
Warrants, Middle-Range Theories, and Inferential Scaffolding in Archaeological Interpretation

Kristin Kokkov

University of Tartu

Robert Chapman and Alison Wylie draw upon Lewis R. Binford's method of middle-range theories and Stephen Toulmin's pattern of argument to explain the structure of inferential scaffolding in archaeological interpretation. However, when analyzing Binford's method of middle-range theories and Toulmin's pattern of argument, it becomes evident that these two models are not compatible and cannot explain the structure of inferential scaffolding in the way proposed by Chapman and Wylie. I claim that Chapman and Wylie's model illustrates instead how research results are presented to the audience or written in historiography, and that it does not describe the process of reasoning from data to evidential claims. The aim of this paper is to show why Binford's method of middle-range theories and Toulmin's pattern of argument are not compatible, and how Chapman and Wylie's model should be modified to describe the structure of inference in archaeology.

1. Introduction

Archaeology is a domain that studies material remains of past action in order to interpret past context and understand social structures and cultural dynamics. The archaeological record is the primary research object of archaeologists (Kosso 2001; Binford [1983] 1988). It consists of static material traces of past events in the present and, by itself, it does not inform us about the past. The meaning of the archaeological record can

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be understood only by studying it, i.e. how the material remains were formed and what might have been the past events that produced this kind of record.

One of the problems archaeology faces is that archaeologists study past people, objects, and events, but as the past does not exist anymore it cannot be observed directly. All the ancient things and materials that have been preserved are in the present. Thus, there is a gap between the subjects—past events and people—that are studied and the information that is preserved from the past. To overcome this inferential gap in the 1970s, Lewis Binford introduced the middle-range theories method as a tool of archaeological interpretation. This is the method of processual archaeology that emphasizes logico-deductive analysis of the meanings of things and forms analogies between similar items.

Reasoning similar to the method of middle-range theories was introduced already in 1958 by Stephen Toulmin. Toulmin distinguishes a claim or conclusion from the data that act as the foundation for the claim. He says that an argument depends on hypothetical statements, which act as bridges and authorize the inference from facts to conclusions (Toulmin [1958] 2003, p. 91). In recent years, the analogical method of investigation has been introduced in different historical sciences under the label “scaffolding” (Chapman and Wylie 2016; Adrian Currie 2018). Currie notes that “scaffolding” has become a common notion in the philosophy of science and that it has been applied to the analysis of many disciplines in the historical sciences—hominid evolution, research about human cognition, culture, and evolution, and palaeontology. Furthermore, Currie claims that “scaffolded investigations are a ubiquitous feature of science” (Currie 2018, p. 267). The historical sciences build conceptual and technical scaffolding by identifying and putting the traces of the past to work as evidence. To mediate traces as evidence about the past, a scientist constructs or employs relevant background theories about the production of the traces and about the transmission and degradation of material remains. (Wylie 2017, p. 4)

Chapman and Wylie draw on Binford’s account of the middle-range theories method and Toulmin’s position on the pattern of argument to explain the structure of inferential scaffolding in archaeological interpretation (Chapman and Wylie 2016, p. 35). They say that the scaffolding consists of middle range theories, background knowledge, technical skill, social networks, institutional infrastructure, and reflexive critique that is required to make observation possible and to mediate the data as evidence. However, when analyzing Binford’s method of middle-range theories and Toulmin’s pattern of argument, it becomes evident that those two accounts of reasoning are not compatible and cannot explain inferential scaffolding

in the way Chapman and Wylie have presented it. I claim that Chapman and Wylie's model illustrate the way in which research results are presented to the audience or written in historiography—argumentation goes from data to evidential claims, and warrants legitimate the conclusions. However, when we reason from data to evidential claims, we need a model of inference that shows how the data obtain meaning and how the warrants are created in the course of inference.

