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Conductive arguments and the ‘inference to the best explanation’

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ABSTRACT: I will demonstrate that conductive arguments are found in the *inference to the best explanation* as it is used in science. Conductive arguments, I argue, operate on two levels: the first is in the construction of hypotheses; the second is through the competition of hypotheses. By constructing arguments based on observations of facts, all possible (conceivable) factors are taken into account and a judgment is made based on our weighing of considerations: conductive argumentation.

KEYWORDS: Argumentation, Conductive Arguments, Inference to the Best Explanation, Science and Argumentation.

1. INTRODUCTION

Taking into consideration the pros and cons of a situation and consequently making an argument for a conclusion is common in many forms of practical reasoning. Despite this simplistic, if not obvious, way in which we often construct arguments, little work has been done in this area of argumentation. It is generally assumed that we operate in either an inductive or deductive methodology when arguing. What has not been readily addressed is this intuitive notion of balancing considerations, that is, the practice of *conductive argument* construction.

My aim throughout this essay is to demonstrate where conductive arguments can be found in the practice of *inference to the best explanation* as it is used in science. Conductive arguments, I argue, operate on two levels: the first is in the construction of hypotheses; the second is through the competition of hypotheses. Given my aim I have devoted the first half of this essay to the elucidation and discussion of conductive arguments. The second half of this paper demonstrates where conductive arguments fit into the *inference to the best explanation*, and how they are used in hypothesis formation. I conclude that there is more work to be done in the area of conductive arguments, but it is clear from what I have presented that conductive arguments operate in science through the *inference to the best explanation*.

2. CONDUCTIVE ARGUMENTS: INTRODUCTION AND BACKGROUND

2.1 Carl Wellman

Carl Wellman attempted to find justification for ethics using different arguments, i.e. deduction, induction, and conduction. After discussing deduction and induction, Wellman comes to what he coins as “conduction” (Wellman 1971: 51). Wellman begins by stating

that a conductive argument is neither inductive nor deductive, but should not be thought of in terms of this negative definition (Wellman 1971: 51). What Wellman has in mind for conductive arguments is a definition that consists of four components: “(1) a conclusion about some individual case (2) is drawn nonconclusively (3) from one or more premises about the same case (4) without any appeal to other cases” (Wellman 1971: 51). While Wellman provides this definition of a conductive argument, he also identifies a number of patterns which constitute conductive arguments.

The first of the three patterns that Wellman identifies is “exhibited by any conductive argument in which a single reason is given for the conclusion” (Wellman 1971: 55). The single reason given is presumed to outweigh any other considerations, even to the point where they are not mentioned. The second pattern consists of “several reasons ... given for the conclusion” (Wellman 1971: 56). Counter considerations in this pattern may not be mentioned because it is presumed the reasons given are strong enough. Questioning the conclusion of this second pattern of conductive arguments would require questioning the validity of the conclusion or inference. The third pattern is “that form of argument in which some conclusion is drawn from both positive and negative considerations” (Wellman 1971: 57). This pattern of argument is demonstrated when an arguer attempts to provide all relevant facts, positive and negative.

The third pattern of conductive arguments is the pattern most discussed within the literature. It is considered to be the most important given its applicability. Though Wellman originally wrote the chapter on conductive arguments in a book concerning ethics, he realised that conductive arguments are used extensively outside of ethical arguments. The use of the third pattern of conductive arguments is applicable to many other types of arguments, i.e. public policy or political debates. The ‘weighing’ of arguments that is present in the third pattern is one of the most intuitive aspects of conductive arguments, that is, weighing and considering multiple premises for a conclusion is conceivably done when engaging in argumentation.

2.1 *Trudy Govier*

Govier in her book *Philosophy of Argument* discusses conductive arguments in the chapter “Reasoning with Pros and Cons: Conductive Arguments Revisited” (Govier 1999). As the title of the chapter suggests, Govier argues that conductive argumentation (of the third type) is the consideration of pros and cons, that is, weighing different aspects of pros and cons in an effort to determine the strength of the argument arriving at a final conclusion.

Govier addresses conductive arguments through a number of examples. In one of these examples, she states that phrases like “‘even with’ and ‘further’ are indicators that we are in the conductive domain: separate reasons are being put forward” (Govier 1999: 164). These are indicators because they entertain counter-considerations or ‘cons’ to the argument being put forth. Govier is extending Wellman’s understanding of weighing the strength of reasons. The, more distinct,—extension of Wellman’s work—is Govier’s addition to evaluating conductive arguments.

