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Evaluating Premise Relations

By

Matthew Stevens

A Thesis
Submitted to the Faculty of Graduate Studies
through the Philosophy Department
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts
at the University of Windsor

Windsor, Ontario, Canada

2012

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Evaluating Premise Relations

By

Matthew Stevens

APPROVED BY:

Douglas Walton, Philosophy

Lori Buchanan, Psychology

Hans Hansen, Advisor

Connie Kvarfordt, Chair of Defense

July 27th, 2012

Declaration of Originality

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Abstract

An essential step to evaluating arguments is moving from the weight of individual premises to the weight of the conclusion. In order to perform this step, one must understand the relationship between the premises in the argument.

In the past, analyzing premise relations in informal logic has been limited primarily to the linked-convergent distinction. This distinction has failed to resolve some of the basic problems in finding a definition because it has underestimated the degree to which premises interact with each other in some complicated way.

Embracing concepts from holistic epistemology, I argue that evaluating a premise involves considering a wide set of presuppositions and implications that that premise, if accepted, carries. I call this wide set the premise/world. The relationship between premises is then essentially just the relationship between these two premise/worlds.

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Introduction

This paper will focus primarily on a detailed analysis of the effects of premise relationships on argument evaluations. In a simple argument from a single premise to a conclusion, an evaluation can rest on questions exclusive to the single premise such as acceptability, relevancy, and sufficiency. An evaluation becomes much more complicated in situations where there are multiple premises because we must then have some sense of how the premises are inter-related with one another in an evaluation. This is a serious and complicated question which has been largely ignored in argumentation literature except for the simple distinction between linkage and convergence.

Even the linked and convergent distinction has run into an impasse over the difficulty in finding a test which isn't riddled with problematic cases. In essence the linked convergent distinction hopes to draw a line between those premises which interact with one another and those which are independently relevant to the conclusion. The main problem that is behind some of the unsuccessful tests is the undeveloped concept of "interaction" between premises. One of the approaches that will be analyzed in the second chapter, Yanal's Degrees of Support Test, suggests that any interaction between two premises in an evaluation is grounds to label the premises linked. According to this theory, "convergence" then is the term given to two premises which are entirely independent. This is a perfect example to highlight the lack of research and understanding in premise relations for there are many ways in which premises may be related with one another, almost all of which feature some sort of interaction with one another. While I hold that a linked relationship is a particular type of relationship between premises,

convergence is an extremely broad category with many relationship types, only one of which is the model of complete independence.

When I say the "relationship between premises" I am talking about the method by which the weight of two premises is combined. If I take premise A to hold weight X and premise B to hold weight Y when considering each premise individually towards the conclusion, the relationship between the premises dictates the method for combining X and Y into an overall sense of the strength Z of the conclusion given the premises. Of course it is not always possible to weigh a premise individually towards a conclusion, which is one of the reasons for declaring a pair of premises linked, but in convergence this is usually an appropriate question. The simple view on convergence is that the premises are independent and should be taken 'additively'. One of the major conclusions I argue for in this paper is that the usual case of convergence, what I call standard supportive premises, are not in a position of complete independence. They usually carry a degree of synergy between the premises so that Z is greater than X and Y combined additively. In my third chapter I present a theory to account for this synergetic relationship along with the other relationships I outline. I call this the World of Hypothetical Implications and base this theory on the epistemic responsibilities involved in evaluating premises. These responsibilities I derive from Brandom's epistemic responsibilities for making judgements in the context of holistic epistemology.

This thesis contains three chapters. The first chapter outlines evaluation methods that are common in the literature and defends an approach of weight evaluations for the purposes and remainder of the paper. The second chapter examines problems surrounding the linked/convergent distinction in detail and ultimately attempts to resolve the issue of

where the distinction ought to lie and how one could develop a test for linkage. The third chapter begins by outlining the Hypothetical World of Implications. The remainder of the chapter is dedicated to using this theory to identify and evaluate new premise relationships within the relationship of convergence. Four such relationships will be identified; Contrary, Disjunctive, Standard Supportive, and Coincidental.

A valuable and necessary step in argumentation evaluation is recognizing the great range of relationships premises may hold with one another. The conclusion of this essay employs these newly identified relationships in evaluating an extended argument to show how useful these distinctions are in further analyzing arguments. In general this paper is an incomplete exploration into some new concepts I think important to argumentation theory. Although I try to give a fairly detailed account of the relationships, I recommend much more work on these prototypes and on identifying others. There are many concepts that will be used in the third chapter which are not sufficiently developed and some conclusions I draw I assume can be improved. Nevertheless, I believe I have made substantial developments in this paper on the topic of premise relations in argument evaluation that are of great use to argumentation theory.

Chapter 1 - Methods for Argumentation Evaluation

The focus of this paper as a whole will be the effects of premise relationships on the evaluation of arguments. By evaluation I mean an epistemic evaluation of an argument, an evaluation by an audience member as to how strongly the conclusion is supported and what epistemic stance¹ they are justified in taking on the issue in question. This is opposed to other forms of evaluation such as logical evaluation; evaluating the strength of the connection between the premises and conclusion independently of other concerns. A necessary first step before jumping into this exploration is to settle on some basic language and methodology that will be used to conduct our evaluations. In particular, we need to have a useful way to evaluate the strength that a premise carries towards a conclusion in an argument so that we may begin to talk about how two premises interact with one another, how to combine these strengths. This chapter will explore some of the language and theories that have been used to evaluate premises and arguments, to the end of resolving what language is best suited to proceed with this study.

A thing to keep at the front of our minds throughout this chapter is that there are two very different motivations possible behind choosing a method of evaluation. The first and more common method is to find a method that is practical for teaching and everyday use in evaluating arguments. The second is to find a method of evaluation that is a good tool to pry deeper into questions of argumentation theory. Our motivation is only concerned with the latter and so, even though a method of evaluation may have very strong qualities for the first motivation, it may be easily dismissed under the second.

¹ Stances being any number of terms such as endorsing, withholding judgement, dismissing, or anything in-between.

1.1 Acceptable-Relevant-Sufficient (ARS) Theories

Many books on the subject offer some variation of conditions that an argument must satisfy to be considered a good or strong argument, centred on the notions of acceptability, relevance and sufficiency. Groarke and Tindale (2008) describe a strong argument as, "an argument with 1) acceptable premises and 2) a conclusion that follows from them."² The second conditions combines relevance and sufficiency into one as is later noted in the textbook.³ One way of evaluating an argument according to this theory is to question if both of these conditions are satisfied or not. If an argument is found not to have acceptable premises OR a conclusion that does not follow from the premises then we have good grounds for considering it a weak or bad argument, while if both conditions do hold then it is a strong argument.

A cogent argument, according to Trudy Govier, is one which satisfies the ARG conditions, Acceptability, Relevance and Adequacy of Grounds.⁴ Adequacy of Grounds is whether the premises provide enough support ground (make the case for) the conclusion. This is the same thing as asking if they are sufficient to ground (support) the conclusion (Sufficiency). Mark Vorobej (2006) defines a cogent argument as satisfying these same three conditions but adds one more; the compactness condition. Compactness asks whether the argument in question could give rise to a proper subset of premises which do not give less support than the original set. If such a subset is possible then the original set is not a cogent argument, and the proper subset is the cogent argument

²Groarke, Leo and Tindale, Chris (2008). *Good Reasoning Matters, Fourth Edition*. Ontario: Oxford University Press. p. 140.

³Groarke and Tindale (2008), p. 147.

⁴Govier, Trudy (1988). *A Practical Study of Argument*. 2nd ed. Belmont, CA: Wadsworth. p. 60-61.

instead. This means removing any redundant or irrelevant premises.⁵ All of these variations on ARS are inspired by Johnson and Blair's very influential first edition of *Logical Self Defence* in which ARS was initially proposed.⁶

There is much discussion in the field of informal logic about how properly to define and apply each of these necessary conditions. For the most part these questions are beyond the scope of this chapter and the answers can vary between theorists. What is important is the general perspective that these approaches take to be the method of evaluation. They ask an audience member to consider premises and ask themselves if they are persuaded that the premises are acceptable, relevant and sufficient for the given conclusion.

Let us assume for now what will be shown in later chapters; that premises interact with one another in complicated ways which affect the amount of support carried from premises to conclusion independently of concerns of relevance and sufficiency. If this is the case, then it would be difficult to even approach this topic within the ARS method. These questions would have to be classified as a further subcategory under the grounding/sufficiency condition, asking first how strong the premises are individually then how strong they are taken together. Even if we went in this direction we would not have the language to progress any further without introducing it ourselves. ARS therefore seems too simple a theory to be of use. Blair openly accepts this lack of complexity of the theory, arguing that it is a virtue of the theory that it is simple and easily learned stating clearly that ARS is more concerned with the first motivation above, teaching and

⁵ Vorobej, Mark (2008). *A Theory of Argument*. Cambridge University Press, NY. p. 51-52.

