Its of the Evidence, Not the Events:
Explanation in the Historical Sciences

Aviezer Tucker
Abstract

Since the past is not given or immediately known, all our knowledge of the past is inferential. The historical sciences (History, Comparative Historical Linguistics, Textual Criticism, Phylogeny, Archaeology, much of Geology, and Cosmology) are primarily engaged in explaining present evidence that preserves information about its origins. The historical sciences typically use historical common causes to explain information preserving similarities or correlations between units of evidence such as texts, testimonies, homologies, DNA sequences, languages, mineral deposits, and materials remains. These explanations usually proceeds in three consecutive stages: First, they prove that the evidence is more likely given some common cause than given separate cause; second, they discriminate among five possible causal nets (I distinguish them according to the shape of their models as the V, W, K, H, and A models) that may connect the evidence with common causes; finally, if the evidence is more likely given one of these causal nets, historians may attempt to infer the character traits of the common causes of the evidence.

　　　　Explanations of historical events are usually themselves inferred holistic units that are common causes of the evidence. The theoretical background that historians use to determine historical common causes is of information theories, about its transmission in time. There is typically little mutual relevance among the historical and theoretical sciences. I demonstrate this claim by considering the relation between the social sciences, concerned with finding regularities between social types, and human History, concerned with inferring common cause tokens. History can neither confirm nor refute social science theories. Social science theories are useful for historians only as information transmission theories and in affecting the priors of some historical hypotheses. Otherwise, the complexity of history and the inability to conduct controlled experiments severely limit the mutual relevance of history and the social sciences. Epistemically, History has much more in common with evolutionary biology than with sociology.

Terminology

A few words about terminology before I start: Since *history* is ambiguous in ordinary language, I divide its common meanings into three and use three different words to convey those meanings. *History* with a capital H means here the discipline that study the past, its methodologies and practices. Lower case *history* means the past. *Historiography* means the representation of history (the past) that historians within the discipline of History, using its methods and methodologies, produce.

Origins of the Debate

　　　　Since by a cruel historical accident, the most widely known approach to the philosophy

of historiography has been Hempel's (1965) often sited logical-positivist account of explanation

in historiography, a "diet," version of the Neo-Kantian proposals of Windelband and Rickert, I shall start by disposing of it before moving on to my own philosophy of historiography.

Like Windelband, Hempel thought that historiographic explanations have a deductive structure. The Social Sciences would provide many of the major premises and History the minor ones. Hempel's dropped Windelband's ideographic characterization of historiographic descriptions. History according to Hempel was mostly applied social science since most of the covering laws and other generalizations would come from the Social Sciences. Other laws and generalizations could come from other sciences or be trivial. The distinctive task of History then is to infer descriptions of initial conditions that can be plugged into a covering law model. Hempel did not consider how historians infer such historiographic descriptions.

Foes of Hempel's model argued for limitations on the extent to which History can be an applied Social Science because of the uniqueness or complexity of historical events. Within such limitations, History could carve for itself some autonomy from the Social Sciences. The uniqueness of historical events (in some appropriate sense) could prohibit connecting them with universal statements. The complexity of historical events may prevent testing multi-variable hypotheses, ascertain causal relations between variables, or determine covering laws that would be underdetermined by complex evidence.

Both sides to this classical debate assumed that historiography is made of atomic observation-like sentences of the past that are epistemically immediate and unproblematic. The philosophical debate was about how historians string together these atomic "beads" using conditionals or causal statement and explanatory deductive or inductive structures and how they justify these structures. However, since history was in the past (that is a tautology), there are no

observation sentences in historiography, none at all. Everything in historiography is inferred rather than observed, including representations of past states of affairs, descriptions, explanations, assertions of causal relations, absolutely everything. Since everything we find in historiography is inferred, there must be a theoretical background for these inferences. Since there are no observation sentences in historiography, historiography is already theory laden before it could possibly be fitted or not into a social science covering law model. History is not simply applied social science because it has its own theories that infer historiography from evidence. These theories may be able to infer causal relations in the past without resorting to the social sciences. I will argue soon that these theories are about the transmission of information in time, information theories for short.

Types and Tokens

I argue that History is distinctly interested in inferring common cause *tokens*. The Social Sciences, by contrast, are distinctly interested in inferring common cause *types*. These opposing goals necessitate entirely different methodologies. My thesis is continuous with the Neo-Kantian tradition in the sense that I agree that the distinction between History and the Social Sciences lies in different goals of inquiry that necessitate different methodologies. However, I disagree with the Neo-Kantians about what are these different aims. Instead of ideographic descriptions and universal laws, I propose the inferences of common cause tokens and types. The methodologies that I propose are appropriate for these two distinct inferences bear no likeness to what the Neo-Kantians imagined.

Pierce's type-token distinction has been useful for the analysis of myriad philosophical problems in the philosophies of mind, language and science, ethics and aesthetics. (Wetzel 2009,

1-2)   For current purposes, it is sufficient to make the fairly uncontroversial claim that as particulars, tokens necessarily occupy a unique spatial-temporal location, whereas types as abstracts do not. "A token event is unique and unrepeatable; a type event may have zero, one or many instances." (Sober 1988, 78) For example, Revolution is a type. The French Revolution or the Russian Revolution are tokens of this type. Revolution as a type does not exist in space and time. The French or Russian Revolutions had a beginning, a middle and an end and they happened in a particular geographical location.

