sources are also a shortcut to primary sources. All of this underscores Paul Feyerabend's observation that the real practice of science is much less neat than Popper's distillation of the process would have us think. Feyerabend's claim is even more applicable to the analysis of history.

There is of course a practical problem – that of taking accepted or 'certified' knowledge as a given and the assumption that it has already reasonably tested. The danger is that certifying a new theory based on its coherence with the existing state of knowledge may actually perpetuate mistaken ideas.[66] Even though there was a time when the consensus of informed option held that the Earth was the flat center of the universe, we must make an assumption of the current state of knowledge as a starting point but not as authority. After all, most of us know of scientific truths from having read about them rather than having done the experiments ourselves (Miller 1985, 50). This is even truer of our historical understanding.[67]

An idea may not be justified by comparing it against the current state of knowledge, but the current state of knowledge can be brought into question with a new theory, or else may be regarded as a baseline to be corroborated, added to, modified, or refuted. This is how our understanding progresses. Therefore, as with scientists, the greatest historians as truth-seekers are those who smash paradigms rather than shore them up. "For the problem is, of course, whether 'the unanimous testimony of historians' is to be accepted, or whether it is, perhaps, to be rejected as the result of their reliance on a common yet spurious source." (Popper 1965, 24) We can see that authority has no bearing on the truth, and thus we are back to the elimination of error.

We must also be careful not to confuse or conflate coherence testing with ideational testing. The testing of one idea with another in order to corroborate a claim is a kind of soft critical comparison. Although highly interpretive, it is a form of testing in that we are comparing a historical idea relative to the current understanding of the same idea. Idea is therefore contrasted with idea. This is opposed to coherence, where a new interpretation is compared for its conformity with the existing state of accepted knowledge.

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[66] For example, an attorney friend once told me that historians of the American Civil War who were not lawyers tended to rely uncritically on J. G. Randall's *Constitutional Problems under Lincoln.* Because, he believed, that this book was incorrect at points in its constitutional analysis, the reliance of later historians on this book enshrined these errors into the historiography of the period.

[67] See Popper, "Sources of Knowledge and Ignorance" *Conjectures and Refutations* (1965, 21-29).

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d. Pragmatic "Truth" (Utility)

The only time we are interested in pragmatic 'truth' (utility) as a measure for historical interpretations is when dealing with an incomplete record (Sub-Roman Britain for example) and must conjecture working theories out of ignorance. Here archaeological speculation replaces or fills in the blanks of a dearth of historical knowledge and where the sources are dubious, inaccurate or contradictory. For questions of chronology and the chronological sequence of events and objects, archaeological techniques, like dendrochronology and seriation may help provide important basic information.[68]

Here we find another parallel between history and the physical sciences. Physicists are able to make precise predictions in quantum mechanics; they can answer the 'what' questions without knowing 'why.' The results of quantum mechanical formalism are knowable in a probabilistic (as opposed to a one-to-one deterministic sense), but we have little understanding of the actual physical phenomena we are describing. As Roger Penrose observes, "[i]t is a common view among many of today's scientists that quantum mechanics provides us with *no* picture of 'reality' at all!" (2005, 782) [69] Because of this, and because of the incompatibility of quantum mechanics with Special and General Relativity, we live in an age of roadblocks in physics that is equally a Golden Age of cosmological speculation not seen since the Pre-Socratics. The point remains: we may not know what is going on in the quantum world, but we can make predictions about quantum outcomes. The purpose of history is not predictive in nature but we may seek to modestly fill in the gaps in our understanding with theories that provide utility rather than factual correspondence. Where structural/realist explanations exist, they are to be preferred to pragmatic explanations – even in the terms of pragmatic utility. Where explanations of correspondence are not possible, utility must suffice.

D. "Facts"

The fact that science and history can both be described by Popper's schema suggests an affinity. The primary distinction arises from the intrinsic differences

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[68] On the archeological dating technique of seriation, see James Deetz, *In Small Things Forgotten* (1977, 64-90).

[69] Thus we have a range of cosmological models attempting to account for the phenomena of quantum mechanics from those positing that the nature of reality is indeterministic (like that of the Copenhagen interpretation) to a kind of ultimate determinism claiming that every possibility happens and therefore every possible universe will exist, such as in the "Many Worlds" interpretation of Hugh Everett. On the different interpretations of quantum mechanics, see generally Max Tegmark, *Our Mathematical Universe* (2014). For a popular primer on quantum mechanics, see David Z. Albert, *Quantum Mechanics and Experience* (1992). For the basis of the "Many Worlds" Interpretation, see Hugh Everett, III. (1957), 'Relative State' Formulation of Quantum Mechanics (1957, 454-462). For a present-day critique of Everett's multiverse, see Lee Smolin, *Einstein's Unfinished Revolution* (2019 153-180).

between behavior of phenomena and process of the natural sciences governed by fundamental laws, and broader human events that are not and therefore the distinction between what we call scientific facts versus what we call facts in history. What then are facts, and what are their respective roles in the interpretive model sketched above?

In popular usage, facts are supposed to embody indisputable, immutable, and universal truths (perhaps akin to the 'atoms of truth' and protocol statements of the logical positivists), such as the fundamental laws of physics.[70] The idea is that reality can presumably be broken down into such statements.

Facts as observation statements have a different role in the realms of history, business, psychology, culture, economics, politics, and the law, than they do in the study of purely physical interaction. In science, facts represent quantifiable patterns based on or governed by fundamental laws that can often be demonstrated inter-subjectively.[71] This is not the case in discussions in history, where 'facts' purport to represent alleged events and sequences of events that in most instances cannot be replicated. [72] Consequently, so much of historical discussion is characterized by educated conjectures. Given that all history is selective and the great majority of facts can never be known, it is easy to see why historical conjectures can pull in so many different directions; once we agree upon the terms, the dates and places of Lincoln's birth and death can be known with relative certainty, but his innermost thoughts on race will be the topic of never ending discussion.