Wellman was reluctant to propose a definite schema or set of rules for conductive arguments. He believed that it would be a mistake to do so because of the fluid nature of conductive arguments. Govier, however, does attempt to provide some rough

guidelines for the evaluation of conductive arguments. The following is from her latest textbook *A Practical Study of Argument*:

- (1) Determine whether the premises offered to support the conclusion are acceptable.
- (2) Determine whether the premises offered to support the conclusion are positively relevant to it, and assess the strength of the reasons.
- (3) Determine whether any counterconsiderations acknowledged by the arguer are negatively relevant to the conclusion.
- (4) Think what additional counterconsiderations, not acknowledged by the arguer, are negatively relevant to the conclusion.
- (5) Reflect on whether the premises, taken together, outweigh the counterconsiderations, taken together, and make a judgment. Try to articulate good reasons for that judgment.
- (6) If you judge that the premises do outweigh the counterconsiderations, you have judged that the R and G conditions are satisfied. Provided that A is also satisfied, you deem the argument cogent. Otherwise, you deem it not to be cogent. (Govier 2010: 365-366)

Govier's addition to Wellman's conductive arguments is through the evaluation of conductive arguments. Wellman provided a characterisation of different patterns of conductive arguments and Govier provided a loose structure for the evaluation of conductive arguments.

3. INFERENCE TO THE BEST EXPLANATION

I have introduced a conductive argument, as described by Wellman, as something which is neither inductive nor deductive, as well as something that takes into consideration the pros and cons. A conductive argument, simply put, is an argument that can take the form of a balance of considerations argument. Furthermore, the implications of conductive arguments operating in scientific explanation are of the utmost importance for this essay. While philosophy of science and argumentation theory are each vast in their own rights, I will limit my scope of investigation to the prevalence of conductive arguments in the 'inference to the best explanation' (IBE for short) found in John Pollock and Joseph Cruz's *Contemporary Theories of Knowledge* (1999).¹

Examples of conductive arguments present in IBE are twofold. The first is the presence of multiple premises. The second is the weighing of evidence in competing hypotheses. I address both in turn.

3.1 Science: Multiple Arguments/Premises

When arguments are put forth in science there is usually more than one premise taken into account. What is implicit in each of these premises is that they contribute to the argument and, given all of the facts, the conclusion "x" is justified. Pollock spends a great

¹ While I am investigating IBE, burden of proof is also relevant to this discussion. Burden of proof, however, is an area of discussion that surpasses the space I have available. Also, while burden of proof is an immense topic, I believe that IBE is an appropriate beginning to any further discussion on the relation of burden of proof and conductive arguments. It is an important topic for another time.

deal of time writing in the area of epistemology and philosophy of science to explain the belief, justification, and warrant in deciding a conclusion. Pollock and Cruz explain that IBE is another form of inductive reasoning, one which underlines much of science while also being common in everyday life (Pollock & Cruz 1999: 41). As Pollock and Cruz explain, a set of observations is often used to make (an) argument(s) for a particular hypothesis (Pollock & Cruz 1999: 41). Given observations of facts we construct an IBE. While Pollock and Cruz suggest that this is inductive reasoning, I believe it is an example of conductive reasoning. By constructing arguments based on observations of facts, all possible (conceivable) factors are taken into account and a judgment is made based on our weighing of considerations: conductive argumentation.

While epistemic justification of facts and observations is needed to construct an argument for a hypothesis, Pollock believes that an ideal warrant is one way of understanding ‘justification in the limit’ (Pollock 1995: 133). *Justification in the limit*, is the limit of justification of a proposition, given that the epistemic status may change over time. To be justified in the limit with respect to ideal warranting is to recognise the limit of justification of something which may in fact change but given our current observations and testing our statements are warranted. The ideal warrant that Pollock introduces is an expression of this justification in limit. Pollock’s definition of the *ideal warrant* is as follows:

A sequent S is *ideally warranted to degree* δ (*relative to input*) iff there is a node α (*relative to input*) of strength greater than or equal to δ such that (1) $\alpha \varepsilon \zeta$, (2) α is undefeated relative to ζ , and (3) α supports S . (Pollock, 1995: 133)

This definition is relevant to conductive arguments because for a conclusion to be ideally warranted is when a reasoner can produce all relevant arguments through a survey all of the reasoner’s beliefs, weighing the strength of node α relative to δ . In Pollock’s definition, δ is taken as the ideal standard for conclusion S , thus node α (in input such as a belief) needs to at the very least match if not supersede δ to be ideally warranted. As long as the node is greater than or equal to δ , remaining undefeated, then α supports S ; thus coming to a warranted justification for the conclusion. To take into account the ideally warranted justification is to weigh all considerations for and against a particular conclusion; to argue conductively.