The French Revolution is the common cause of millions of documents, material remains, and other forms of evidence like paintings. Historians attempt to infer from these contemporary information preserving effects of the French Revolution representations of it. By contrast, social scientists attempt to generate theories about the causes and effects of revolution as a type. Types and tokens do not have to share properties. (Wetzel 2009, 118-119) Social science theories about revolutions need not be about the French Revolution. Vice-versa, the French Revolution cannot do much for discussions of Revolution as type beyond illustration; it cannot confirm or refute them.

There is a high correlation between the goals, methods, practices, and paradigmatic success stories of History and the Social Sciences, and respectively, the inferences of common cause tokens and types. The historical evidence for common cause tokens is of tokens as well, documents, material remains and so on, all existing in space-time. The theories that connect the evidence with the inferred representations of common cause token are information theories about the transmission of information in time. By contrast, the Social Sciences infer common *types* of causes from *types* of effects. The theoretical background for this inference is often from Statistics. Often these common cause types are "hidden" or are not obvious. Their inference is

therefore a discovery. Common cause types can be theoretical entities such as Nationalism, Risk Aversion, or Social Function. For example Nationalism is a type of mental state whose tokens cannot be observed directly. Various types of effects like wars, artistic expressions, and state formations are explained by this common cause type. As types, neither the cause nor its effects have specific space or time.

Philosophers have not paid sufficient attention to the distinction between cause types and tokens. Only rarely do Philosophers specify whether they are analyzing causation as a type or a token. (e.g. Kvart 2004) Philosophers sometimes specified that they discussed "particular," "singular," "actual" or "factual" causes. They may have meant something close to cause tokens. The distinction between the inference of common cause types and tokens has been made even more rarely. Arntzenius (1992, 230-1) stressed the frequent confusion between types and tokens in philosophic discussions of the inference of common cause. Reichenbach's (1956) examples for common causes are all of tokens. But his characterization of correlations between effects as those between statistical frequencies is of types. It looks like he confusedly thought it possible to infer common cause tokens from types of effects. Reichenbach's foundational formulation of the problem of inference of common cause and his formulation of the influential "principle of the common cause" led to a great deal of confusion in the subsequent discussion of the inference of common cause. (Tucker 2007) Within the context of inferences of common cause tokens in phylogeny, Sober (1988; 2001, 339) stated clearly that this was the inference of common cause tokens. Distinguishing History from the Social Sciences requires the presentation of a clear distinction between the inference of common cause tokens from tokens of effects, and common cause types from types of effects.

Historical Science

Historians look first for properties that tend *to preserve information* about their origins to use them as evidence to infer their common causes. The extent to which certain properties of events tend to preserve more information than others is an empirical question that should be answered by information science. Some processes tend to preserve in their end states information from their initial state more than others. Processes have varying levels of information preservation, varying levels of *fidelity*, a term used by textual critics to evaluate the reliability of texts (Maas 1958). Fidelity is used in this sense as *reliability* is used in probability theory or *credibility* in jurisprudence (Friedman 1987). Some information is *nested,* it can be inferred only with the aid of theories that link properties explicit in the information signal with information that is "nested" in it (Dretske 1981, 71-80). In addition to general theories about the fidelities of certain processes, the evaluation of the reliability of evidence may involve the examination of evidence for the causal chains that purportedly transmitted information from a common cause to the evidence. When authors who report about historical events were separated by time or space from those events, historians look for evidence for the causal chains that may or may not have connected the events with them and estimate their reliability. The selection of historical evidence according to its information preserving qualities is theory laden and is bootstrapped by historiographic knowledge of the chains that transmit information in time.

Evidence in History always includes correlations or similarities between reliable documents, testimonies, languages, material remains and so on. As in Sober's (1999, 255-6) account of the inference of common cause tokens in phylogeny, I argue that the first stage in the inference of common cause tokens is the comparison of the likelihoods of the similar, information preserving, properties of the evidence given a common cause token and given separate causes: *The common cause hypothesis* asserts that the information preserving properties

of the evidence preserve information about some common cause or causes *without specifying the properties of that common cause*. For the common cause hypotheses to be accepted, the likelihood of the evidence given some common cause must be higher than its likelihood given *separate causes*. Usually, the separate causes are specified in the hypothesis, unlike the common cause. For example, suppose that the evidence consists of a set of testimonies that share certain properties, for example they all tell that a certain king murdered his father to inherit the throne. The common cause hypothesis would simply claim that the testimonies share a common cause without specifying it, without saying what were its properties, such as an event where the king indeed murdered his father or an event where a group of false witnesses agreed to frame the poor orphan. The separate causes hypothesis would usually specify the separate causes, e.g. that one witness hated the king, another was loyal to the next in line for the throne, yet a third was paranoid and so on.

It is often difficult but also unnecessary to assign *precise* likelihoods because historians do not prove the high likelihood of the evidence given the hypothesis they favor as much as prove its negligible likelihood given the alternative hypothesis. Since the common cause and separate causes hypotheses are exhaustive and mutually exclusive, proving that one of the hypotheses is improbable implies that the other must be the case.

Formally, if E_1 & E_2 &... E_n are units of evidence that share certain properties and C is some common cause, the likelihood of the evidence given the common cause hypothesis is:

$$Pr(E_1 \& E_2 \&... E_n | C) = Pr(E_1|C) \text{ x } Pr(E_2|C).... \text{ x } Pr(E_n|C)$$

This is also the equation Reichenbach (1956, 157-167) presented. Reichenbach's equation is only one part, the likelihood, of a larger equation that includes also the prior probability of the

common cause hypothesis and must be compared with the likelihood of the evidence given separate causes. The meaning of C in my formulation of the inference of common cause is of *some token common cause* without specifying its properties, whereas Reichenbach was ambiguous not to say confused about whether it is a type or a token and whether or not its properties can be known.