⁶ Blair, J. Anthony (2011). "Informal Logic and its Early Historical Development." In: *Studies in Logic*. Vol. 4, No. 1. p. 12.

applying the theory to real world application.⁷ There is little reason going forward for our purposes to consider adopting this method.

1.2 Schemes or Fallacy Theories

Another approach to argument evaluation asks the audience to recognize arguments as instances of common prototypes. These scheme-recognition approaches are not usually meant as a definitive evaluative test, but rather an indicator tool with which to help the practical understanding and evaluating of arguments.⁸ Fallacies have a very long history in informal logic and there has been a great deal of work done enumerating and grounding the field. Identifying an argument or part of an argument as matching a recognized fallacy (e.g., argument from authority) used to be grounds for dismissing the argument as bad reasoning. More recent work has shown that supposed fallacies can sometimes be perfectly fine instances of neutral reasoning schemes. There can be both good and bad arguments that are instances of the same neutral argument scheme. A particular instance of this scheme is only bad (fallacious) if it does not appropriately answer certain critical questions such as, 'is the authority an expert in the field to which the proposition they are asserting belongs'. Douglas Walton takes this stance and asserts that fallacies are often just instances of defeasible reasoning schemes, thereby translating fallacies into improper uses of an argument scheme.⁹ In his book, *Fallacies and Argument Appraisal*, Christopher Tindale doesn't adopt the same method for analyzing fallacies as Walton but still recognizes fallacies as characterizing their own schemes or

⁷ Blair, J. Anthony (2011). p. 12.

⁸ There are other approaches to schemes that would disagree with this statement, but this is the one we will be considering, endorsed by Robert Pinto; Pinto, Robert (2001). *Argument Inference and Dialectic*. NL: Kluwer Academic Publishers. P. 98-111. And Douglas Walton; Walton, Douglas (2011). "Defeasible Reasoning and Informal Fallacies." Available at SSRN:<http://ssrn.com/abstract=1775825>.

⁹ Walton, Douglas (2011). *Defeasible Reasoning and Informal Fallacies*. Available at SSRN:<http://ssrn.com/abstract=1775825>.

patterns of reasoning.¹⁰ Evaluating a fallacious argument under either approach first involves recognizing the relevant scheme.

Schemes theory asks audience members to recognize arguments as specific cases of some common argument scheme when appropriate. In doing so, a method for evaluating the premises specific to the context can be established and the important critical questions for a particular argument brought forward. An argument is a good one when it resembles a recognizable scheme and satisfies the conditions of that scheme for the most part.¹¹

Fallacies and schemes are a part of many important textbooks in informal logic, even those that support another more explicit method for evaluating an argument, like ARS. They are well structured and practical to use in many cases making them handier than the abstract questions of relevance and sufficiency. One might argue that schemes are not different from ARS as a method of evaluation; schemes are only easily recognizable specific cases where relevance-sufficiency can be better defined. Indeed Johnson and Blair analyze fallacy schemes as following from an error in applying one of the ARS conditions.¹² For instance, the straw man fallacy is a fallacy because it makes premises irrelevant. Argumentation schemes may not be obviously or even commonly recognized as a form of argument evaluation, but it is a method by which a set of premises and conclusion can be interpreted as being strong or weak and is thereby appropriately seen as one. A challenge for the scheme theorists is separating descriptive

¹⁰ Tindale, Chris (2007). *Fallacies and Argument Appraisal*. Cambridge University Press. NY, p. 6.

¹¹ Schemes are usually discussed in connection with sets of critical questions that should be asked of the context to determine the quality of the appeal to the scheme, above simply being recognized as following the scheme.

¹² Johnson, Ralph and Blair, J. Anthony (2006). *Logical Self-Defence*. International Debate Education Association. New York, NY. p. 65-75.

from normative functioning schemes. The normative and hence evaluative aspect of schemes is properly left to the critical questions involved with each scheme¹³ and taking the schemes themselves to be merely descriptive (this distinction is not always so easy to maintain).

There may be some advantages to adopting a scheme based approach for our purposes. If the relationships between premises can be categorized into recognizable forms with characteristics, then arguments could be seen exhibiting these characteristics and an appropriate method of evaluation could be applied. This is to say that a scheme-based method of evaluation could possibly handle incorporating premise relationships¹⁴ as identifiable schemes or part of the identity of schemes. The problem is that this method only works for already identified or identifiable common schemes and we intend to approach a topic about which there is not much already known. This theory does not help us to investigate what these relationships are, and so it will not be useful for the purposes of this paper, although I reserve that it may be a useful medium with which to deal with the consequences of this study.

1.3 The Folly of Deductivism

In the past, a good deal of effort had been paid to the attempt to ground rational argumentation around formal logical validity. Natural language deductivism asserts that all informal arguments should be interpreted as attempts to create deductively valid

¹³ A stance Walton adopts.

¹⁴ The relationships that define how one is to move from the strength of each individual premise for the conclusion to reaching the strength of the premises taken together towards the conclusion.

arguments.¹⁵ The conclusions of such an argument become as certain as the premises are taken to be. Obviously most natural language arguments do not take a valid form¹⁶ but often they can be translated into one by filling in assumed missing gaps in the argument, or reconstructing the argument into such a form. Take for example; Tom was not involved with the break in last weekend, he was with me the whole time. This could be rewritten; P1 - Tom was with me all of last weekend, P2 - It cannot be the case that Tom was both with me and involved in the break-in, C - Tom was not involved in the break-in. This argument is reconstructed to be valid and therefore its evaluative strength follows simply from the acceptability of the premises.

The appeal of deductivism is felt by many who seek to unify the difficult field of informal logic under the more established and productive heading of logic. However, since around the 1970's this has become almost unanimously accepted as a bad idea.¹⁷ The methods with which a person naturally reasons cannot be reduced to deductive reasoning schemes. A very common example is the following; P1- Crow 1 is black, P2 - Crow 2 is black... PN - Crow N is black, C - All crows are black. A deductivist would try to add a premise something like; PN+1 - All crows are similar to the ones seen.¹⁸ This however changes the nature of the argument being presented. The original argument was never meant to support the conclusion as following deductively from its premises, neither

¹⁵ Stanford Encyclopaedia of Philosophy. "Informal Logic, NLD and Beyond." <http://plato.stanford.edu/entries/logic-informal/#Ded>. 2011 - This does not reflect the position of all deductivists, it is more specifically an ontological deductivist perspective.

¹⁶ I am taking validity here to be the more general informal validity. Informal validity asks that it not be logically possible for the conclusion to be false given the premises. Groarke, Leo (1992). "In Defence of Deductivism: Replying to Govier." In; Eemeren et al., eds. *Argumentation Illuminated*. Amsterdam: SICSAT, p. 113.

¹⁷ Korb, Kevin (2004). "Bayesian Informal Logic and Fallacy." In: *Informal Logic*. Vol. 24 No. 1. p. 49.

¹⁸ *Stanford Encyclopaedia of Philosophy*. "Informal Logic, NLD and Beyond". <http://plato.stanford.edu/entries/logic-informal/#Ded>. 2011

would the author necessarily endorse PN+1. The argument is an induction, moving from certain premises to an uncertain conclusion. This 'reconstruction' changes the very essence of the argument, pulling it back into deduction. The problems this type of fraud raises are serious, especially as more difficult cases are discussed. It thereby undermines attempts to generate a well rounded theory of argument. Deductivism simply can't handle the complexities found in natural language arguments, or account for the degrees of strength premises usually hold.¹⁹ Reconstructing arguments into deductively valid ones ignores the responsibility rhetoricians push for, that the structure of arguments ought to rest on psychological considerations.²⁰ The faults of deductivism are therefore a cautionary tale for those in the field.

The argument above is a criticism of the ontological perspective of deductivism, that deductivism does not reflect the way people actually reason. Some people argue that reconstructive deductivism can still be a useful logical device for evaluating the connection between premise and conclusion.²¹ Deductivists argue that the theorist is not obliged to inquire after the arguer's intentions.²² The reconstruction remains correct because it supplies as a premise only what is the implicit basis of the inference being made,²³ a premise that must be endorsed by the arguer to save attributing some contradictory belief (the opposite of the implicit premise).²⁴ Even this non-ontological

¹⁹ Korb, Kevin (2004). p. 49.

²⁰ Vorobej, Mark (1992). "Defining Deduction". In: *Informal Logic*. Vol. 14, No. 2-3. p. 105.