The aim of this paper is to show why Binford's and Toulmin's models are not compatible and how the model proposed by Chapman and Wylie should be modified in order to describe the structure of reasoning in archaeology. The paper is divided into two parts. First, I am going to explain the method of middle-range theories, Toulmin's pattern of argument, and the model of inferential scaffolding in general. Then I am going to explain why these accounts of reasoning are not compatible and how Chapman and Wylie's model of argumentation should be modified so that it could comprise the middle-range theories method, thereby describing the process of reasoning in archaeology.

2. The Method of Middle-range Theories

The notion of “middle range theories” originates from sociology. Sociologist Robert K. Merton (1968) defined the notion by saying that middle range theories are the logical link between low order detailed descriptions of social classes and high order theories about social systems. However, Binford developed his own account of the middle-range theories method in archaeology, which does not have an explicit connection with sociology or Merton's theory. He claims that his version of the middle-range theories method does not deal with different stages of abstraction, rather it concerns the creation and testing of theory. In his work *For Theory Building in Archaeology* (Binford 1977) he introduced the middle-range theories program for the first time in print.

According to Binford, middle-range theories are causal connections or logical links that tell us why the archaeological record is the way we see it nowadays. Binford emphasizes that the archaeological record is a modern phenomenon and observational claims made about it are not “historical claims,” but present-day facts (Binford 1983, pp. 36, 48, 50, 57–8). Thus, there arises the question, how can we get from present facts to claims about the past? If we make claims about what we can see in the archaeological record, we use observational language. But if we try to explain why this archaeological record is such as it appears to us, we should use a causal relation or logical link that tells us why the archaeological record is as we see it in the present. According to Binford, these causal relations or logical links are middle-range theories.

Binford portrays the archaeological record as an untranslated language that needs to be decoded, and archaeology is the domain that decodes this static and contemporary document into dynamics of the past cultural systems (Binford 1988, pp. 19–20). The middle-range theories operate like a “Rosetta Stone”¹ for decoding past material remains. These theories connect observations made about the present archaeological record to past actions that produced the archaeological record that we see in the present. Binford presents the middle-range theories method as a link between observations and experiences of what the world is like to theories that seek to tell us why the world is the way it appears to be (Binford 1983, p. 48).

Mark Raab and Albert Goodyear claim that Binford’s idea of the middle-range theories method was methodological in character because it allows archaeologists to deal with material records but not necessarily with problems of cultural dynamics (Raab and Goodyear 1984, pp. 258–60). This method works as a tool to analyze the principles of site formation processes. Raab and Goodyear claim that for Binford, the method of middle-range theories was intended to provide a logico-empirical bridge between the static phenomena evident in the contemporary archaeological record and the behavioural dynamics that are inferred to have produced those phenomena. But these dynamics do not encompass larger questions about the causes of change or stability in a cultural system.

It is important to note that “middle-range” is not a feature of the content of a theory and middle-range theories are not a special kind of theory, but instead it is the use of theories in a particular case that makes them the middle-range theories (Kosso 2001, pp. 62–3). In reasoning from the present archaeological record to claims made about past events, there is the “middle-range,” a void in the research program that is occupied by a different kind of theory (Hartmut Tschauer 1996, p. 26). The same theory can in one context be used as a middle-range theory but in another regarded as itself a finished product.

The theories that are used as middle-range theories in a research program have to be external independent information or knowledge. Wylie says that there has to be an independence between the constituents and the conclusions of an inference (Wylie 2002, p. 176). “The evidential

1. The Rosetta Stone is a black basalt slab that is thought to have been created in the year 196 BC. It was found at Rosette in 1799 by Napoleon’s army. Since the stone has the same text in two languages, Egyptian and Greek, and three writing systems, hieroglyphics, demotic script, and the Greek alphabet, in 1822 Jean-Francois Champollion found it to be the key to decoding Egyptian hieroglyphs. (Encyclopedia Britannica 2017)

claims brought to bear on models or hypotheses must be credible in their own right” (Wylie 2011, p. 383). For example, Wylie has noted that there is no interdependence between the theories of chemistry and physics that are used to ascertain the source and dates of material remains, and the sociocultural and anthropological theories used in the models of cultural interaction (Wylie 2011, p. 383). “If the theoretical presuppositions that underlie explanatory reconstructions of the past also inform the interpretation of the archaeological data used to test them, then testing is threatened by a vicious circularity” (Wylie 2002, p. 118).