Formally, assessing the likelihood of the evidence given separate causes (S_1, S_2,.. S_n) and their respective prior probabilities can be expressed by the following equation:

$Pr(E_1 \& E_{2...} \& E_n | S_1 \& S_2...\& S_n) = [Pr(S_1|B) \times Pr(E_1|S_1)] \times [Pr(S_2|B) \times Pr(E_2|S_2)]... \times [Pr(S_n|B) \times Pr(E_n|S_n)]$

In assessing the priors of the common cause and separate causes hypotheses, historians examine whether causal chains that extend backwards from the units of the evidence could or could not have intersected and converged.

The likelihood of the evidence given separate causes reflects the functions of the shared properties of the evidence. Sometimes, the shared properties of the evidence have the same *type* of function and the same *type* of cause. For example, if in a culture such as the Roman one, the worse insult to a man would be to claim that he married a prostitute and then committed incest with their children, testimonies that share the desire to insult the man or defame his memory will say so about him. The causes for these shared properties of the testimonies are of the same *type*, the desire to smear somebody's reputation in a common cultural context. These testimonies do not preserve information about any single event.

Evidence whose shared information preserving properties have no conceivable functional value, or even confer a disadvantage on their bearers, such as testimonies that present the

witnesses in a negative light or run counter to their interests or political or ideological commitments usually radically decrease the likelihood of the evidence given separate causes. The likelihood of any single such unit of evidence given separate causes is low, the likelihood of several identical ones given separate causes is vanishing. When the likelihood of each unit of evidence given separate causes is low, the effect of multiple members, such as similar testimonies, is to decrease exponentially this likelihood. Therefore, historians devote great efforts for the discovery of multiple testimonies and other units of evidence.

Multiple units of evidence such as testimonies achieve a significant gap between the roughly estimated likelihoods of the evidence given these two hypotheses. We can formally sum-up the ratio of likelihoods of similar evidence given common cause to separate causes hypotheses:

$\{[Pr(E_1|C) \times Pr(C|B)] \times [Pr(E_2|C) \times Pr(C|B)] \times \dots [Pr(E_n|C) \times Pr(C|B)] \}$

_____

$\{[Pr(E_1|S_1) \times Pr(S_1|B)] \times [Pr(E_2|S_2) \times Pr(S_2|B)] \times \dots [Pr(E_n|S_n) \times Pr(S_n|B)] \}$

E_1, E_2,... E_n stand for units of evidence; C stands for the hypothetical common cause; S_1, S_2... S_n stand for separate causes, and B stands for background knowledge. The upper part represents the likelihood of the evidence, given the common cause hypothesis; the lower its likelihood, given separate causes.

If the posterior probability of some common cause is significantly higher than that of separate causes, the next stage of Historical inference attempts to determine a causal-

informational map that connects all the units of evidence, such as testimonies with some common cause. Five alternative types of causal nets are possible:

1. *A single historical event is the common cause of all the units of evidence*: The modeling of the history of the transmission of information would be tree-like and be composed of many Y or V like intersections. For example, there are many testimonies for the events of D-Day that agree on many of its details. They were all caused by this single event.

2. *Multiple ancestral common causes:* All the units of evidence are the effects of the same set of common causes. For example, suppose there are three sources of evidence today for an event in ancient history. All three were written hundreds of years after the event by historians who had access to the same two primary sources that had since been lost. The modeling of the history of the transmission of information would be bush-like with W like intersections.

3. *The common cause may be one of the units of evidence.* For example, historians may have four sources for an ancient event. But three of the sources may have simply copied the earlier fourth one. The model of the history of the transmission of information would look then like the letter K.

4. All the units of the evidence may have affected each other, for example, if several witnesses discussed what they saw after the event or if editors compared several versions of a text to unify them. The model of the history of the transmission of information would look like a web composed of H like intersections where information is transmitted between all the units.

5. *Complex combinations of types 1 or 2, with types 3 or 4.* The evidence had one or more common sources and later there were interaction between the various units of evidence. For example, several ancient oral traditions were combined together to create a unified text. The editors sought not just to preserve the ancient sources, but also to create a coherent text that may

also have fitted their political interests. The model of historical information transmission would include A like (or upside down A like) of X like intersections.

Another way of saying that the evidence has common cause or causes but no mutual causal influences, corresponding exclusively with the first "V" or second "W" models of information transmission above, is by describing its members as *independent*. *Independence of evidence is the absence of intersection between the causal-information chains that connect the units of evidence with their common cause or causes.* If the evidence is not independent, the historian needs to distinguish the properties of the evidence that preserve information about an original common cause or causes from those that preserve information about later stages in information transmission between the units of evidence.

When evidence for the stages in the information transmission is scarce, all five possible common cause hypotheses may make the evidence equally likely. For example, though it is highly more probable that the Indo-European languages had common rather than separate causes, it is impossible to find whether it was a single language, proto-Indo-European, or whether several geographically proximate languages mutually influenced each other until they became very similar, before spreading tree-like around the globe through the Latin, Germanic and Slavic language families while continuing to influence each other when becoming neighbors again.