²¹ Primarily defended by Leo Groarke in a number of papers from 1992-2002.

²² Godden, David M. (2005). "Deductivism as an Interpretive Strategy: A Reply to Groarke's Recent Defence of Reconstructive Deductivism". In: *Argumentation and Advocacy*. Vol. 41, No. 3. p. 16.

²³ Groarke, Leo (1995). "What Pragma-Dialectics Can Learn from Deductivism and what Deductivism can Learn from Pragma-Dialectics". *Proceedings of the third ISSA Conference on Argumentation*. Vol. 2 Analysis and Evaluation. p. 141.

²⁴ Godden, David (2005). p. 17.

defence of deductivism then has justification through the epistemic position of the arguer and here again we run into the problem. Godden explains;

"Consistency does not commit an arguer to acceptance of the associated conditional... While an arguer might not believe its negation, he or she might not believe the conditional either. The arguer might be agnostic with respect to the associated conditional, or might not have considered it at all... Indeed, there is a larger point hidden beneath the possibility of an arguer's consistent agnosticism regarding the associated conditional. Arguers are only committed to accepting the associated conditional if they are already committed to the deductive standard of evidence."²⁵

Deductive reconstructivism is simply indefensible as an evaluative method for our epistemic purposes. The last defence of deductivism would be to argue that it might still be useful for one to ask whether the conclusion deductively follows from the premises, or what it would take to be deductively valid, even if this is a removal from the arguer's beliefs/intentions. This does not save the approach from obvious criticism though. If the argument is actually an attempt at deductive reasoning then it is useful to evaluate it in that way, which other theories would also recommend doing.²⁶ The question becomes whether it is useful to analyze arguments that are attempts at inductive reasoning in this way. While it is one way of evaluating such arguments, I cannot see any purpose to the evaluation given that it does not reflect the reasoning involved. Changing the argument into a deductively valid one creates a new trivial case which is then evaluated, but there is

²⁵ Godden, David (2005). p. 18.

²⁶ ARS could show that the conclusion deductively follows, and scheme based approaches recognize arguments as deductive reasoning schemes when appropriate.

no applicability of this case and hence the evaluation is only interesting as some thought exercise.

1.4 Weight based Evaluations

ARS and Scheme based evaluations were dismissed because of a lack of ability to give a detailed analysis of arguments. Instead, a method is needed that can give more detail as to how strong connections are between premises and conclusions. A fairly common expression in informal logic is that of "weight" or "weighing". Weighing a premise asks for a value to be given to the argumentative force²⁷ of the premise in relation to its conclusion. Any approach to evaluation that hopes to examine closely the forces at work in arguments needs a theory that is sensitive to weight concerns. There are two different ways to make a weight evaluation that will be considered. The first is a breakdown of weights into tiered categories. The second, and what will be argued for, is a numerical assignment of weights. Unfortunately there are few theories that attempt to apply the concept of weight to evaluations and so the review below will attempt to build an approach out of tangent enterprises. One field which has started to accept the value of turning to a weight based evaluation is conductive argumentation.

A conductive argument is one which has the following; 1) there are one or more reasons supporting a conclusion, none of which provide conclusive support for it. 2) There are one or more counter-considerations that actually or apparently count against the conclusion.²⁸ Conductive arguments are then arguments which contain within them both pro and con considerations before reaching some conclusion, despite the contrary

²⁷ Some people might use the terms logical force or rational persuasion but each of these shows bias towards some means of evaluation, while argumentative force remains more neutral in this regard.

²⁸ Govier, Trudy (1999). p. 155-157.

evidence. Arguments of this type raise a difficult question for argument evaluation. As Robert Pinto points out, no method of evaluation is possible unless one is prepared to assess the relative strengths of the pro and con considerations.²⁹ For example, if one were to attempt to judge the argument using an ARS theory they may simply find that both the pro and con considerations are acceptable and relevant. If we defined sufficiency here as a question of whether the pros outweigh the cons or vice versa, then sufficiency can not be judged until one can already conclude that one side is stronger than the other.

The same sort of rationality applies to our situation. If we are to compare the relationships between premises, evaluate the effect that one premise has over another then we must be able to come to a sense of how much weight each premise holds individually and then together. In order to develop a tier based weight strategy let us look at an approach developed by Robert Pinto to deal with conductive arguments and attempt to translate the basic idea to apply to non-conductive arguments. This translation is a little forced but necessary since no good method of tier based weight evaluation already exists.³⁰

1.5 Tier Based Weight Schemes

An interesting introduction to weight based evaluations comes from Michael Scriven in his paper, *The 'Weight and Sum' Methodology*. Scriven begins by recognizing a tactic that is used in everyday decision making; for a given decision one often breaks

²⁹Pinto, Robert (2011). "Weighing Evidence in the Context of Conductive Reasoning". In: Blair, J. Anthony and Johnson, Ralph, eds. *Conductive Argument: An Overlooked Type of Defeasible Reasoning and Argument*. London: College Publications.p. 116.

³⁰To my knowledge, there are some tier based evaluations that have a more limited scope such as Mark Vorobej's TRUE test of linkage but it is even less obvious how to develop a wider approach out of.

down each candidate by different categories relevant to the decision. For example, if I were trying to reach a decision on what TV to buy, I may draw the following chart:

	Cost	Picture Quality	Reliability
Sony	3	8	9
Samsung	6	7	8
Sharp	9	5	5

Table 1.1

In this situation, each value is considered as a score out of 10 where the higher the number is, the better it is. A difficult question then becomes how to combine these scores into some conclusion that accounts for the variable importance each category might hold, which categories I take to be the most important. The easiest way is likely to change the range of values for each category. If I take quality to be the most important factor in my decision to buy a TV then I should change the range of value for that column to be out of 20, or whatever seems appropriate. There are other difficulties and concerns that are involved in using such a method, one particularly interesting one is how to account for new conditions being introduced. If I wanted to introduce a new condition into the set above, any value given to that category diminishes the value of the other categories. This may be an unfavourable consequence but it is one that is difficult to avoid. In order to properly give ranges of values to a category, one must be omniscient as to the complete

set of categories.³¹ This gives rise to scepticism that applying numbers will never be accurate since we can never have solid epistemic footing on which to apply values.

Pinto takes up a form of this approach as a method for evaluating conductive arguments. He takes a two dimensional tiered approach which turns on the concepts of risk and weight. Motivated by Scriven, Pinto hopes to see all premises as members of larger categories, called features. For instance, arguing that speeding is dangerous falls under the feature of safety for the topic in concern, 'should I speed?' Once the features are all exposed, the weight of a premise becomes a product of the importance of the feature F on which it turns and the degree to which the premise makes F present.³² This mimics the methods suggested in Scriven, where the degree to which the premise makes F present is the value out of 10 given for the category and the importance dictates what that value ought to be multiplied by, to set the importance of the category relative to the others. The weight of the premise is only half the story though as it must then be combined with the risk taken in assuming the premise.

The dimension of risk is not well explained by Pinto, but it seems to be a question about the strength of the inference between the premise/feature and the conclusion to be reached. This is in many ways redundant with the importance and degree-of-satisfaction questions except that it is not asking the normative question (if you take importance to be that) of how important the feature is, rather the logical question of how likely the conclusion would be given the premise and feature on which it turns. It seems that it only makes sense to ask either the risk or importance question but not both, depending on the

³¹Scriven, Michael (1981). "Weight and Sum Methodology." In: *American Journal of Evaluation*. Vol. 85, No. 2. p. 88.

³² Pinto, Robert (2011), p. 119.

example. It is not clear why Pinto holds both questions to be relevant, rather than combining them into one question, I believe this is merely an unfortunate consequence of the freshness of the study. The combination of the weight and the risk, Pinto calls the Force or strength of consideration C (which turns on a feature F).³³

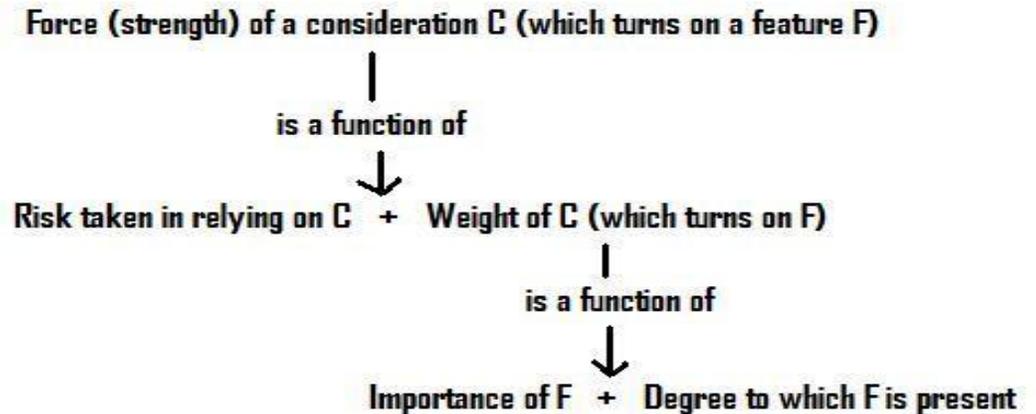


Figure 1.1³⁴

The language this theory uses is difficult to process since Pinto recommends reinterpreting premises away from their original text towards considering primarily the features on which premises turn. This was designed to help categorize pro and con considerations which speak directly against each other from those that speak indirectly against each other. Premises speak directly against each other if they disagree within a particular feature on the topic, and indirectly if they disagree across different features. For instance, two premises that argue for and against speeding being dangerous could be easily analyzed as arguing directly against each other within a single feature, while premises that state speeding is dangerous and speeding is time efficient speak indirectly

³³ Pinto, Robert (2011), p. 120.