Even with the limitations of historical facts, we can in some instances test interpretive (as opposed to narrowly factual) historical conjectures.

III. Conclusion

> Error is the mother of Knowledge, and the history of the birth of Knowledge out
> of Error is the history of the human race.[73] (Richard Wagner)

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[70] On logical positivism and protocol statements, see Popper, *Conjectures and Refutations* (1965, 39-41), *The Logic of Scientific Discovery* (1935/1959, 95-97), and A.J. Ayer, *Philosophy in the Twentieth Century* (1982, 199-200). See also, A.J. Ayer, ed., *Logical Positivism* (1959), A.J. Ayer, *Language, Truth and Logic* (1946) and Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (1961).

[71] See note 38.

[72] The late Stephen Hawking and Leonard Mlodinow have suggested that John Wheeler's delayed-choice experiment indicates that events in the past may not be 'fixed.' See *The Grand Design* (2010, 82-83).

[73] In the spirit of critical rationalism, I do not accept Popper and his ideas uncritically. For instance, I think that the criticisms of Paul Feyerabend, one of Popper's most brilliant students and a philosopher widely regarded to be an apostate of the Popperian outlook, have a good deal of validity. In my opinion, Feyerabend's criticisms make critical rationalism more nuanced, more careful, and less strident. They strengthen Popper's program. Feyerabend is correct that Popper distills the scientific method to an outline of clarity and simplicity that rarely exists in the real world. But Feyerabend's anarchistic 'anything goes' approach to science – while

Out of error comes knowledge, and from testing, this knowledge progresses toward truer answers. Even if the heart of the cosmos is one of epistemological darkness, tested knowledge is real knowledge and critical elimination is a valid, if limited, method. It is *the* method. Even if all investigation ultimately arrives at a position of Kantian doubt holding that there are limits to what we can know, or that in most cases we cannot know at all, we will still come to know this great negative truth through reason, through testing.[74]

In practical terms, the question for the historian is: how do we eliminate error, or rather, how do we test our theories? Popper says that we arrive at truer explanations through the failure of vigorous attempts to disprove our own ideas.

In history we must resist the urge to confirm what we already believe and must never insulate theories from criticism – things that require moral courage and integrity. This is a view that requires and inspires honesty with oneself as regards the topic of investigation. No pet theory or favorite interpretation should ever be so dear as to deter us from the most rigorous attempts to disprove it in the strongest way possible through the use of the historical counterexample, historical falsification. As Nietzsche observes, "[a] very popular error: having the courage of one's convictions; rather it is a matter of having the courage for an

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perhaps more reflective of how science really works – can be completely accounted for in Popperian terms in that it still involves testing and the elimination of error even if it is by less formal, *ad hoc*, unsystematic, or accidental means. When boiled down to its elements, the method is still one of trial and error and Feyabend's depiction of how science works still requires inspiration, conjecture, and refutation. If not, then there would be no difference between science and pseudoscience (and non-science generally), and yet this does not seem to be the case. In the spirit of critical rationalism, I do not accept Popper and his ideas uncritically. For instance, I think that the criticisms of Paul Feyerabend, one of Popper's most brilliant students and a philosopher who is widely regarded to be an apostate of the Popperian outlook, have a great deal of validity. Feyerabend's criticisms, in my opinion, make critical rationalism more nuanced, more careful, and less strident. They strengthen Popper's program. Of course the great irony of all this is the lesson that critical rationalism should not be taken uncritically for an authority. And yet the idea that no body of knowledge is authoritative and that no theory or sets of theories should ever be beyond earnest revisiting are themselves foundational tenets of critical rationalism. I should also note that although I am a realist and a rational skeptic, I am not as optimistic as Popper about what we can know. There are several cosmological models that appeal to me – the ideational universe of Plato, the elegant classical model of Special and General Relativity, and the brilliant outline of Leibniz's *Monadology.* There are also models that I find unsettling, but which I would accept as true, if shown to be. The "Many Worlds" model of Hugh Everett, III, is the paragon example of these. And yet as I have grown older, I have fallen into a Kantian doubt; perhaps the world is fundamentally beyond our kin. But even with our weak tools of reason and observation, we must do the best we can. We cannot know everything but perhaps we can know more, no matter how tenuous and conditional. My point is that I believe that science gives us something real and that its knowledge is progresses. And that is something. See, Paul Feyerabend, *Against Method* (1993). On Popper's agreement with Kantian doubt, see *Conjectures and Refutations* (1965, 194).

[74] Richard Wagner, quoted by R.J. Hollingdale in *Nietzsche, the Man and his Philosophy* (1965/1999, 61).

attack on one's convictions!!!" (Kaufmann 1974, 19) As scholars committed to truth, we must lead the attack ourselves. We must invite honest criticism. Like the combat officer whose position has been overrun, we must call in fire on our own coordinates.

No historical interpretation is ever final and no historical information no matter how well tested should ever be beyond revisiting. History should not be "argument without end," (Geyl 1955) but rather good faith discussion without end. As Popper notes, "I may be wrong, and you may be right and by effort we may get nearer to the truth." (1945/1994, 431)[75] As it is with history, so it is with the philosophy of history, and if I am lucky, somebody will take notice of the premises of this article and try to disprove them, so that by effort we may get nearer to the truth.

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[75] Quoted again in *The Myth of the Framework* (1994, xii).

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