3.2 Weighing of Arguments: Competing Hypotheses

While conductive argumentation and reasoning can be seen in the construction of a hypothesis within science, conductive argumentation and reasoning also operates on another level. This other level is the competition between different hypotheses. IBE is predominately found when a reasoner must choose one explanation over another (cf. Harman, 1968: 165). Science is constantly reassessing its hypotheses and consequently must make an inference that one explanation is better than the other—the *Inference to the (currently) Best Explanation*. It is this judging and weighing of hypotheses and choosing one over a competing hypothesis that is of interest.

Gilbert Harman in a paper entitled “Knowledge, Inference, and Explanation” (1968) explains that the analysis of knowledge is to take the analysis as a working hypothesis; but to do so we must take IBE into account (Harman 1968: 167). Furthermore, such an analysis renders counterexamples—or perhaps counterconsiderations—useless

because IBE is not just a good inference to the best explanation, but IBE plus intuitions about what we know (Harman 1968: 167). Thus, when we are faced with competing hypotheses IBE is inferred. This, I argue, is another instance of conductive arguments given that one must weigh a number of considerations (or premises), to come to a conclusion.

3.3 Conductive Argument and Hypothesis Formation

The significance of conductive arguments is found in the hypothesis formation. My previous points on conductive arguments and hypotheses have been that multiple arguments/premises and competition between hypotheses is evidence of conductive arguments. My innovation into the role of conductive arguments and IBE is that both are intricately involved in the process of hypothesis formation. The collection and evaluation of premises to form a hypothesis and then the testing of this hypothesis against other competing ideas is necessary for the survival of any hypothesis. Though I present hypothesis formation and testing as distinct, they are only to a certain degree. When contemplating the possibilities for explaining a phenomenon one not only weighs the pros and cons of the possibilities, but also tests the strength of the hypothesis in thought experiments. Before you can even physically test a hypothesis in a lab setting, the mental thought experiments have to be played through, and this process itself is also aided by conductive arguments (weighing pros and cons). Also, the contemplation of counterconsiderations or counterexamples for a hypothesis involves conductive argumentation. One must weigh the pros and cons of each stage of hypothesis formation and proceed accordingly.

Hypothesis formation is regulated by conductive argumentation because the updating of information of premises that form hypotheses must be done through a careful consideration of all the pros and cons. The ideal justification which I introduced through Pollock is an example of a system of justification of beliefs that surveys all conceivable objections. If a belief that we once held as being justified is revealed as incorrect, then the process of conductive argumentation and hypothesis revision takes place once again. The very process of hypothesis formation occurs through the collection and evaluation of premises, the updating of our justified and warranted beliefs, and also in the competition between hypotheses. In each of these phases, conductive argumentation is utilised, and as a consequence conductive argumentation is at the heart of IBE and hypothesis formation.

In order to demonstrate conductive argumentation in hypothesis forming, consider the following: phenomenon *P* occurs and scientists who investigate this phenomenon believe they have two possibilities. The first being hypothesis *A* and the second being hypothesis *B*. The scientist who supports hypothesis *A* does so because the pros outweigh the cons, and this consideration of both the pros and cons allows the construction of hypothesis *A*; and the circumstances are the same for the other scientist who supports a rival hypothesis. When a scientist investigates phenomenon *P*, they construct all conceivable possibilities, all the pros and cons. The scientist then constructs and determines whether their hypothesis is justified. Through the surveying of possibilities and the subsequent construction of a hypothesis, conductive argumentation and reasoning (with IBE and ideal warranting) is used. A rival scientist operates in a similar manner with a different hypothesis. When both rival scientists confront each other's respective theories, they must go through the process of evaluation of hypothesis *A* and *B*, and determine which hypothesis is correct. To summarise, consider the following notation:

Consider theory T and let P_T be a set of pros for T and C_T a set of cons for T . The *universe* of T is denoted $\Omega_T = P_T \cup C_T$.