³⁴ Pinto, Robert (2011), p. 120.

against each other towards the decision of whether or not to speed. Let us work through an example of how to apply this theory.

- Ex. 1.1
- | | | |
|----|---|---|
| P1 | Speeding leads to a higher chance of fatalities in accidents. | C |
| P2 | Speeders do not get in more accidents than non speeders. | P |
| P3 | Speeding is less fuel efficient. | C |
| P4 | Speeding will save a significant amount of time. | P |
| C | I should/should not speed. ³⁵ | |

This argument would break down into features; F1 - Safety Concerns, F2 - Financial Concerns, F3 - Time Concerns. Evaluating these premises is obviously subject and context sensitive. Let us suppose someone evaluates them in the following way:

Premise	Feature	Importance of Feature	Degree to which Feature is Present	Total Weight of each Premise
P1	F1	4	8	32
P2	F1	4	6	24
P3	F2	3	2	6
P4	F3	2	8	16

Table 1.2

The measures of importance and degrees to which each feature is present are made relative to each other. The total weight of each premise or consideration is the product of the importance of the feature on which it turns and the degree to which this feature is present.³⁶ Instead of using numbers as above, Pinto suggests that evaluations

³⁵ All examples in this paper will be listed in the Appendix.

³⁶ The use of numbers here is against the theory being supposed, but I find it a useful first step before reducing it to a tiered assessment and one that will prove useful later.

should be one of comparative degrees.³⁷ One should calculate the weight of each consideration against the weight of some other consideration. These are evaluated on a tiered scale including values, 'significantly more', 'more', 'slightly more' 'relatively equal'.³⁸ In this example we see how risk becomes redundant, there is no sense to asking how strong the inference is between the premises or features and supposed conclusion since it is merely a preferential question. The strength of the inference is essentially the same as the strength of the weight of each consideration.

Pinto proceeds to give suggestions for how to combine differences in degrees of risk and weight. The rules behind combining the two dimensions are all similar to the following, "A marked difference in risk in favour of a less weighty consideration gives slightly more force to the less weighty consideration, but only if the latter had only slightly less weight than the weightier consideration."³⁹ The other combinations explore the other degrees to which the dimensions may be present. The chart below outlines how to compare two considerations for and against an issue. Let the categories indicate the amount of risk and weight that feature 1 holds relative to feature 2 which it speaks against. Those in bold are stated explicitly by Pinto, I have taken the liberty to fill in relationships that were not mentioned, following his intended relationship:

³⁷ Relational evaluations he argues are far more coherent and defensible than applying some numerical evaluation. We often have the ability to accurately order considerations even though specific evaluations are arbitrary and erroneous. Pinto (2011), p. 121 (among other places)

³⁸ Pinto (2011), p. 123.

³⁹ Pinto, Robert (2011), p. 123.

	Considerably More Weight	More Weight	Slightly More Weight	Slightly Less Weight	Less Weight	Considerably Less Weight
Marked (positive) Difference in Risk		Considerably More Force	Moderately More Force	Slightly More Force	Standoff	Slightly Less Force
Moderate (positive) Difference in Risk	Considerably More Force	Moderately More Force	Slightly More Force	Standoff	Slightly Less Force	Considerably Less Force

Table 1.3

The above chart takes the two dimensions as being roughly equally relevant to the overall force of the argument. If we take example 1.1 again, to reach the conclusion let us take the collection of considerations that support speeding against those that do not. It seems we should say either that the considerations implying that we should speed are slightly weightier or equally weighty to considerations that we should not speed.⁴⁰ If we say that the risk is equal between the two considerations then the conclusion as to the force is the same as the weight.

This method was only developed to deal with conductive arguments but it gives an interesting suggestion for a method that may be translatable into more standard argumentation evaluation. If, instead of battling against each other, we were developing a method for combining the weights and risks of premises that work with each other then we may have a method to evaluate the relationships between premises. Of course the table above does not give answers relevant to these new questions; the table would have

⁴⁰ The weights of premises one and two can be directly compared to reach a weight from feature 1. There is however no known method for combining the considerations from features 1 and 3. It seems that it is necessary not only to be able to evaluate two premises against one another but also how two add two premises to one another. With these questions I found it easiest to make use of the numbers found earlier to know how to combine the weights, i.e. 40 in favour of speeding, 38 against. This of course is an argument against the tier based approach.

to be reconstructed to suit the new pursuit. What we would be able to preserve is the general methodology for combining multiple tier based scales and the language of risk, weight, and force.

There are however good reasons to resist using this language to develop a theory around. Aside from the problems with the separation of risk from weight, difficulties arise from the language shift from premises to features. This shift merely adds another layer of difficult questions. It is not at all easy in many arguments to break down premises into the features on which they turn. This can only hurt argument analysis by pushing the content of the analysis further from the actual argument. It is not at all obvious how to apply features to many arguments.

A better foundation for a tiered system is partially suggested by Robert Yanal. He describes two parameters of evaluation as the strength of evidential support and the accuracy of the evidence. This involves a two question process: First, how well does the evidence (the premise) support the conclusion? Secondly, is the premise true?⁴¹ Yanal breaks down the first question into a scale of responses that allow for the conclusion to be deductively valid, strong medium or weakly supported by the premise.⁴² This he labels the degree of validity. The second question is called the *truth of the premise(s)*, and is unfortunately restricted in Yanal's theory to rendering only yes or no responses.⁴³

It is interesting that theorists have often restricted premise acceptability to this duality, even when the inference strength admits of degrees. In argumentation, an epistemic evaluation as to the acceptability of a premise is not a question of whether it is

⁴¹Yanal, Robert (1988). *Basic Logic*. Thomas Learning. p. 72.

⁴² Yanal, Robert (1988), p. 76.

⁴³ Yanal, Robert (1988), p. 73.

actually true or false, it is instead a measurement of the audience's willingness to accept it as true. It seems reasonable to say that an audience judges an argument both on the acceptability of the premises and the strength of the inference to the conclusion and that these two parameters admit of varying quantities.

The tiered evaluation would then ask the two questions; 1) To what degree is the premise acceptable, and 2) To what degree does the premise, if true, support the conclusion. The degrees for question two were discussed above, question one could be answered in terms of 'very likely', 'moderately likely', and 'slightly likely'. Whether these responses are made independently for each premise or, like with Pinto's strategy, merely an ording between the premises can remain an open question.

A method for working with a tiered system of evaluation would then mimic the one explored by Pinto above. To find the overall strength of a premise, a piecewise formula or chart would have to be given, stating the overall weight of a premise given each combination of degrees available between these two parameters. In theory one could then use these degrees of weight to develop ways of combining multiple premises together.

The short-comings of this theory are almost identical to its supposed strengths. This lies in the intersection between ARS theories and a numerical assessment of weight hoping to borrow the strengths from both perspectives. A tiered system hopes to provide a more detailed approach and accessible tools for argument analysis over the standard ARS theory while still avoiding running into overwhelming accuracy problems by adopting the numerical approach. This approach then only fits halfway between being

effective at deeper argument analysis while still attempting to preserve its everyday argument analysis merits. Breaking down the strengths of premises into a limited number of degrees will do little but provide rough pokes and sweeping statements about the relationships between premises, the number of options for combining weights would force details to be overlooked. Even with the evaluation of example 2.1 it seemed necessary to revert back to the numerical assignments made originally.

1.6 Numerical Weight Assignments

The last of the approaches we will look at is one which evaluates arguments from a numerical/probabilistic approach. Probability theory in mathematics is largely based on Bayesian theories, and there have been multiple attempts to translate some of these principles into argumentation analysis with limited success. Other alternatives to the strict Bayesian theory have also been suggested. A first step to any of these approaches is the ascribing of numerical values to the premises involved in an argument. This is obviously difficult to do.