Historians are able in many cases to infer which of the five possible common cause hypotheses is most probable. For example, textual critics were able to prove that the various exemplars of the bible and Homer's epics had initially multiple common causes and then they influenced each other in the process of editing. There is independent evidence in many cases for links on the causal information chains that connect events with evidence for the presence of a

single or multiple common causes. Composite documents may preserve linguistic differences that indicate multiple common causes. Historians and textual critics look for discontinuities in style, conceptual framework, and implicit values, as well as internal contradictions, gaps in the narrative if there is one, and parts that are inconsistent with the alleged identity of the author. Frequently, the theories that assist in the assessment of the fidelity of evidence and the competitiveness of the common cause hypothesis also assist in proving whether there was a single or multiple common causes. For example, assuming the theory that the mutation rate of the names of God is lower than those of other words, that the fidelity of the names of God is higher than that of other parts of edited documents, it is possible to analyze parts of the bible into its constituent parts, as the first biblical critics did, according to the different names of God used in the text.

When one of the possible five common cause hypotheses clearly increases the likelihood of the evidence more than the others, scientists may attempt to infer the properties of the common causes. If there is enough evidence to prefer one of the five possible types of common causes, the evidence may still not suffice for determining the properties of the common causes. For example, from the references in the Bible to two lost older books, the *Book of the Wars of Jehovah* and the *Book of Righteousness*, it is possible to infer that some of the materials in the Bible were caused by these books, but there is not much that can be known about them. Likewise, humans and apes had a single most recent common ancestor about six million years ago, but the character traits of that ancestor are unknown.

When there is sufficient evidence, historians compare the likelihoods of the evidence given competing representations of historical events. Historians evaluate the prior probabilities of these competing specific common cause hypotheses according to whether the hypotheses are

coherent with established historiography and internally coherent. When historiographic hypotheses are inconsistent with each other, less entrenched ones are examined first because they have lower prior probabilities. (cf. Kosso 2001, 106-108)

The prior probabilities of common cause hypotheses, C_1, C_2,... C_n can then be multiplied by the likelihoods of the evidence, E_1, E_2,... E_n, given these common cause hypotheses:

$Pr(E_1 \ \& \ E_2,...\& \ E_n|C_1) = [Pr(C_1|B) \ x \ Pr(E_1|C_1)] \ x \ [Pr(C_1|B) \ x \ Pr(E_2|C_1)]...x[Pr(C_1|B) \ x \ Pr(E_n|C_1)]$

The comparison of competing common cause hypotheses is then simply

$Pr(E_1 \ \& \ E_2|C_1) : Pr(E_1 \ \& \ E_2|C_2)$

<u>The Inference of Common Cause Types in the Social Sciences</u>:

The most prominent character of the Social Sciences over the last hundred years has been an increasing concentration on the inference of causes. (Box-Steffensmeier et al. 2010) Some institutionally recognized social scientists use the methodologies of the historical sciences to infer common cause tokens, for example in case studies and process tracing. (Bennett 2010) The inference of social common cause types from types of effects through the application of statistical methods such as the Neyman-Rubin model of causal inference is exclusively distinct of the social sciences. The social subject matter distinguishes the social sciences from sciences that use similar statistical methods to infer common cause types like Medicine or Agronomy. (Morgan & Winship 2007. Brady 2010, Sekhon 2010)

The social sciences begin with hypotheses that connect types of causes with correlated types of effects. The transition from tokens to types of causal relations is achieved via the averaging of

causal effects. For example, the correlation between higher than average income, interest in classical music, and the number of books purchased annually, may be the result of higher education. Social scientists would measure the average effect of higher education, not its effect on this or that individual, just as no medicine half cures any token individual. Individuals get cured or not as a result of taking the medicine. The inference of common cause types, so typical of the Social Sciences, proceeds in two stages:

In the first stage, social scientists need to prove that the correlation between the types of effects (income, music and books in my contrived example) is more likely given the common cause type (higher education) than given separate types of causes. Social scientists specify the properties of the common cause type they propose, but do not specify the properties of the alternative types of separate causes. The method for achieving a significant gap between the likelihoods of the correlations given the common cause type and the unspecified separate causes that may be many, varied and unknown, is the random assignment of members to two populations to make them nearly identical in sharing the same types of (unknown or unspecified) variables with the exception of the common cause type (sometimes called the treatment) that all the members of one group share and none of the members of the other (control) group are affected by. Any significant difference between the two populations is likely then to be the result of that common cause type. For example, social scientist may choose a random sample of persons representing a population, divide the random sample into two sufficiently large groups, equal in size, likely to be identical in character, whose only difference is the presence or absence of the hypothetical common cause type, higher education in our example. Then social scientists measure the difference in the putative effects between the two populations (e.g. annual income, hours per week spent listening to classical music, and number of books read annually) and see if

there is a significant gap between the two groups. If so, the correlation between the types of effects is more likely given a type of common cause than given separate types of causes.

Let me emphasize the differences between History and the Social Sciences. Their goals and methods are the mirror image of each other. History is interested in inferring common cause tokens. The Social Sciences infer common cause types. History compares in the first stage the likelihoods of information preserving evidence given a *common cause token whose character traits are unknown*, and separate *cause tokens whose character traits are known and are often separate tokens of the same type* like the will to defame somebody in a cultural context. In the social sciences the character traits of the proposed common cause type are specified. But the character traits of the alternative separate causes are not specified. For example, that the higher income of people with higher education (the common cause type) relates to their education rather than to many unknown separate causes that may have affected the income levels of graduates.