Peter Kosso draws our attention to the fact that the theories that can be used as middle-range theories, describe, for example, the formation of the archaeological record, the use and deposition of artefacts, how they went through degradation and settled in the place and position where they were found (Kosso 2001, p. 62). Thus, they give meaning to the present-day data. These descriptions include theories about how the artefacts were made, used, and later deposited by burial for example, neglected or intentionally discarded. There are also theories about the alteration of deposited artefacts by natural and cultural activities. The descriptions also include claims about the area where the artefacts were found—the propensity for erosion and the local people.

To illustrate how an osteological theory acquires the function of a middle-range theory, I provide an example about bones found in a cave (Appendix A, Figure 1). To find out which kind of bones they are (human or an animal), scientists use comparative anatomy as the middle-range theory. According to this theory the bones are shown to be a human skeleton. Thus, archaeologists can make the claim that those bones in the cave belonged to a human being. Altogether, the middle-range theories give meaning to the archaeological material and are the basis for making claims about past events and cultural context.

3. Inferential Scaffolding

Chapman and Wylie (2016) propose an account of reasoning that they call “inferential scaffolding.” “Scaffolding” is a metaphor borrowed from construction to describe a structure of inference. In building construction, the scaffold is a temporary structure that is built for the purpose of making possible the building of other structures.

Chapman and Wylie have drawn upon Toulmin’s position in explaining the structure of inferential scaffolding in archaeology. Toulmin distinguishes a “claim or conclusion” whose validity we aim to establish from the “datum” that acts as a foundation for the claim (Appendix A, Figure 2) (Toulmin [1958] 2003, p. 90). He says that an argument depends on hypothetical statements, which act as bridges, and authorize the step from facts to

conclusions (Toulmin [1958] 2003, p. 91). Toulmin calls them “warrants.” The warrants are incidental and explanatory. They explicitly register the legitimacy of the step from data to the claim and refer the claim back to the larger class of steps whose legitimacy is being presupposed. Warrants are general and ensure the validity of all arguments of the respective type (Toulmin [1958] 2003, pp. 91–2).

In addition to claims, facts, and warrants, Toulmin identifies three additional sets of considerations that arise when an argument is challenged: “backing,” “rebuttals,” “qualifiers.” Backing is required for warrants when the inferential move from fact to claim is called into question; a rebuttal draws attention to circumstances in which the authority of the warrant is questionable; qualifiers specify the intended strength of an argument (Toulmin [1958] 2003, pp. 93–6). The backing for warrants differs from statements of warrants, because warrants are hypothetical, bridgelike statements, but the backing for a warrant is a categorical statement of fact. (Toulmin [1958] 2003, pp. 97–8)

Toulmin gives an example illustrating the pattern of argument (Appendix B, Figure 3):

In support of the claim (C) that Harry is a British subject, we appeal to the datum (D) that he was born in Bermuda, and the warrant can then be stated in the form, “A man born in Bermuda may be taken to be a British subject”: since, however, questions of nationality are always subject to qualifications and conditions, we shall have to insert a qualifying “presumably” (Q) in front of the conclusion, and note the possibility that our conclusion may be rebutted in case (R) it turns out that both his parents were aliens or he has since become a naturalised American. Finally, in case the warrant itself is challenged, its backing can be put in: this will record the terms and the dates of enactment of the Acts of Parliament and other legal provisions governing the nationality of persons born in the British colonies. (Toulmin [1958] 2003, p. 97)

Chapman and Wylie use Toulmin’s pattern of argument as the basis for the model of inferential scaffolding and say:

Toulmin’s central point is that the inferential work of warrants should be recognized as critical to the appraisal of substantial arguments; he emphasizes the role of what we will refer to as inferential scaffolding of various kinds, the gap-crossing assumptions, auxiliary hypotheses, background knowledge that constitute middle-range theory in an archaeological context. (Chapman and Wylie 2016, p. 35)

Chapman and Wylie use the term “warrants” in Toulmin’s sense (Chapman and Wylie 2016, p. 89) and say that archaeologists constantly build “the warrants that underpin evidential arguments in archaeology” (Chapman and Wylie 2016, p. 41). They say that archaeologists build empirical foundations and “inferential warrants are one component of what we characterize as the scaffolding necessary for doing this” (Chapman and Wylie 2016, p. 45).