Also, consider the *worth function* which is defined as: $\omega : \Omega_T \rightarrow \mathbb{R}$

Such that $\omega(P) \geq 0$ for all $P \in P_T$ and $\omega(C) \leq 0$ for all $C \in C_T$ and denote the *merit* of a theory T by:

$$M_T = \sum_{\eta \in \Omega_T} \omega(\eta)$$

If $M_T \geq 0$, then T is *adopted*. If $M_T < 0$, T is *rejected*.

How pros and cons are weighed is left open. In the worth function above, it is designated as real numbers to merely represent pros and cons as positive and negative, respectively. This is not to imply that one should weigh pros and cons numerically, only that they have some sort of order. The weight of each individual pro and con, and how they contribute to the overall merit, depends on the implicit elements of each pro and con and the worth value assigned to them by the reasoner. There are no restrictions on the elements within each set of pros and cons. Each pro and con has a number of factors that will influence its value, and as such each element can be a single element, set, or multiset. For example:

$\Omega_T = P_T \cup C_T$, where the pros are represented as $P_T \{ \alpha, \beta, \gamma, \dots \}$, and the cons as $C_T \{ \delta, \tau, \rho, \dots \}$. Also, α , if it is itself a set, may be expanded as $\alpha \{ \mu, \kappa, \theta, \dots \}$, etc.

For competing hypothesis, consider the following representation:

If Γ is the set of all theories, define \geq_M on Γ by $T \geq_M T'$ if $M_T \geq M_{T'}$.

The evaluation of a hypothesis, for example A or B, is through the construction of a conductive argument. In the notation above, a hypothesis (or theory)² is determined to have merit if one decides that the pros outweigh the cons. Furthermore, if it is determined that theories A and B are inadequate, and they are able to re-evaluate a new set of pros and cons, the result is a new hypothesis to be considered. This use of conductive arguments and reasoning is explained by the use of weighing the pros and cons taken into consideration, represented in the notation. What is demonstrated by this is a constant renewal of hypotheses, which is possible only through the use of conductive argumentation and IBE, as each hypothesis is weighed against another (in the notation above a hypothesis is represented by T : $T \geq_M T'$ if $M_T \geq M_{T'}$, and where M_T includes the weighing of all pros and cons). Whether a rival hypothesis is determined to be successful, or a new hypothesis is needed, the careful consideration and weighing of all possibilities is done and an inference is made to the best explanation (IBE). Through the initial construction of a hypothesis or the constant testing of one hypothesis against another, a consideration of the pros and cons is used.

² Although I have interchanged between using a hypothesis and a theory, the notation provided is testing a hypothesis; hence it is represented as a *theory*. There is no semantic significance behind using either word.

3.3.1 Kekulé and Conductive Arguments

Using the above explanation of taking into consideration the competition of hypothesis and the weighing of pros over cons, consider August Kekulé and his discoveries concerning benzene. When Kekulé was beginning his career there was little understanding of how benzene was structured. Other compounds that were compiled of the same number of carbon and hydrogen reacted different to benzene (cf. Roberts 1989: 75). During the period before Kekulé’s breakthrough, no scientist was able to completely formulate, let alone justify, a working hypothesis. All ideas, all pros and cons, failed to adequately support a sufficient hypothesis.

Kekulé had a dream³ and he imagined in his dream that carbon atoms could form a chain, and thus begun his ‘structure theory’ (Roberts 1989: 77). This intuition about the structure of molecules was the beginning of a more thorough theory. Kekulé using his intuitions about benzene made an IBE and began to form a hypothesis. He continued with this structure theory and had another significant flash of inspiration (from a second dream), where he imagined that a snake bit its own tail forming a circle. The second dream inspired Kekulé’s proposal that carbon could link to other carbon atoms forming a cyclical structure. Consider the following, if we consider Kekulé’s idea of carbon linking to other carbon hypothesis *A* then we should consider Kekulé’s rival/predecessors as hypothesis *B*.