Historians try to prove that the evidence is more likely given a common cause token than separate causes *using information theories*. By contrast, social scientists use statistical randomization techniques to prove the causal relevance of common cause types. The effects types in the social sciences need not preserve information about their causes. Historically, both the methods of History and the Social Sciences were borrowed from other disciplines with different subject matters. History received the methods of turn of the 19th century textual criticism and philology. (Tucker 2004, 46-85) The Social Sciences borrowed their methodologies in the early twentieth century from the statistical observation data analysis methods that had been developed for the analysis of crop yields and for clinical trials of medicines. (Morgan & Winship 2007, 6-13) Both History and the Social Sciences have increased the sophistication of the methods they borrowed and expanded their methodological

tool kit. But the core has not been replaced since the early 19th and early 20th century respectively. "Classical" social and political theories, e.g. the works of Max Weber, Karl Marx, and Emil Durkheim as well as the classical economics in the tradition of Adam Smith are just as theoretical, composed entirely of types and their relations. They differ from contemporary social science in attempting to justify their theories without resorting to the statistical methods that dominate much of contemporary social science.

At the second stage, having established that the variable types are meaningfully correlated with each other, it is necessary to find the exact causal relations, which may be complex. One or more of the effect types may affect the others requiring the construction of multicollinear, interactive, and so on models. Some social scientists demand further the discovery of mechanisms as necessary conditions for the inference of causal relations in the social sciences. It is not necessary to take sides in these debates here, since I am attempting to do philosophy of social science rather than social science. Suffice it to say that in this second stage social scientists attempt to use a variety of tools to infer increasingly precise causal nets. For example, high income may grant its beneficiaries the free time to listen to classical music and read books and the money to buy books and CDs. Perhaps reading books improves income through education and knowledge. Additionally, social scientists need to control for hidden variables types that may cause both the common cause type and its effects. For example, family wealth may affect both the level of educational attainment, the level of income, and leisure time for cultivating one's taste in music and reading.

In the experimental sciences, including the experimental social science, experimental designs control types of variables to isolate their effects. When such experiments are impossible, as is the case with most of the theories and hypotheses of the social sciences, they resort to

statistical observational data analysis. If successful, using a variety of statistical control techniques to hold different variables constant while measuring others, social scientists conduct multivariate regression analyses that generate equation and multi-equation models, and causal maps that measure levels of causal influence that each variable exerts on the others on a scale from 0 to 1. The posterior probabilities of causal hypotheses need not be affected by the means by which the researcher infers them, whether control of types of causes is achieved in the laboratory by design and intention, or through other "natural" undersigned experimental methods, or by using statistical analysis of observational data.

Historians operate entirely differently than social scientists. If they wish to examine a token of the relation between education and income, say in the biography of a person, they will collect evidence and infer from it representations of the events that took place. They will find out that the philosopher Charles Sanders Peirce's very high education did not do much for his income. By contrast, Irving Berlin's lack of education did not stop him from becoming wealthy. Historians can follow exactly why Peirce's education was of no financial advantage to him (his unconventional morals prevented him from gaining an academic position and his writings and other skills were not very profitable) and why Irving Berlin did not need an education to become a successful composer of popular music.

It is possible to conduct a regression analysis for a sample drawn from a spatiotemporally defined population. It may be possible, for example, to draw a causal map that connects higher education, income and so on, say, in the United States before and after 1945 tracing the effects of the GI Bill. However, I would argue, this kind of research infers common cause types and not tokens and so is part of the Social Sciences or "Social Science History." The variables studied, "higher education," "income" and so on are abstract objects that may have instances, they are

types. The income of no single individual after 1945 had the kind of regression analysis that the social scientist would discover anymore than any family had 2.3 children. Historians by contrast would find out how the GI bill affected individuals and then amalgamate. They would not randomize or conduct regression analysis.

Let me be clear: There is nothing wrong with using social science methodologies on historical data. Some people who are institutionally identified as historians do it and that is fine and their results are interesting. However, when they infer common cause types, abstract object that do not correspond with any historical events, they do so as social scientists and not historians. The localization of the causal models they discover should not obscure that they are about abstract object, types. Theoretical science can, but does not have to be global.   Vice-versa, there are scholars who make a living as social scientists by doing qualitative analysis and trace path dependencies and processes. (Bennett 2010) There is nothing wrong with what they do and their results are interesting. But what they actually do is Historical science, not Social science. They trace common cause tokens and not types.

<u>Interactions between historiography and the social sciences</u>

Single tokens are not useful for the evaluation of theories made of types. An unemployed PhD does not disprove the causal relation between higher education and higher income. The British-American war of 1812 does not disprove that democracy favors peace among democratic nations according to the democratic peace theory. Many variables affect income or war and peace. If democracy is one factor that very much encourages peace among democratic states, the theory does deny that other variables are at play in history and may overwhelm the effects of democracy, just as other factors may overwhelm the effects of higher education on income, as in

the case of poor Pierce. There is a gap between types like democracy, peace and war, and tokens like the War of 1812.

It is possible to characterize a type as having a certain property even if not all its tokens have the property. Though many tokens, e.g. of letters and words, resemble each other and share properties, not all do. "[T]he analogy to zoology is helpful… Not every so-called black bear is black; not every grizzly is four-legged, brown or has a hump… It may be permissible to characterize the species in terms of such properties anyway… [I]n many cases, one extrapolates from properties of the tokens, individually or collectively, to properties of the type. However,… even if the overwhelming majority of the tokens have a property it does not entail that the type has it" (Wetzel 2009, 119, 120)   A type may also have a property that most of its tokens do not share. For example, most of the tokens of a word type may be spelled differently than the type. Some properties of a type are not shared by any of its tokens, for example, "The grizzly bear is endangered." (Wetzel 2009, 120)   The relations between Social Science types and historiographic tokens are not closer.