In addition, they equate middle-range theories with “warrants” and say that “the status of these claims as warrants is functional; what makes them middle-range theories is not a matter of specific content or level of abstraction but, rather, the role they play as “material postulates” that license inference in an evidential argument” (Chapman and Wylie 2016, p. 53).

They modify Toulmin’s schema to provide an archaeological example of an evidential argument (Appendix B, Figure 4). They say that the warrants on which archaeologists rely represent an array of background knowledge. Warrants include abstract theoretical presuppositions about the nature of the cultural subject; theory of culture, the geology of stratigraphic superposition, the human physiology of sex differences, the physical chemistry of carbon isotopes, the ethno-history of mortuary practices, and archaeological comparanda (Chapman and Wylie 2016, p. 43). Hence, they list the same kind of theories as warrants that Kosso gave as examples of middle-range theories (Kosso 2001, p. 62).

But when looking at the schema Chapman and Wylie present (Appendix B, Figure 4), notice that “warrant 1” and “warrant 2” do not fulfil the requirements of the warrants in Toulmin’s sense. Toulmin said that warrants are general statements and certify the validity of all the arguments of the respective type (Toulmin [1958] 2003, pp. 91–2). But if this were the case in Chapman and Wylie’s schema (Appendix B, Figure 4), then it could be said that all the bones that are non-human bones are extinct mega-fauna. And thus, since Chapman and Wylie equate warrants with middle-range theories, the warrants in Chapman and Wylie’s schema also do not match the description of middle-range theories either. The theories that can have the function of middle-range theories should be independent theories borrowed from outside of the research program under consideration. But warrant 1 and warrant 2 are specific statements concerning the particular bones found in the cave. I think those theories that could have had the function of middle-range theories in the reasoning schema—the geological theory of stratigraphic superposition and the anatomical theory of human physiology—are classified instead as “backing” in the schema (Appendix B, Figure 4). So there seems to be confusion in what the warrants and middle-range theories are, and where they are situated in the research program.

4. Reasoning from Data to Evidential Claims in Archaeological Research

Chapman and Wylie interchangeably use “warrants” in Toulmin’s sense and “middle-range theories” in Binford’s sense (Chapman and Wylie 2016, pp. 47, 89). However, when we analyze Toulmin’s and Binford’s accounts more in detail, it becomes evident that “warrants” and “middle-range theories” cannot be the same entities. I claim that they have different functions because they are used in different stages of reasoning.

Toulmin does not explain in his book how the warrants are constituted. He says that “warrants” have the function of registering the legitimacy of the step from data to the claim. It seems that in Toulmin’s account, the claim or conclusion is presented when the person implicitly already knows the meaning of data and relevant warrants respectively. Toulmin says that

We are not in general concerned in these essays with the ways in which we in fact get to our conclusions, or with methods of improving our efficiency as conclusion-getters. ... [O]ur concern is not with the getting of conclusions but with their subsequent establishment by the production of a supporting argument; and our immediate task is to characterise the stages into which a justificatory argument naturally falls. (Toulmin [1958] 2003, p. 17)

This shows that Toulmin’s model of argument does not illustrate how the inference from data to conclusion takes place but shows how the truth of the conclusion is certified. In Toulmin’s model the data already have a meaning and his pattern of argument illustrates the way in which we present the argument that we already have. The warrants are to hand, and only if the move from fact to claim is called into question do the warrants need the “backing.” The “backing” for warrants do not have to be made explicit if the warrants are conceded without challenge (Toulmin 2003, pp. 91, 97–8). Chapman and Wylie refer to Toulmin by saying that “the inferential work of warrants” (Chapman and Wylie 2016, p. 35) licenses the inference in an argument, but Toulmin says that the warrants “authorize a step in an argument” (Toulmin [1958] 2003, p. 92). Therefore, it seems that Chapman and Wylie have extended the function of the warrants beyond what Toulmin would have agreed to.