The reasons to be resistant to an approach along these lines are numerous. First, it is right to be sceptical that a numerical evaluation of the probability of a premise in natural language is possible, outside of perhaps some special cases. This stance has been held by many theorists including Govier (2001), Wellman (1971), and Pinto (2011). Almost no premises naturally carry probabilities and so in order to apply a probabilistic approach to natural language arguments, a method must be adopted to ascribe values to situations. Any theory that attempts this will have a difficult time justifying itself. What makes a premise 80% probable towards the conclusion rather than 85%? If the method relies on some intuitive epistemic ascription of values, such as 'I feel there's an 80%

chance of the conclusion given the premise' as it appears it must, then the criticism becomes that such intuitive notions are never as specific as a number implies. Using numbers creates a false sense of absoluteness and can allow erroneous consequences to be reached by relying on them.

A second problem is that formulas that work with numbers do not naturally translate from probability theory or fuzzy logic into natural language reasoning. There is no coherent system that could be put in place to talk about how to combine probabilities of premises towards a conclusion. If two premises hold probabilities P_1 and P_2 and support the same conclusion, how do we reach the probability of the conclusion? This cannot be simply added since each individual probability may be over 50% and yet together still not prove the conclusion. No matter how this issue is resolved, there is no hope of developing a universal system that could act as more than a metaphor for combining these epistemic numbers.

One last concern is whether attempting this approach is falling into the same errors as deductivism. Kevin Korb asks, "If the methods of deductive logic are relatively useless for understanding natural language arguments or scientific reasoning, why should we believe that the formal methods of probability calculus can do any better?"⁴⁴ After all, probability calculus is formal as well, while human reasoning is not. Korb defends a probabilistic analysis of natural language arguments in the face of all these criticisms by arguing that such formal quantitative tools can shed some light on semi-formal reasoning even if it is not a complete method for evaluation.⁴⁵

⁴⁴ Korb, Kevin (2004). p. 49.

⁴⁵ Korb, Kevin (2004). p. 49.

The criticisms above do perhaps give good reason to avoid a numerical approach to evaluation as an everyday approach that is to be applied and taught. It may however remain a very useful tool for our purposes of prying deeper into the study of the field, so long as we remember its limitations.⁴⁶ If, for example, we were to assume explicit probabilities for premises in an argument then it may be possible to reach a formula for the appropriate way the premises affect one another in a given situation. Such a formula would be wonderfully detailed for the discussion, even though it likely would hold no practical purpose, since no justification for the formula or way of universalizing the theory is possible. Moving forward we will hold that such formulas are to be considered metaphorical for the relationships being described and are useful to that capacity - that they suggest a non-literal resemblance in the actual relationship.

In some situations we may simply assume explicit probabilities in connection with the premises. In other situations it may be useful to develop some way of assigning a numeric value to the weight of a premise. In this pursuit we may employ the same terminology we developed for Yanal's tiered weight section; that a premise is to be evaluated first in terms of its acceptability, secondly on the strength of the inference to the conclusion. Each question should be evaluated numerically between 0 (weakest) and 1 (strongest). Let us formalize this language. *Weight of Acceptability* of premise X (Wax) is the degree to which an audience member is willing to accept a premise [$0 \leq x \leq 1$]. *Weight of Relevance*⁴⁷ of premise X (Wrx) is the degree to which the premise supports

⁴⁶ The evaluation is meant to reflect the subjective position of the audience member relative to his or her epistemic state. The closer these evaluations can be kept to this subjective concern the safer it will be from misuse.

⁴⁷ Relevance in this model is more complicated than its counterpart in some ARG theories. It includes parts of the concepts of relevancy and sufficiency according to some understandings of those words.

the conclusion if the premise is accepted [$0 \leq x \leq 1$]. The *Weight of the premise* X^{48} (W_x) then is the product: $W_x = W_{ax} * W_{rx}$.

This should fit with our intuitions on this question. If Jimmy told me that it is snowing outside, in support of the conclusion that there is snow outside; $W_{rx}=1$, $W_{ax}=0.9$, $W_x=0.9$. The premise is as strong in support of the conclusion as it is believed to be true. If I see Jimmy's wet boots after he comes inside; $W_{rx}=0.6$, $W_{ax}=1$, $W_x=0.6$. The premise is as strong to the conclusion as it is relevant to the conclusion. If I hear the squishy sound of Jimmy tracking water into the house; $W_{rx}=0.6$, $W_{ax}=0.7$, $W_x=0.42$. Of course the weight isn't exactly 0.42, whatever that means, it implies the weight is lower than the weight of the individual questions, and roughly proportional to the factor of them. If we held a single premise argument then the weight for the conclusion would be the same as the weight of that premise.

The next question is obviously, how do we reach the Weight of the Conclusion (W_c) in arguments with more than one premise? Even though premises only hold weight in relation to a conclusion, the conclusion itself carries a weight of its own which is the combination of the weights of all the premises in the argument. As I have been asserting, this is not just a question of the respective weights of the premises involved but also the relationship that the premises share in a given situation. Illuminating these metaphorical formulas is then the overall focus of the rest of this investigation.

⁴⁸ The weight of the premise of course means the weight of the premise towards a specific conclusion and is the bond between the two as opposed to being carried by the premise alone.

1.7 Conclusion

It is interesting to note that the two different motivations behind finding a theory of evaluation seem almost negatively relevant to one another. That is, the better a theory is for everyday argument evaluation, the worse the theory seems to be for investigating the deeper questions of argument analysis.

It is useful and very likely necessary for the rest of this discussion to adopt a weight based method of evaluation. Further, I have argued that actual numbers as weights being assigned to premises may help highlight relationships that exist between premises. Using numbers can be helpful so long as it remains understood that these are tools used to uncover metaphorical formulas for what the actual relationship being described is. A difficult question to discuss later will be how to translate these discoveries out of numerical language into something more practical.

Chapter 2 - Linked vs. Convergent Tests

The linked convergent distinction is the main distinction that is commonly made about the relationship between premises in relation to a conclusion. This distinction is so widespread that it can be found in almost all modern textbooks on argumentation theory. Despite its place as a cornerstone of argumentation theory it is very underdeveloped and problematic. Most of the academic debate on the subject is stuck resolving the difficulties behind defining this distinction. Although it has often been said that whether two premises are linked or convergent can be intuitively understood, even if a particular definition fails to perfectly draw the line, through investigating difficult cases we see that different theorists differ greatly even in their intuitions about straight forward cases.

This chapter will investigate the different definitions that have been proposed and the numerous counter examples that have been brought forward to cast doubt about each of them. Furthermore, it will highlight how the different definitions reflect different ways of interpreting the distinction. Some people have begun to question the legitimacy of the distinction, arguing that it is merely arbitrary and inherently problematic and should therefore be abandoned. I will evaluate these claims and decide if this popular distinction is salvageable. This investigation will continue to be one designed around epistemic argument evaluation, how an individual audience member should come to decide how persuasive they find the argument.

There have been many common things said to describe the linked-convergent distinction in the past: ‘two premises fill in/do not fill in each other's logical gaps’, ‘two premises are in the same line of reasoning/separate lines of reasoning’, ‘two premises are to be understood together supporting the conclusion/individually supporting the

conclusion'. The problem with any of these common sayings is that they do not give any hints on how to handle difficult cases. There is no way to know explicitly what is meant in each definition. For example, here is one common type of argument⁴⁹ which cannot be clearly said to be linked or convergent using the previous characterizations of the distinction:

Ex. 2.1 P1 Crow 1 is black.
 P2 Crow 2 is black.
 .
 .
 .
 PN Crow N is black.
 C All crows are black.

The premises here build off of each other to develop the conclusion and yet any single observed crow could be disregarded and the conclusion still supported. It is therefore difficult to decide whether this should be linked or convergent. This shows the need to find an explicit definition or test in order to properly apply the linked/convergent distinction, to know if two premises in a particular argument are to be identified as convergent or linked. No matter how or where this distinction is to actually be, if it is a real distinction to be made then there must be some sort of reliable line on which to draw it. So far there have been three main candidates for such a test. We shall call these; the irrelevancy test, the insufficiency test, and the degrees of support test. Within these tests there are different variations, and a few more rogue attempts. Let us go through each of these tests in turn, examining the different expressions of the test and problematic cases that arise.

⁴⁹Example 2.1 is commonly referred to as an evidence accumulation argument.