History and the Social Sciences typically resort to each other when their usual evidence and methods of inference are insufficient for inferring respectively common cause tokens or types. Such underdetermination may appear as multiple different or even mutually inconsistent competing underdetermined hypotheses and theories.   While the Social Sciences and Historiography can and do help each other in reducing underdetermination, the scope of this mutual assistance is limited. The challenge is to connect the right types with the right tokens, so they are mutually relevant.

Social Science theories may participate in the token inferring process as *information transmission theories*. Historians possess a toolkit of information theories. Some theories gave originated in History itself or in adjacent fields like jurisprudence or philology, e.g. that eye witness reports written immediately after the events are more reliable than memoirs written years later or that reports written by people with an interest in the effects of the reports are less reliable than reports on events written by people without such interests, for example, diaries or deathbed confessions. From a contemporary anachronistic perspective they may appear to be common sense psychology, but their historically recent origins demonstrate that they are not trivial or humanly universal. There is no evidence for communities that shared these theories prior to the second half of the 18th century, only isolated individuals. Social Science theories can help in extracting nested information from the evidence, or direct historians to examine new sources of evidence containing nested information. For example, theories of inflation interpret ancient "shaved" metal coins that debased the coinage as a form of devaluation of the currency in relation to a gold (or other metal) standard. They extract the nested information about a rate of inflation embedded in the coins according to the percentage of the metal lost in the debasing. (De Cecco 1985)

Social science theories may also assist in all three stages of Historical inference by helping to assess priors. For example, historians debate when, where, and who wrote the bible. At the second stage, philological analysis indicates a complex "A" like model of transmission to the present, multiple common sources were edited together. It would be desirable to be able to date some of the sources of the bible. The social science theory that connects the introduction of writing to the establishment of strong central government that develops or adopts writing to keep track of the taxes it collects would decrease the prior probability that the texts that became the

bible could have been written before the establishment of a strong monarchy. Therefore, the Pentateuch and the books of Joshua and Judges could have been written only centuries after the events they describe were supposed to have happened.

Historiography can provide social science with data that may participate in the process of inferring cause types, as descriptions of natural uncontrolled experiments that sometimes unintentionally, without design, produced repeatedly constellations that isolate types of causes. Selected, abstracted, and conceptually homogenized through averaging to fit a theory that makes correlations between types apparent, historiography can form raw evidence for the inference of common cause types. However, since history and therefore historiography are usually complex, it is difficult for social scientists to isolate appropriate multiple tokens of type-type causal relations. It is difficult to distinguish which tokens of types of causes were responsible for which tokens of types of effects. If a social science theory claims that cause of type A has an effect of type B, if token of B does not follow a token of A, it does not imply that the theory is false. Many intervening variables, tokens of other types of causes could have intervened. Vice-versa, if token A is indeed followed by token B, B could be the result of a token of another type of cause or causes. Historiography needs to supply series of cases where tokens of social theory types are correlated in a relatively simple or randomized context. That can happen mostly in easily quantifiable series in demographic or economic historiography.

The Costs of Bridging the Gap

The Social Sciences and History can co-exist nicely in harmony without disturbing each other. However, when social science theories are required to explain or fit history, social science

theories are affected in four ways by a perceived gap between what they say about types and historical tokens that appear not to fit the theory:

First, the theories can become vague, so they can be interpreted in different and even inconsistent ways and remain vaguely intact. For example, the Democratic Peace theory can be vague in its characterization of democracy and peace, so apparent counter-examples could be dismissed as wars between at least one not-truly-democratic side, or as not really wars but lesser conflicts. Marxism is notoriously vague in the same way about class, the bourgeoisie and so on.

Second, Social Science theories can become complex, add many ad hoc hypotheses and mini-theories to account for all the apparent historical anomalies. For example, Skocpol's theory of social revolution had to add many ad hoc hypotheses and become very complex to fit all the differences between the three cases she compared and the theory of revolutions she developed. (Tucker 2004, 151-160)

Third, a Social Science theory may fit perfectly one and only one historical case. It may turn descriptions of tokens into descriptions of types merely by dropping their specific space-time coordinates, keeping all their other complex properties, abstracting none. Such a Social Science theory would have no anomalies or exception. But it would have the scope of a single historical case.

Fourth, all three methods can combine into one when a theory that is vague or complex is fragmented into ad hoc theories each of which fits one and only one historical case perfectly. The ad hoc theories are loosely linked with each other as different interpretations of the same grand vague or complex theory. They would use the same vague concepts and theories but give them different and mutually inconsistent meanings. Fragments of complex theories use different