The problem is that Chapman and Wylie have taken Toulmin’s model to illustrate the way in which archaeologists reach claims about the past—how archaeologists interpret the meaning of material remains and formulate claims about the past. However, Toulmin’s model does not illustrate how we get the conclusions, rather how we justify them. Therefore, his model can instead be used for describing how the

conclusions are pre-sented and justified to the audience, not for illustrating the process of archaeological reasoning. There is an essential difference between the model of presenting the argument and the model of inferring the claims.

5. Toulmin's Model Modified

In archaeology, very often, the material remains that are excavated are unfamiliar and do not tell us much about the past by themselves. The meaning of the archaeological record can be understood only by studying it. Therefore, if we want to use Toulmin's model of argument to illustrate the process of reasoning from data to conclusion the positions of the components in the model have to be altered. So, if we have the data, but do not know the meaning of it, how can the claim then be made?

In Toulmin's example (Appendix B, Figure 3), if we do not know anything about Bermuda, the datum "Harry was born in Bermuda" does not tell us much by itself. And if we do not know the meaning of the data, then we do not have any warrants nor the conclusion. To give meaning to the data we need middle range theories. Binford said that the function of middle range theories is to provide logico-empirical bridges between the data and the claim for which the data is the foundation (Binford 1983). Thus, we have to have the middle-range theory about what Bermuda is and how it is related to Great Britain, namely that Bermuda is a British Overseas Territory. Then, using this knowledge as middle-range theory, we can give meaning to the data "Harry was born in Bermuda," and thereby have the warrant "a man born in Bermuda may be taken to be a British subject" and accordingly be justified in making the claim that "Harry is a British subject" (Appendix C, Figure 6).

As shown above, the middle-range theories are independently existing general theories, borrowed from outside of the research program under consideration. Contrary to Toulmin's ([1958] 2003, pp. 91–2) claim that warrants are general and ensure the validity of all the arguments of the respective type, I think the warrants are the results of reasoning from the data in a specific context, not independent theories or facts. They are formulated to bridge a piece of argumentation from a concrete datum to the conclusion. The warrant "a man born in Bermuda may be taken to be a British subject" is general only in the sense that it can be applied to all the men who are born in Bermuda and only for certifying the validity of claims about their legal status.

It seems to me that in Toulmin's model, the theories classified under "backing" can have the function of "middle-range theories." As Toulmin says, the backing for warrants are categorical statements of fact (Toulmin [1958] 2003, p. 97). Thus, they are independent theories or facts that exist

outside of the specific pattern of argument. Backing stands behind the warrants, this is the assurance, without which the warrants themselves would possess neither authority nor currency (Toulmin [1958] 2003, p. 96).

The theories that can function as middle-range theories are general and borrowed from outside of the current pattern of inference. They can be used for making different kinds of warrants, depending on the data that is analyzed. The fact that Bermuda is a British Overseas Territory, is general knowledge about this territory. For example, it can also be used for making warrants about the official language of Bermuda.

Accordingly, for the cases where the meaning of the data is not yet known, I propose a modified version of Toulmin's schema (Appendix C, Figure 5), where the "backing" (B) has the function of "middle-range theories" (MRT); they come first and give ground to the warrant. And then we can use this warrant to make the claim (C). Thus, in the model of reasoning where the aim is to give meaning to the data and infer the conclusions, the warrants do not have the function of "middle-range theories" because warrant-kind-of-statements are the result of reasoning when middle-range theories are applied to data. "Warrants" are a kind of intermediate result of reasoning and they are not the ultimate goal of interpretation. The conclusion is the result of reasoning from warrants. Therefore, when analyzing the process of archaeological interpretation, it becomes evident that there are at least two stages of reasoning—first, the reasoning from data to warrants by using middle-range theories, and second, the reasoning from warrants to the claims about the past.