2.1 Irrelevancy Test

The first test is the irrelevancy test. This is the most popular test in argumentation text books likely because it is the simplest in its formulation. Copi, Cohen and McMahon endorse such a test in *Introduction to Logic*.⁵⁰ Douglas Walton summarizes this test as; "Assume the first premise is true and the second premise is false, and ask: 'Does the conclusion have any support at all?' Assume the second premise is true and the first premise is false and ask: 'Does the conclusion have any support at all?'"⁵¹

Here the test centres on the question of whether both premises are required to form a reason to accept the conclusion. If the answer to either of these earlier questions is yes, if one of the premises is capable of supporting the conclusion, then the premises are convergent.⁵² If neither of these give a positive response then the premises need each other and are linked, assuming that together they do provide some support. Walton calls this the falsity/no support test.⁵³ Copi et al. ask for a strong version of this test, that neither premise be capable of standing on its own. Alternatively one may argue for a weak interpretation, where only one of these premises must fail the test to be considered linked. These particular tests ask that one premise be considered false in considering its effect on the other premise, a slight variation of this test is to ask instead if one premise were suspended or simply not known to be true, does the other still lend any support? This alternative was once supported by James Freeman who asks, "If we knew that just one of the premises were true, and had no knowledge of the other, would we see why that

⁵⁰ Copi et al. (1990). *Introduction to Logic, Eighth Edition*. NY: Macmillan. p. 20.

⁵¹ Walton, Douglas (1996). *Argument Structure A Pragmatic Theory*. Toronto: University of Toronto Press. p. 110.

⁵² Walton, Douglas (1996) p. 110.

⁵³ Walton, Douglas (1996) p. 119.

premise was relevant to the conclusion? If we blocked the other premise completely out of our mind, would we see why the first still gave a reason for the conclusion?"⁵⁴

Relevant here means only that a premise gives some justification towards the conclusion. This test is called the suspension/no support test and is usually taken to be a weak version of the test, if either one of the premises can give any support towards the conclusion under the suspension of the other then it comes out as convergent. Let me summarize the definition for these four tests:

Suspension/No Support Test (Weak)

Two premises, P1 and P2, of an argument, $\{P1, P2\} \rightarrow C$, are linked with one another iff suspending P1, P2 is no longer positively relevant to C OR suspending P2, P1 is no longer positively relevant to C. P1 and P2 are convergent iff suspending P1, P2 is still positively relevant to C AND suspending P2, P1 is still positively relevant to C.

Suspension/No Support Test (Strong)

Two premises, P1 and P2, of an argument, $\{P1, P2\} \rightarrow C$, are linked with one another iff suspending P1, P2 is no longer positively relevant to C AND suspending P2, P1 is no longer positively relevant to C. P1 and P2 are convergent iff suspending P1, P2 is still positively relevant to C OR suspending P2, P1 is still positively relevant to C.

Falsity/No Support Test (Weak)

Two premises, P1 and P2, of an argument, $\{P1, P2\} \rightarrow C$, are linked with one another iff asserting P1 is false, P2 is no longer positively relevant to C OR asserting P2 is false, P1 is no longer positively relevant to C. P1 and P2 are convergent iff asserting P1 is false, P2 is still positively relevant to C AND asserting P2 is false, P1 is still positively relevant to C.

Falsity/No Support Test (Strong)

Two premises, P1 and P2, of an argument, $\{P1, P2\} \rightarrow C$, are linked with one another iff asserting P1 is false, P2 is no longer positively relevant to C AND asserting P2 is false, P1 is no longer positively relevant to C. P1 and P2 are convergent iff asserting P1 is false, P2 is still positively relevant to C OR asserting P2 is false, P1 is still positively relevant to C.

⁵⁴ He changes his position in his later work, *Argument Structure: Representation and Theory*, as will be explored near the end of this chapter. Freeman, James (1988). *Thinking Logically*. NJ: Prentice Hall. p. 178.

These four tests are very similar and shall all be put under the heading of 'no support tests'. Some theorists take the privilege of employing either test, depending on which seems more appropriate in a given situation. In particular Trudy Govier has been seen arguing in some instances in favour of the falsity version⁵⁵ while in other places defends a suspension/no support test or states the test in such a way that either test may be endorsed.⁵⁶ In Groarke and Tindale's text book, *Good Reasoning Matters!*, the suspension/no support test is employed in practice yet it is not explicitly endorsed, leaving room for the falsity/no support test to be adopted should it be needed.⁵⁷

There are some small differences between these two tests. In situations where one premise acts as an explanation of the relevancy of the other premise, the falsity test will show the argument to be linked while the suspension test will usually call it convergent:

Ex. 2.2 P1 Jim used someone else's work without citation.
 P2 This event violated the school's plagiarism policy.
 C Jim should be punished.

This example gives different results from these two tests. If the second premise is suspended, it is still reasonable to accept that the first premise supports the conclusion independently. In this situation there is a background belief available that usually when a person uses other people's work without citation they are breaking the school's plagiarism policy and therefore should be punished. If, on the other hand, the second premise is considered false, if this use of others' work were not for some reason a violation of the school's plagiarism policy, then the conclusion would no longer be supported. The audience would reason that this use of another's work was some legitimate exception to

⁵⁵ Govier, Trudy (1985). *A Practical Study of Argument*. Belmont, CA: Wadsworth. p. 131.

⁵⁶ Govier, Trudy (1985), p. 126.

⁵⁷ Groarke, Leo and Tindale, Chris (2008). *Good Reasoning Matters!*, 4th edition. Ontario: Oxford University Press. p. 38-39.

the background belief. Examples of this type are usually assumed to be linked and therefore the falsity test fares better in these cases. The falsity test functions as a slightly more rigorous test before labelling two premises convergent and it generally seems to give the better results of the two across the wide set of challenge cases. However, the suspension/no support test is still used often since it is easier to conceptualize blocking a premise out of one's mind than drawing the implications of negating that premise and it is usually sufficient in labelling premises as properly linked.

There are examples that can still be found to reject either of these no support tests. These tests ask whether each premise is absolutely necessary for the other to be considered relevant. Counter examples are numerous as there are many situations which intuitively seem to be linked and yet, even when one of the premises is assumed to be false, the other can still be argued to give some support to the conclusion:

Ex. 2.3 P1 This book is on Physics.
 P2 This book is on Chemistry.
 C Neither of these books is on philosophy.

Ex. 2.4 P1 Pigs are mammals.
 P2 No mammals lay eggs.
 C Pigs don't lay eggs.

These are just a couple examples where the two premises work together to reach the conclusion although having both premises is not completely necessary to reach the conclusion. In Ex. 2.3, even if the first book were not on physics, there is small reason to believe that it is therefore on philosophy, and so the conclusion remains supported. In 2.4 we see that P2 is in fact false, there are some known mammals that lay eggs. Nevertheless the vast majority of mammals do not lay eggs and so P1 is still a strong reason to accept the conclusion. On the irrelevancy test then both of these examples are convergent.

The important thing to realize is that we are considering these examples under the no support tests, which ask if any support at all remains if one of the premises is considered false. Obviously the amount of support for the conclusion is diminished if one premise is taken away but that is not the nature of the test here. In response to these problems a new line of tests were proposed. Rather than asking, after removing a premise, if the remaining premise provides any support at all, perhaps the question of linkage is whether the amount of support is significantly affected.

2.2 Insufficient Evidence Test

What it means for the support to be significantly affected is a difficult question. One solution is that it is the difference between a conclusion being adequately supported or not. Let us call these tests the 'insufficient evidence' tests. They ask if one of the premises were suspended or assumed false, would the other premise still provide sufficient support. This test has been especially endorsed in dialectical theories, specifically Van Eemeren and Grootendorst.⁵⁸ Convergent arguments, or as they call it 'multiple argumentation' is when there are several premises present and each is sufficient to reach the conclusion:⁵⁹

Ex. 2.5	P1	Jake didn't have a ride to the theatre.
	P2	The movie wasn't playing.
	C	Jake did not see the movie.

⁵⁸Van Eemeren, F. H. and Grootendorst, Rob (1984). *Speech Acts in Argumentative Discussions*. Dordrecht and Cinnaminson: Foris.

⁵⁹ Van Eemeren and Grootendorst (1984). p. 91.

A linked argument, or as they call it 'co-ordinative compound argument', is an argument where each premise is necessary to reach the conclusion.⁶⁰

Ex. 2.6 P1 It didn't rain this morning.
 P2 It didn't rain this afternoon.
 C It didn't rain today.