"corners" of the complex theory. But if it were attempted to put all these fragments together, reassemble the jigsaw puzzle, they would not fit together. Alternatively, it is possible to interpret vague theories clearly and consistently, but then add numerous ad hoc hypotheses to explain away all the anomalies. The result is a theory that is clear and of a wide scope, but also cumbersomely complex with ad hoc hypotheses heaped upon each other to explain the anomalies. This is the basic problem of all attempts to create a synthesis between the social sciences and historiography: Historical Sociology, Historical Economics, Social Science History, Marxist Historiography, Structuralist Historiography and so on. They have to face tradeoffs between scope and accuracy, complexity and incoherence. Schematically the forced moves of historical social science look like this:
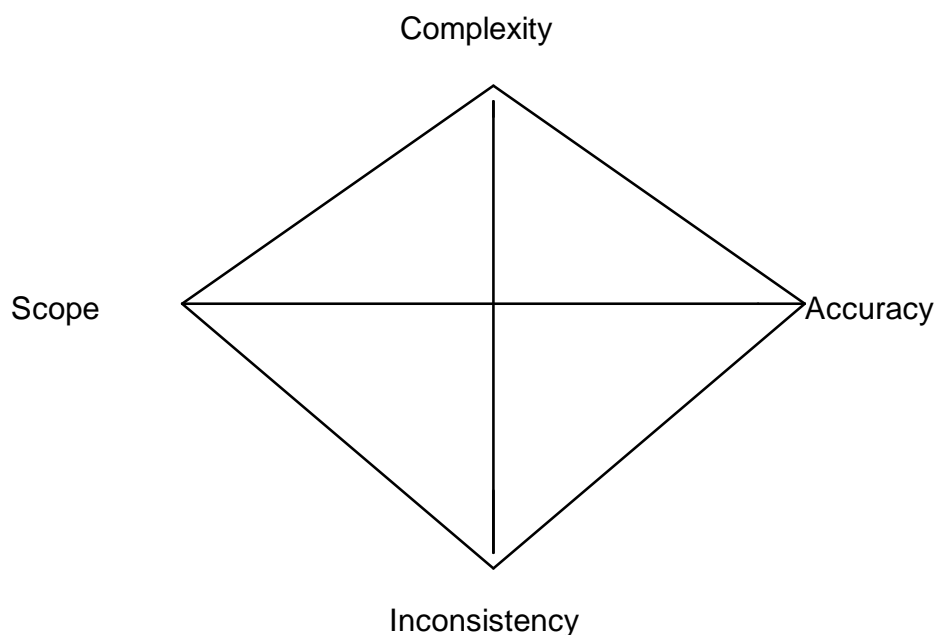
Complexity

Scope

Accuracy

Inconsistency

Figure 1

A vague theory can have a broad scope but no accuracy. If it attempts to become more accurate, it must do so at the cost either of becoming cumbersomely complex with numerous ad hoc hypotheses, or fragment into mutually incoherent small theories.

Consequently, the views that History is applied Social Science and the Social Sciences provide the laws or general principles for historiographic explanations, or that history is the subject-matter of the social sciences, are inadequate. The actual interaction between History and the Social Sciences is limited. The social sciences may lend History some of their theories as applied information theories. They may also affect the evaluation of the priors of historiographic hypotheses. The conclusions of historiographic research may *illustrate* rather than confirm or refute the results of Social Science research. That is about it.

Conclusion: Overcoming the Positivist and Humanist Dogmas

This essay entails the sacrifice of two philosophic holy cows, or dogmas, associated with the humanist and the positivist schools. Both dogmas are deeply rooted in the intellectual world of the first half of the 19th century in Europe, yet they proved incredibly resilient over two centuries. They keep echoing through the chambers of philosophy like ghosts that haunt the divided house of philosophy long after they died. Despite the establishment of psychology in the 19th century, humanists have continued to claim that there is a crucial epistemic and methodological distinction between the sciences that have a human and those that have a non-human subjects. Instead, we saw that the epistemically and methodologically relevant distinction is between the historical and theoretical sciences of tokens and types. History has more in common with Geology, Phylogeny and Historical Linguistics than with the Social Sciences. "[A]ll attempts to diagnose or explain individual or historical cases involve process tracing. This

is true not only of social events like the Fashoda crisis, the end of the First World War, and the end of the cold war, but of historical events in the hard sciences, like the origins of a particular rock formation (geology), the extinction of the dinosaurs (Evolutionary biology), or the origins of the universe (cosmology)." (Bennett 2010, 705) The social sciences have more in common with Agronomy and Epidemiology than with History.

Another tradition started with Hume, continued with Comte and Mill, and culminates in a somewhat more modest form with the Neo-Kantians and Hempel. It has considered History to be an applied science. For Hume and Mill the relevant science was of human nature. Comte called it Sociology. Far from it, we saw that currently there is no such science and there has never been such a science. Attempts to apply Social Science theories to history usually stumble against the gap between types and tokens and the complexity of the subject matter and have to resort to vagueness or ad hoc complexity or fragment into incoherent mini-theories.

The difference between History and the Social Sciences is a particular case of the difference between the Historical and Theoretical sciences of tokens and types. Several historical sciences are concerned with inferring token common causes or origins: phylogeny and evolutionary biology infer the origins of species from information preserving similarities between species, DNAs and fossils; comparative historical linguistics infers the origins of languages from information preserving aspects of exiting languages and theories about the mutation and preservation of languages in time; archaeology infers the common causes of present material remains; and Cosmology infers the origins of the universe. These are the Historical Sciences, sciences that attempt to infer rigorously descriptions of past events, processes, and their causal relations from their information preserving effects. The Theoretical Sciences are not interested in any particular *token* event, but in *types* of events: Physics is

interested in the atom, not in this or that atom at a particular space and time; Biology is interested in the cell, or in types of cells, not in this or that token cell; Economics is interested in modeling recessions, not in this recession; and Generative Linguistics studies "Language" not any particular language that existed in a particular time and was spoken by a particular group of people. The theoretical Sciences are interested in regularities between types. The distinctions between realms of nature and academic disciplines are epistemically and methodologically arbitrary.

Since from an epistemic and methodological perspective, History has more in common with Geology and the Social Sciences with Agronomy than with each other, one implication of this essay is the elimination of a special place for human beings, their societies and histories in epistemology.