I modified Chapman and Wylie's schema according to the modified version of Toulmin's schema (Appendix D, Figure 7). Thus, instead of being in the background, the theory of comparative anatomy and the theory of geological principles of superposition are in the first position and are explicitly used to give meaning to the datum. The meanings of the datum can be referred to as "warrants." The two warrants "the non-human bones are extinct mega-fauna" and "human & mammoth remains could only be preserved in the same deposit if they co-existed" provide ground for the evidential claim that "humans co-existed with extinct mega-fauna."

In archaeology the conclusions are often created through the process of combining several different warrants with one another. Various aspects of the data are analyzed by using different middle-range theories, and thereby different warrants are created. For example (Appendix D, Figure 7), the datum about the bones found in a sealed cave deposit is analyzed with two middle-range theories. And the resulting two warrants are combined into the evidential claim that "humans co-existed with extinct megafauna."

Thus, the meaning of the evidential claim depends on the combination of all the warrants that are created by middle-range theories.

Furthermore, I argue that the claims that Chapman and Wylie give as rebuttals to warrants operate rather as a working hypothesis in the process of reasoning (Appendix D, Figure 7). In archaeological interpretation, this kind of hypothesis is usually proposed in the beginning of interpretation rather than being rebuttals to the warrants that already exist. If it is already known that the bones are extinct mega-fauna (mammoth), the rebuttal that proposes that the bones were from Roman legion elephants, is unfounded. The warrants function as rebuttals to the hypothesis.

Therefore, as Toulmin proposed his model as justification of argument, I think that Chapman and Wylie's schema (Appendix B, Figure 3) can illustrate the way in which research results are presented and justified to the audience or written in historiography—argumentation goes from data to evidential claims, and warrants are given in support of the inference. In historiographical texts the scaffolding is hidden and the backing theories are not emphasized because they are not relevant any more. However, if we only have the raw data, then we need the model of reasoning that describes how the data acquire the meaning and how the inference proceeds from data to evidential claims.

6. Conclusion

The model of inferential scaffolding has a different structure than that proposed by Chapman and Wylie. Toulmin's model of argument does not illustrate how the inference from data to conclusion takes place but shows how the credibility of the conclusion is certified. I argue that "warrants" and "middle-range theories" have different functions in the model of inferential scaffolding.

When using Toulmin's model for describing inferential scaffolding, the positions of the components have to be altered. Then it becomes clear, that "warrants" do not have the function of middle-range theories and nor are they gap-crossing assumptions. The "warrants" are the results of the interpretation and rely on middle-range theories. Thus, middle-range theories themselves do not underpin evidential arguments, rather this is the function of "warrants."

It appears that the inference from data to evidential claims has at least two stages: first there is the inference from data to warrants of a different kind. The move from data to warrants is mediated by middle-range theories. Then, the second stage is a move from warrants to an evidential claim. Warrants are relational: the meaning of one warrant influences the meaning of another warrant and together they formulate the claim about the past.

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Appendix A

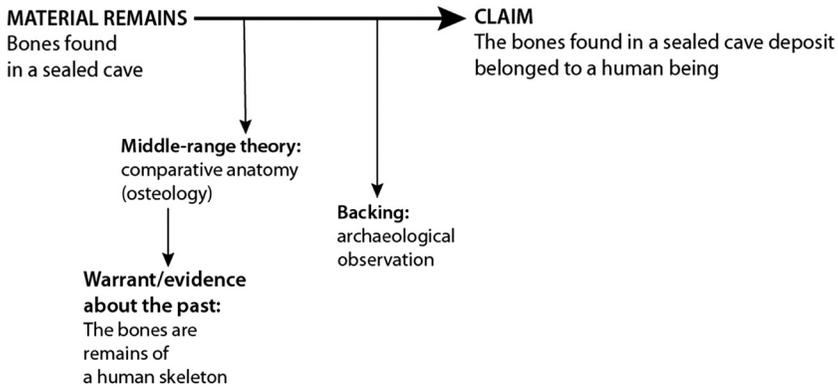


Figure 1. Archaeological example of the function of a middle-range theory.