Hypothesis *B* was tentatively formed and it suffered from constant objections and ambiguity in its explanatory power; hypothesis *B* had overwhelming cons. Hypothesis *B* is ‘tentatively formed’ because, despite the overwhelming failure, it was the best hypothesis available at the time. When Kekulé proposed his cyclical structure it was revolutionary but largely criticised because of a lack of ‘evidence.’⁴ Kekulé, as an organic chemist, was well aware of the problems (cons) of the current theories (*B*) therefore worked on and proposed hypothesis *A*. The pros for *A* were its new and innovative approach that filled the gaps of *B*—primarily by providing a reason why benzene reacted differently to other carbon based molecules. The cons for *A* were the new gaps and questions left unanswered, i.e. the missing isomers that theoretically should be present from Kekulé’s theory. The competition between the scientists and their hypotheses allowed continued renewal and refinement of their theories until one became the clear winner. Ultimately, hypothesis *A* was successful because it provided answers for the cons presented by opposing scientists who supported *B*. *B* was left wanting because it failed to explain the scientific phenomenon of benzene and its reactions. One could (simplistically) evaluate Kekulé and his rivals as adding more pros and cons to the already established, or emerging, hypothesis because of the debate that they continued to have. As the

³ Some people have suggested that a hypothesis formed from a dream, or sudden intuition, is not a hypothesis. The suggestion is that the forming of a hypothesis through a dream or intuition is opposed to how I have currently constructed hypothesis formation—that is, there is no conductive reasoning or arguing going on in a dream, or intuition, used to form a hypothesis. I do not think having a dream or intuition is indifferent to conductive reasoning and IBE. Kekulé wanted to solve the problems of organic chemistry, and through conductive reasoning (whether conscious or unconscious) came to a certain solution presented or influenced by a dream. There is always a number of influencing factors, not all of which may be known to the reasoner. How we come to solutions for cons is important, but the important point is that Kekulé made a conductive argument in forming his hypothesis.

⁴ The equipment during this period was inadequate to fully prove Kekulé’s theory, though some experiments were performed.

competition of *A* and *B* continued, more cons were added to *A*, however, these cons were answered and thus overcome with conductive arguments. The overwhelming weight of *A*'s pros prevailed over its cons, and the pros of its rival *B*. And with the weighing of evidence favouring *A*, what is implicit is the shifting of an IBE that at one point supported *B* but supported changed to *A*. The shift of the IBE is due to the conductive arguments presented and the weighing of arguments that is implied in conductive arguments, thus leading to *A* as the winning (and therefore continued surviving) hypothesis.

4. CONCLUSION

To conclude, conductive arguments are present in IBE. When we make an IBE we are weighing considerations, weighing evidence, and as such considering the pros and cons. Not only is this found in the formation of the hypothesis itself, but at a later point when one hypothesis is competing against another. The conductive argument may not always be obvious, but its presence is there, i.e. there are varying degrees of the presence of conductive arguments—that is to say, some conductive arguments are stronger and more obvious than others. Regardless of how obvious or not a conductive argument is, it is clear that in science conductive arguments are used extensively and this is something that has yet to be addressed in a serious manner. How we construct arguments, how we construct hypotheses or decide which hypothesis is better than another, has obvious impacts on the way we do science. The link between IBE and constructive arguments needs to be investigated more fully.

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Commentary on “CONDUCTIVE ARGUMENTS AND THE ‘INFERENCE TO THE BEST EXPLANATION’”

by Dean Goorden

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1. INTRODUCTION

I find myself in agreement with Goorden’s overall thesis that conductive argument is prevalent in scientific reasoning and has a crucial role in theory selection. Although Carl Wellman in his *Challenge and Response* did not address scientific argumentation to any great degree, we do find sentences such as the following: “But in judging an ethical issue, as in establishing a scientific hypothesis, there are usually two sides to be considered.” (1971: 25). Trudy Govier, perhaps the principal contemporary theorist of conductive argument is more explicit: “Any subargument to the effect that H1 is a better explanatory hypothesis than its competitors will have a convergent structure and will be a conductive argument. Thus IBE arguments require conductive subarguments” (2005: 355). Govier holds that conductive arguments are key in evaluation processes of all kinds from interpretations in literature to science to politics to argument evaluation itself. (2005: 395) But I believe Goorden is correct that this view has not been widely accepted in the larger community of scholars, so it makes sense to further develop and defend this thesis.

Goorden’s principal antagonist in his paper is John Pollock who maintains that scientific hypotheses are developed using principally *inductive* reason and argument. Goorden puts forward two principal arguments:

- (1) Pollock’s general theory of argument is fundamentally conductive in nature.
- (2) As understood by Gilbert Harman, putative inductive arguments in science are better understood as inferences to the best explanation (IBE’s), which are conductive.

I shall address each of these two arguments in turn, after a comment on vocabulary.