'Sufficient' and 'necessary' here means 'sufficient' or 'necessary' to prove the conclusion to the antagonist in a dialectical argument.⁶¹ If both premises taken together are necessary to give enough support to create an assumption for the conclusion, then the premises are linked. If on the other hand either premise alone is sufficient to shift the burden of proof to creating an assumption for the conclusion, then the premises are convergent. Insufficient Evidence tests do not have to be interpreted in dialectical terms, one might simply ask; if one premise were removed, would the other be sufficient to endorse the conclusion. Let us restate this definition:

Insufficient Evidence Test (Weak)

Two premises, P1 and P2, of an argument, {P1, P2} → C, where the conclusion is sufficiently supported are linked with one another iff suspending or refuting P1, P2 is no longer sufficient to be able to endorse C OR suspending or refuting P2, P1 is no longer sufficient to be able to endorse C. P1 and P2 are convergent iff suspending P1, P2 is still sufficient to be able to endorse C AND suspending P2, P1 is still sufficient to be able to endorse C.

Insufficient Evidence Test (Strong)

Two premises, P1 and P2, of an argument, {P1, P2} → C, where the conclusion is sufficiently supported are linked with one another iff suspending or refuting P1, P2 is no longer sufficient to be able to endorse C AND suspending or refuting P2, P1 is no longer sufficient to be able to endorse C. P1 and P2 are convergent iff suspending P1, P2 is still sufficient to be able to endorse C OR suspending P2, P1 is still sufficient to be able to endorse C.

⁶⁰ Van Eemeren and Grootendorst (1984). p. 91.

⁶¹ Van Eemeren and Grootendorst (1984). p. 91.

2.3 Degrees of Support Test

This leads us to our third attempt at a linked-convergent test, the 'degrees of support test'. One version of this test is proposed by Malcolm Acock who defines a linked argument as, "when its two premises taken together give more support to its conclusion than the sum of supports that each premise individually gives to the conclusion."⁶² This test appears to only ask if the amount of support is any higher from the presence of the two premises together than the sum of them individually, if they create some sort of synergy between them. For many examples this seems to do a good job labelling them linked or convergent, however it is difficult to apply this test to unclear case because Acock does not give information on how to apply the test.

Robert Yanal takes up this idea and makes it more explicit with an actual algorithm to define this relationship that he introduced in an appendix in his text book, *Basic Logic*.⁶³ Yanal believes that the difference between linked and convergent can be expressed as a difference in the way the combined strength of the premises is properly calculated. He claims, "Convergent arguments have premises whose probabilities sum in the ordinary way. Linked arguments have premises whose probabilities don't sum in the ordinary way. Linked arguments have reasons that 'jump' ordinary probability sums."⁶⁴ The ordinary sum is described as $ProbC = ProbP1 + (1-ProbP1)ProbP2$. In ordinary language this says; in a two premise argument, the strength of the second premise speaks to the amount of uncertainty left by the first premise. This formula is not order specific, if

⁶²Acock, Malcolm (1985). *Informal logic Examples and Exercises*. Belmont, CA: Wadsworth.

⁶³ Yanal, Robert. (1988). *Basic Logic*. St. Paul: West Publishing Company. p. 54.

⁶⁴Yanal, Robert (2003). "Linked and Convergent Reasons - Again". Conference paper - 2003 OSSA.

the premises were reversed in this formula it would still give the same results as is necessary.

A different version of this same formula was endorsed by John Black in his paper, 'Quantifying Support' (1991), for the same purpose of calculating the probabilities of convergent support.⁶⁵ This formula he takes from probability calculus for handling cases of disjunctive probability. This disjunctive rule states; if we flip a coin twice, the probability that at least one of the times it will land heads is calculated as $1/2 + 1/2 - (1/2 * 1/2)$ ⁶⁶ (This fits argumentatively if we think of P1 as stating that the first flip will land heads and P2 stating the second flip will land heads). Hence we shall call Yanal's algorithm alternatively the disjunctive formula.

Here we have been given a formula, but what exactly is the test? Yanal and Black argue that this formula represents the way weights between convergent premises ought to be calculated. The test then would be to take two premises with numeric weights or probabilities attached to them and calculate what the actual strength of the conclusion is in light of the premises. If the appropriate probability comes out as the one given by Yanal's algorithm then the premises are convergent, if the actual probability is some other quantity that 'jumps' beyond this sum then the premises are linked. Of course this suggests that we always have a method available to calculate the appropriate combined weight of the premises with which to compare Yanal's formula's results against, which is not the case but we will mostly ignore this question. The more important question will be,

⁶⁵ Black's version: $ProbC = ProbP1 + ProbP2 - ProbP1 * ProbP2$.

⁶⁶Hurly, Patrick J. A (2008). *Concise Introduction to Logic*. CA: Thomas Wadsworth p. 517.

is this model actually appropriate for all forms of convergent arguments? This test can be explicitly defined as follows:

Degree of Support Test

Two premises, P1 and P2, of an argument, $\{P1, P2\} \rightarrow C$, are linked with one another iff the appropriate weight for the conclusion IS NOT calculated using the ordinary sum, $ProbC = ProbP1 + (1-ProbP1)ProbP2$, i.e., it jumps beyond this sum either positively or negatively. P1 and P2 are convergent iff the weight of the conclusion IS appropriately calculated using the ordinary sum.

Using Yanal's convergence test, we do nicely come to the intended conclusion at least some of the time. In order to test this theory let us only look at examples where we assert the premises do truly hold some explicit probative quantity. This is obviously an unlikely thing but we shall not explore that challenge here. Instead let us only consider whether this test works in ideal situations. Here are two examples which nicely show the strength of Yanal's test:

Ex. 2.8	P1	Al shot at the target.	(0.7)
	P2	Bob shot at the target.	(0.6)
	C	Therefore the target was hit.	(0.88)

The weight of the conclusion for example 2.8 is reached by applying the formula: $ProbC = 0.7 + (0.3*0.6) = 0.7 + 0.18 = 0.88$. Example 2.8 is discussed by G.C. Goddu and David Conway and confirmed by both to be *accurately* summed in the ordinary way.⁶⁷

Ex. 2.9	P1	She's either in the study or in the kitchen.	(0.5)
	P2	She's not in the study.	(0.1)
	C	Therefore she's in the kitchen.	(1)

⁶⁷Goddu, G. C. (2003). "Against the "Ordinary Summing" Test for Convergence". In: *Informal Logic*, Vol. 23, No. 3 p. 225 and Conway, David (1991). "On the Distinction between Convergent and Linked Arguments". In: *Informal Logic*, Vol. 13 No. 3 p. 152-154.

In example 2.9 we are meant to notice the logic involved in the premises makes the conclusion deductively true and hence the conclusion has a weight of 1. Example 2.9 is put forward by Yanal in his 2003 conference paper for OSSA (Windsor Ontario)⁶⁸ and shows a typical case of linked premises because the support for the conclusion is far beyond the ordinary sum of 0.55.

Alexander Tyaglo takes up this test in his paper, 'How to Improve the Convergent Argument Calculation' (2002). In this paper Tyaglo mathematically resolves how to generalize this test to apply to situations where there are more than just two premises in the argument.⁶⁹ He also employs a meta-theoretical test to judge the appropriateness of these algorithms. To verify this method, he introduces a set of four conditions that must necessarily be preserved by Yanal's test. If one of these conditions is violated, then the test could not work. These conditions are; C1 - that the formula always give a result between 0 and 1, C2 - it does not matter which order the premises are taken in, C3 - if one premise makes the conclusion Prob=1 additional premises cannot weaken this support, and C4 - an irrelevant reason does not affect the probability of the conclusion.⁷⁰ All these conditions are satisfied by the ordinary sum.

G. C. Goddu, in his excellent paper, 'Against the "Ordinary Summing" Test for Convergence', challenges Yanal's test. He notices that it had simply been assumed that many common convergent arguments are appropriately summed in this way. Even Tyaglo's 'verification' of this equation is simply proof of its sufficiency in certain regards

⁶⁸ Yanal, Robert (2003).

⁶⁹ The formula is: $p(C|T_1, \dots, T_x) = p(C|T_1, \dots, T_{x-1}) + \{1 - p(T_1, \dots, T_{x-1})\} p(C|T_x)$. Tyaglo, Alexander (2002). "How to Improve the Convergent Argument Calculation". In: *Informal Logic*, Vol. 22, No. 1 p. 68

⁷⁰ Tyaglo, Alexander (2002), p. 65.

and says nothing about its necessity or appropriateness.⁷¹ As proof to the contrary, Goddu examines the following example:

Ex. 2.10 P1 The Mail was delivered today.
 P2 Tom went to work.
 C It is a weekday.⁷²

This argument should be readily identified as convergent yet it does not sum the ordinary way. If we suppose that the mail is delivered every day but Sundays, then $ProbP1=5/6$. Again let us assume that Tom works 5 days a week but 30% of his days off are weekdays while the remaining 70% are weekends, then $ProbP2=0.88$. The ordinary sum of these two premises is 0.98 but the actual probability of the conclusion can be calculated using a more rudimentary method. Goddu takes 100 weeks and finds the number of days where both of the premises apply and the number of days in this set in which it is actually a weekday. The resulting ratio he correctly deduces is $440/470 = 0.936$.⁷³ This is the mathematically appropriate calculation as to the weight of the conclusion and it disagrees with the disjunctive formula. Hence the premises, according to Yanal's test, are not convergent. Let us call this method of evaluation case based analysis.