If we finally return to the issue of historiographic explanation: There is no epistemic distinction between descriptive and explanatory historiographic propositions; both are the best explanations of the evidence. For example, the best explanation for the independent diaries of soldiers of the same unit that state that on a certain date their unit came under heavy bombardment and therefore panicked and retreated is that indeed they came under heavy bombardment and therefore panicked and retreated. There is no need for further knowledge of psychology or human nature under fire. Had this explanation of the retreat depended on psychological theories, it would have been indeterminate, since under fire soldiers are known to retreat out of fear, become paralyzed with fear and stay put, or become emboldened with rage and charge forward. The mere description of the stimulus together with background conditions and contemporary psychology is insufficient for explaining the actual retreat. But psychology is redundant here. The preservation of information on panic and retreat is the best explanation of the independent evidence for it in personal diaries. The relevant background theory is not psychological, but informational, the reliability of independent witnesses who witnessed and participated in the events.

Explanations of descriptions of events in paradigmatic historiography are composed of atomic explanatory units that are the best explanation of a range of evidence, given background information and theories. Further analysis of explanation of descriptions of events is redundant.

Sources

Arntzenius, Frank (1992) "The Common Cause Principle," *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, Vol. II, 227-337.

Bennett, Andrew (2010) "Process Tracing: A Bayesian Perspective," in *The Oxford Handbook of Political Methodology*, Janet M. Box-Steffensmeier, Henry E. Brady & David Collier eds., Oxford: Oxford University Press, 702-721.

Box-Steffensmeier, Janet M., Henry E. Brady & David Collier (2010) "Political Science Methodology," in *The Oxford Handbook of Political Methodology*, Janet M. Box-Steffensmeier, Henry E. Brady & David Collier eds., Oxford: Oxford University Press, 3-31.

De Cecco, Marcello (1985) "Monetary Theory and Roman History," *The Journal of Economic History*, 45, 809-822

Dretske, Fred I. (1981) *Knowledge and the Flow of Information*, Cambridge MA: MIT Press.

Friedman, Richard (1987) "Route Analysis of Credibility and Hearsay," *Yale Law Journal, 96*, 667-742.

Geertz, Clifford (1973) *The Interpretation of Cultures: Selected Essays*, New York: Basic Books.

Hempel C. G. (1965) *Aspects of Scientific Explanation*, New York: The Free Press.

Kincaid, Harold, (1996) *Philosophical Foundations of the Social Sciences: Analyzing Controversies in Social Research*, Cambridge: Cambridge University Press.

Kincaid, Harold (2009) "Philosophies of Historiography and the Social Sciences," in Aviezer Tucker ed., *A Companion to the Philosophy of History and Historiography,* (Malden MA: Wiley-Blackwell), 297-306.

Klein Daniel B. & Stern, Charlotta (2009) "Groupthink in Academia: Majoritarian Departmental Politics and the Professional Pyramid," *The Independent Review*, Vol. 13, No. 4, 585–600.
Köhnke, R. C. (1991) *The Rise of Neo-Kantianism: German Academic Philosophy between Idealism and Positivism,* trans. R. G. Hollingdale, Cambridge: Cambridge University Press.

Kosso, Peter (2001) *Knowing the Past: Philosophical Issues of History and Archeology*, Amherst NY: Humanity Books.

Kvart, Igal (2004) "Causation: Probabilistic and Counterfactual Analysis," in *Causation and Counterfactuals*, John Collins, Ned Hall & L. A. Paul eds., Cambridge MA: MIT Press, 359-386.

Maas, Paul (1958) *Textual Criticism*, trans. Barbara Flower, Oxford: The Clarendon Press.

Miller, Richard W. (1987) *Fact and Method: Explanation, Confirmation and Reality in the Natural and Social Sciences,* Princeton: Princeton University Press.

Mises, Ludwig von (2005) *Theory and History: An Interpretation of Social and Economic Evolution*, Bettina Bien Greaves ed., Indianapolis: Liberty Fund.

Morgan, Stephen L. & Winship Christopher (2007) *Counterfactuals and Causal Inference: Methods and Principles for Social Research*, Cambridge: Cambridge University Press.

Reichenbach, Hans (1956) *The Direction of Time*, Berkeley CA: University of California Press

Rickert, Heinrich (1962) *Science and History: A Critique of Positivist Epistemology*, trans. George Reisman, Princeton: D. Van Norstrand Company.

Sober, Elliott (1988) *Reconstructing the Past: Parsimony, Evolution, and Inference*. Cambridge MA: MIT Press.

Sober, Elliott (1999) "Modus Darwin," *Biology and Philosophy*, 14, 253-278.

Tucker, Aviezer (1998), Unique events: The Underdetermination of Explanation, *Erkenntnis,* 48-1, 59-80.

Tucker, Aviezer (2004) *Our Knowledge of the Past: A Philosophy of Historiography*, New York: Cambridge University Press.

Tucker Aviezer (2007) "The Inference of Common Cause Naturalized," in Jon Williamson & Federica Russo eds., *Causality and Probability in the Sciences*, London: College Press, 439-466

Van Fraassen, Bass (1989) *Laws and Symmetry*, Oxford: Oxford University Press.

Wetzel, Linda (2009) *Types and Tokens: On Abstract Objects*, Cambridge MA: MIT Press.

Windelband, Wilhelm (1980) "Rectorial Address, Strasbourg, 1894," trans. Guy Oakes, *History and Theory* 19, 169-185. [translation of: "Geschichte und Naturwissenschaften," in Praludien Vol II, Verlag von J. G. B. Mohr, Tübingen, 136-160].