I am not entirely clear on the distinction, if any, between Goorden’s key terms “hypothesis formation” and “hypothesis construction”. In philosophy of science, hypothesis *creation* is often distinguished from hypothesis *development*. Hypothesis creation often requires imagination and quirky creativity, as seen in the example of Kekule’s dream of circled snakes leading to the successful hypothesis regarding the structure of benzene. Hypothesis development on the other hand is a matter of testing and also of relating hypotheses to areas of established knowledge. So I am not sure how to align Goorden’s terms ‘construction’ and ‘formation’ with my terms ‘creation’ and ‘development’. I understand and accept in general terms Goorden’s concept of hypothesis competition.

2. GOORDEN ON POLLOCK AND CONDUCTIVE ARGUMENT

Working from John Pollock's concept of an ideal warrant, Dean Goorden argues that "To take into account of the ideally warranted justification is to weigh all considerations for and against a particular conclusion; to argue conductively." (p. 4) For Pollock, an ideal warrant for a thesis is an argument that supports that thesis and is undefeated by any other argument in the argument set. In Dean's quoted material, Pollock is applying what we commonly today refer to as *abstract argumentation frameworks*. Abstract argumentation frameworks (AAF's) were prominently defined by Dung (1995). Henry Prakken in his (2008) characterized Pollock's system as instance of an AAF (2008: 12).

Today there are many versions of AAF's including *extended* AAF's that involve weightings and values. In his 2009, Prakken attempts to integrate the AAF approach of Pollock with those of other prominent theorists in artificial intelligence and law (AI & Law). There remain quite a few outstanding issues and controversies in defining, understanding, and applying AAF's. Given the above background, I will be investigating not so much Pollock's particular views as the more general issue as to whether AAF's are properly characterized as conductive in nature. I hope this move is fair to Pollock and to Goorden.

My reconstruction of Goorden's argument in the section of his paper on Pollock and conductive argument is as follows:

- (1) Conductive arguments have multiple arguments/premises in mutual contention.
- (2) Pollock's AAF's also have multiple arguments/premises in mutual contention.
- (3) Therefore, Pollock's AAF's are correctly classified as conductive arguments.

This is clearly an argument from analogy based on relevant similarities which are accurately described. While I find myself in some sympathy with the outlines of Goorden's view here, I also believe we need to bring in the process/product distinction in theory of argument (or argumentation) in order to further refine some terms, distinctions, and issues. A relevant dissimilarity between Pollock's AAF's and conductive arguments (relying here on Govier's version thereof) is that the former, an AAF, is a *process*, whereas the latter, a conductive argument, is a *product*. I interpret Goorden's conclusion as involving the term *conductive argumentation process*. Let's look at the root meanings of "conductive" here in order to navigate the process/product distinction.

The term "conductive" apparently derives from the Latin word "conducere" which means "to bring together", as an orchestra conductor brings together the various instruments and musicians into a unitary musical performance. Both conductive arguments and conductive argumentation processes involve bringing multiple conflicting reasons together, so Goorden's argument from analogy above does work at a *very* general level which treats the process/product distinction in theory of argument as of marginal importance.

The process/product distinction has been addressed many times in theory of argument, including very recently by Chris Reed and Douglas Walton in their (2010). Reed and Walton argue that *argument schemes*, in their sense of that term, provide a "particularly close tie between the product- and process-oriented representations" in theory of argument. The product-oriented approach is typified in argument diagramming, and the process approach is of course dialogical and dialectical. The overall thesis of Reed and Walton in this paper seems to be that the process and product approaches are distinct but interactive, and each approach is indispensable. It is easy to see in general terms how argument schemes

connect product and process, since the basic scheme is an argument form and the associated critical questions are dialogical. As an illustration, Reed and Walton mention an ongoing *Archeologos* project to lay out the structure of apparently all the arguments of Plato.

It may be helpful here to take a deeper look at the process/product distinction as provided by Walton in his (2010). In this paper, Walton is addressing analogical arguments as they typically appear in argumentation. Our interest here in Walton's paper is not in the analogical argument type itself but rather in general process/product issues that he addresses in this paper.