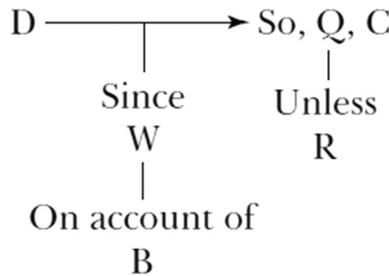


Figure 2. Pattern of argument. ‘Datum’ (D) act as foundation for the claim; “claim or conclusion” (C) is the statement, whose validity we aim to establish; “warrant” (W) registers the legitimacy of the step from data to the claim; “backing” (B) is required for warrants when the inferential move from fact to claim is called into question; “rebuttal” (R) indicates circumstances in which the authority of the warrant is questionable; and “qualifiers” (Q) specify the intended strength of an argument. (Toulmin [1958] 2003, p. 97)

Appendix C

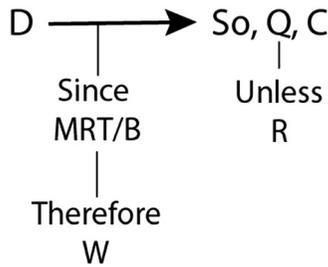


Figure 5. Toulmin's schema modified.

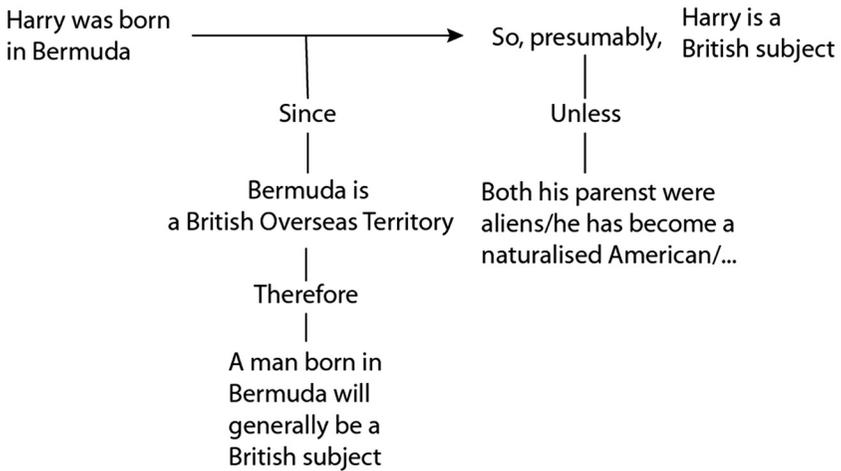


Figure 6. Toulmin's example modified.

Appendix D

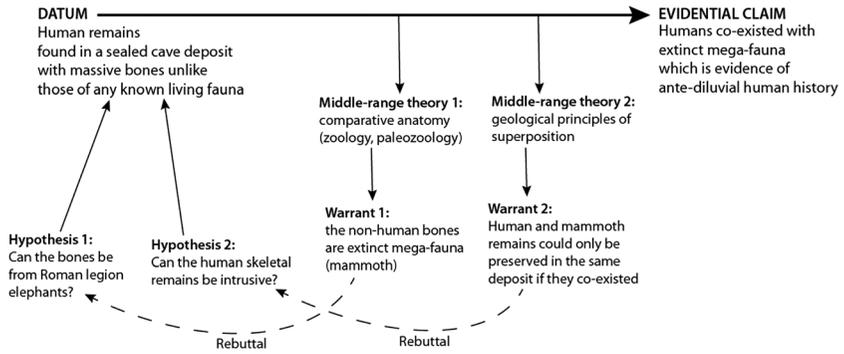


Figure 7. Modified schema of the archaeological example.