In Walton's view, what he calls the "simple scheme" for argument from analogy is found at what he calls the "presentation stage" when the argument is viewed as "provisionally acceptable" (ibid.: 27). The usually later "evaluation stage" according to Walton exhibits

...the more complex type of scheme advocated by Guarini which functions as a device for evaluating an argument from analogy as strong or weak. The idea is that the two schemes need to be employed in tandem, with the simple scheme being used first and the more complex scheme being used to follow up. (Walton 2011: 27)

The relevance here to us is that distinct argument forms typically appear at different dialog stages, with evaluation-oriented forms appearing most typically in the later stages of the dialog. It seems to me that the sequence of presentation stage and then evaluation stage is probably common in argumentation, with the evaluation stage being obviously the attempt at a resolution of the point at issue.

According to Govier, conductive argument forms are a pre-eminent evaluative argument form. Govier's overall view is that conductive arguments are key in evaluation processes of all kinds from interpretations in literature to science to politics to argument evaluation itself (2005: 395). It seems appropriate to me to say that conductive arguments are common in the later stages of a typical dialectical exchange, with the earlier stages being typified by the presentation of contending reasons. But given this, do we want to say that abstract argumentation frameworks, including Pollock's, are conductive, at least in a process sense? I think this would be an overstatement and do not agree with Goorden on that point. AAF's abstract from argument content, which it seems to me has to mean abstracting from argument forms and thus from argument as product. I think the term "conductive" has to stay allied with argument as product and the conductive argument form. Perhaps the following formulation would work: All conductive arguments are dialectical, but not all dialectical processes are conductive. There is room for further discourse regarding how to fine-tune these technical terms in theory of argument. Product is involved in process, but that should not mean that product is dissolved in process.

3. GOORDEN ON HARMAN, IBE'S, AND CONDUCTIVE ARGUMENT

Goorden's second major argument in this paper is that, according to Gilbert Harman, induction as used in science and elsewhere is really an inference to the best explanation, or IBE. Gilbert Harman in his (1963: 88) stated that "all warranted inferences which may be described as instances of enumerative induction must also be described as instances of the inference to the best explanation." Harman's view is one of many understandings of inference to the best explanation, which is sometimes alternatively identified as *abduction* or *argument* to the best explanation (ABE). There has been surprisingly little consensus

to date on the nature of IBE's, or ABE's, or abduction. Douglas Walton provides an alternative, dialogical-based account of IBE's in his (2005), and John Woods and Dov Gabbay put forward a very technical account of abduction in their (2004). In the present commentary, I shall address only Harman's views on IBE's (or abduction, ABE's).

Goorden relates Harman's concept of IBE's to conductive argument as follows: "Thus, when we are faced with competing hypotheses IBE is inferred. This, I argue, is another instance of conductive arguments given that one must weigh a number of considerations (or premises), to come to a conclusion." In his explication of inference to the best explanation, Harman proposes among other things to interpret inductive generalization argument forms (example #1 below) as being IBE's (example #2 below):

- (1) Inductive: All of the X number of swans observed to date have been white and none black; therefore all swans are white.
- (2) IBE: The quantity X of swans observed to date has been white and zero observed have been black or any other color; the best explanation of these observations is that all swans are white; therefore, all swans are white.

Presumably the alternative explanations of all observed swans being white would involve biased sampling methods or possibly a sample size that is too small. Whether all putative inductive arguments should be replaced by IBE versions is an interesting thesis which I shall not attempt to assess. The present relevance is that Goorden argues that the "formation" of hypotheses involves IBE's and hence conductive argument.

For the sake of argument, let us provisionally grant the basics of Harman's view that inductive logic is really abductive logic under the hood, so to speak. Clearly the conductive part of Harman's IBE argument form is the implicit subargument supporting the premise to the effect that that one particular explanation is the best available one for the given observation. Such a subargument supporting that premise would both involve multiple explanations and, commonly, multiple criteria of explanatory goodness.

It seems to me that much of the time the premise stating the 'best explanation' in Harman's IBE is not supported by a conductive subargument. Instead, the 'best explanation' based on it is a presumptively plausible one. We could say that plausibilistic, presumptive reasoning is latently conductive; but that seems to be a stretch. It is a fair point that, while everyday reasoning is typically presumptive, scientific reasoning is less often so. On the other hand, paradigm-based 'normal' scientific reasoning in the Kuhnian sense is presumptive in many ways as well.

In his (1973) in a section on inference to the best explanation, Harman discusses the defeasible generalization that doctors' diagnoses are correct; Harman uses an example of a doctor diagnosing measles in a particular case. Harman describes one exception condition as the doctor misperceiving the patient's symptoms. Regarding this example, Harman says "The competing explanatory statements here are not other explanations of the doctor's being right but rather explanations of his being wrong." (1973: 132) We thus seem to have in Harman two somewhat distinct senses of competing hypotheses, which I think is significant.

Harman's example of the doctor's diagnosis illustrates the point that arguments involving the application of generalities to cases inherently involve a *paired* pro and con structure, with reasons for the generality applying being on the pro side and the exceptions on the con side. Harman is here applying defeasible generalization with a known,

relevant exception category in an individual case. In such an application, we would definitely have *paired* pro and con reasons.

If all conductive arguments are defeasible case applications with the pros and cons being generalities and their respective exception conditions, then all pro and con reasons are paired in the sense above. But as has been pointed out by Pinto:

Wellman himself (1971: 68) says that “the factors [or considerations adduced in a conductive argument] do not *always* occur neatly in pairs, one pro balanced against one con” (italics added). In saying this he seems to be conceding that *sometimes* pro and con considerations do occur “neatly in pairs”. (Pinto 2010: 5)

Whereas *paired* conductive arguments are featured in Harman’s account of IBE’s in hypothesis development, unpaired conductive arguments seem especially prominent in the other area of focus for Goorden, hypothesis competition.

A widely used example of hypothesis competition is the transition from the Ptolemaic geocentric theory in astronomy to the Copernican heliocentric theory. In the very early years of the heliocentric Copernican theory (a ‘hypothesis’ at that stage), the long-standing geocentric Ptolemaic theory had the edge in all major criteria of goodness in other than simplicity. The argument in those early years might be summarized as follows:

- (1) *Pro*: The Ptolemaic theory has more coherence with other established views than other competing theories.
- (2) *Pro*: The Ptolemaic theory has more documented empirical success to date than other competing theories.
- (3) *Con*: The Copernican theory has more elegance/simplicity than other competing theories.
- (4) *So*, the Ptolemaic theory is the best available theoretical explanation.

Eventually, the empirical support swung to the Copernican side, but the Copernican’s theory’s lack of coherence with prevailing non-scientific views was famously an issue for a very long time. Clearly the above argument from astronomy is conductive but does not have paired pros and cons.

In selecting which of the two rival theories is the best one, general criteria of explanatory goodness are applied. These criteria in recent years have usually been described as some combination of (1) empirical success, (2) scope, (3) coherence with existing theories, and (4) simplicity or elegance, the last being understood in various ways. This kind of conductive argument to the best explanation consists at least predominantly of *unpaired* pros and cons, unlike the case-based applications of defeasible generalizations (generalities).

Working with multiple criteria of diverse kinds is a central feature of conductive arguments. Pinto in his 2010 quoted from Wellman’s (1971: 54) as follows:

Whenever some descriptive predicate is ascribed on the basis of a family resemblance conductive reasoning takes place. In all such cases there are several criteria for the application of the term and each of these criteria may be satisfied to a greater or lesser degree and they may vary in importance as well. The fact that one or more criteria are satisfied in a particular instance is a reason for applying the term, but the inference is non-conclusive and does not appeal to the fact that the criteria have been found empirically associated with the term in other cases. (Pinto 2010: 17)

I suggest there may be a strong and interesting association between, on the one hand, being case-based and having paired pros and cons, and on the other not being case-based and having unpaired pros and cons. While Wellman famously believed that all conductive arguments are inherently case-based, Govier does not agree with Wellman on that point: “In the sense in which ‘case’ means instance, or particular case, I do not think it is useful to reserve the term *conductive argument* for arguments of which the conclusion deals with a particular case as distinct from some general issue” (personal communication).

Perhaps applying the paired/unpaired distinction to the case-based/non-case-based distinction would advance the discussion as to whether all conductive arguments should be described as case-based. This area of exploration may or may not work out, but it seems to be worth a longer look. I view my comments above as more of an extension of Goorden’s second argument rather than a major objection to it. Most of my analyses in this commentary center on argument as product, which I for one view as the senior partner, so to speak, in the process-product distinction that we have been addressing.

4. CONCLUSION

In summary, I suggest the following: (1) It may prove fruitful to explore further the distinction between paired and non-paired types of reasons in theory of conductive argument; (2) The term “conductive” is most usefully applied with an emphasis on argument as product rather than as process, although both these approaches can have value; (3) An IBE applying presumptively established knowledge to an instance may not be conductive as an argument product; and (4) An analysis of the distinction between ‘conductive’ and ‘dialectical’ as key terms might prove helpful.

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