The reason for this result is not terribly difficult to realize. The disjunctive formula only works for conditions which are completely separate from one another in some regard. The premises must support the conclusion in an explicitly divided way. Example 2.10 fails to satisfy this condition because the two premises speak about the same hypothetical world and hence their conditions can combine with synergy in a case

⁷¹ Goddu, G. C. (2003), p. 224 referring to: Tyaglo, Alexander (2002), p. 65.

⁷² Goddu, G. C. (2003), p. 225.

⁷³ Goddu, G. C. (2003), p. 225/226.

study analysis to disagree with the disjunctive formula. The premises 'overlap' in their hypothetical worlds. The concept of hypothetical worlds will be the main theme of Chapter 3 and this example will be fully explained in the standard supportive section.

At the end of his paper, Goddu wonders whether he has discovered the key counterexample that refutes the ordinary summing test. The example above does not completely accomplish this. It is possible for Yanal or somebody to argue that the test above only shows that many arguments that look convergent are in fact linked in some complicated way, although I hope that most people would recognize the withering relevance of Yanal's test. I believe there is an example that should be considered the definitive counterexample to put this attempted definition to rest, and it is coincidentally one that both Yanal and Goddu analyzed improperly themselves:

Ex. 2.11

- P1 She typically goes to the kitchen around this time to make a cup of tea. (0.8)
P2 I just saw her walking in the general direction of the kitchen. (0.75)
C Therefore she is in the kitchen.⁷⁴

Yanal labels this argument convergent saying:

"'She typically goes to the kitchen this time of day to make a cup of tea' confers some likelihood on 'She's in the kitchen.' Suppose that 4 out of 5 days she goes to the kitchen at this time to make tea. Then that premise confers on its conclusion a probability of 0.8. Now there is a remainder of uncertainty of 0.2 of whether she's in the kitchen now. The second premise, that I've seen her walking in the direction of the kitchen, removes some of that uncertainty. Suppose that I'm generally right about what I see — say 75% of the time. Then we can say that the second premise

⁷⁴ Yanal, Robert (2003) and, Goddu, G. C. (2003) p. 226.

reduces the uncertainty by 75%, or 0.75 times 0.2, which is 0.15. (To say the same thing in the positive, the second premise increases the certainty by 0.15 by removing the uncertainty of 0.15.) We're then entitled to add the probabilities of the two premises, $0.8 + 0.15$, and see that our two premises support the conclusion with a probability of 0.95."⁷⁵

This calculation is inappropriate since, just as the example before, the two premises overlap. They could affect each other in a case based analysis. Goddu again astutely recognizes this problem but unfortunately calculates the 'combined' probability wrongly in this case:

"Consider 100 cases in which it is her typical kitchen time. Given Yanal's proposed probability, in 80 such cases she will be in the kitchen and in 20 she will not. Now suppose in all 100 of those cases I was present to view her movements just prior to her arriving at her destination. Given that according to Yanal I am correct about what I see 75% of the time, in 60 of the 80 cases in which she is in the kitchen, I will have seen her heading for the kitchen. In 15 of the 20 cases in which she is not in the kitchen I will not have seen her heading to the kitchen. In the remaining five cases in which she is not in the kitchen, I will have seen her heading for the kitchen. Hence, in 65 cases it is both kitchen time and I saw her heading that way, but in only 60 of them, or just under 93%, will she be in the kitchen."⁷⁶

⁷⁵ Yanal, Robert (2003).

⁷⁶ Goddu, G. C. (2003), p. 226-227.

The problem with the above example is that it does not provide enough information to apply P1 to P2 using case based analysis. Goddu hoped to get around this problem by including the assumption that 'in every case in which it is kitchen time, I was present to view her movements'. Even with this assumption (and also because of it) the probability is impossible to solve. The mistakes made in Goddu's solution begins when he takes 60 of 80 cases to represent being right in what I saw 75% of the time. This assumption is incorrect as it takes a narrow perspective on how to combine the premises. Goddu applies the premise probabilities in succession, first premise 1 then premise 2. This does not reflect the actual way of reasoning about this example. Setting up the example with a firm 80 cases in which she is in the kitchen and 20 cases she is not makes the probabilities work backwards in calculating how many cases I saw her heading in that direction. This is an oversimplification of the calculation and hence a mistake. I will go through the correct proof now, applying the probabilities of the premises at the same time rather than in succession. This will show that the probability is unsolvable both with and without Goddu's assumption:

Let T represent cases in which it is tea time
 Let V represent cases in which it is tea time and I saw her going towards the kitchen
 Let W represent cases in which it is tea time and I saw her **not** going towards the kitchen
 Let K represent cases in which she is in the kitchen
 Let A represent cases in which she is not in the kitchen

Using the example and Goddu's assumption, that we were able to see her movements in all 100 cases, we get the following formulae.

Let $X=100$ represent the number of cases being considered

XT (cases considered)
 $V+W=X$ (Either I saw her going towards the kitchen or not)
 $0.8X=K$ (From P1) $0.2X=A$ (From P1 inverse)
 $0.75V=K$ (From P2) $0.25V=A$ (From P2 inverse)
 $0.25W=K$ (From P2 inverse) $0.75W=A$ (From P2)

These are the algorithms following from how often each premise must be right.

$K \rightarrow 0.8X = 0.75V + 0.25W$ (Since she must be in the kitchen in 80% of the cases and I must be right 75% of times I saw her going and wrong 25% of times I did not)

$A \rightarrow 0.2X = 0.25V + 0.75W$ (Similar argument)

The goal now is to solve for variables V and W before we can solve for K - find out what number of the cases I must have seen her heading towards the kitchen vs. not heading towards the kitchen.

Let $X=100$

$K \rightarrow V = (80 - 0.25W) / 0.75$

Sub into A

$A - 20 = 0.25[(80 - 0.25W) / 0.75] + 0.75W$

$20 = 26.67 - 0.08W + 0.75W$

$0.67W = -6.67$

$W = -9.96$

Sub into K

$K - V = 109.99$

Here V and W are outside of the acceptable range of answers (0-100). This means that the probability is not solvable given the premises and the assumption. There is a very good reason why this is the case, P2 was not meant to speak to the entire set of times in P1; the probabilities are incompatible in this way. In order to find a proper solution to this probability, there needs to be a third variable as follows: Let U be the number of cases when it is tea time but I did not see her heading in any particular direction. Then $V+W+U=X$ and the equation becomes unsolvable without knowledge of U. There is not enough information in the example to know how often P2 and P1 apply together. We can bound the probability by finding the minimum and maximum values: $U=100$ $ProbC=0.8$, $U=20$ $V=80$ $ProbC=0.95$. The reason for this maximum is, of the 100 cases where its tea time, I could have at most seen her heading to the kitchen 80 times - in this situation, of

the 20 times I saw nothing she had to be in the kitchen all 20 times. So of the 80 times I did see her, 60 times I can be sure she was in the kitchen from P1 and 20 times I was initially unsure. Hence seeing her on those 20 cases makes 15 more cases sure. This is not a calculation as to the probability when $U=20$ $V=80$, this is an upper bound (The actual probability would have 4 of 20 cases not determined by P1 also not determined by P2 and hence $ProbC=92$, this may be the more appropriate upper bound).

The probability of the conclusion is underdetermined, and hence every value between 0.8 and 0.95 is equally correct mathematically speaking. There is reason to even reject this analysis of the example however. Here we have finally calculated a definitive probability range to the situation we have created from the premises while including a number of additional assumptions.

There is a deeper problem behind the attempted calculations of the probability for the conclusion given the premises in this example. There is an unfair assumption that has been made that the probability we are interested in is the event probability, the objective likelihood that, given the two premises occur, the conclusion will also occur. This is different than the question of how strongly an audience believes the premises support the conclusion. In some circumstances it is reasonable to say that these two quantities should be the same, that the event probability reflects the proper strength of the conclusion given the premises, for instance example 2.10, but the example must be appropriately set up to employ an event probability analysis. In example 2.11 this is not the case and forcing this type of analysis is changing the nature of the premises and their intended support for the conclusion.

This example does function as the definitive counterexample to Yanal as the probability cannot even be calculated. Examples such as this one are free to be interpreted as either linked or convergent. Problematic cases forced Yanal's test to label examples with even slight synergy linked, making this label mean less and less and now we have seen an example which challenges whether even convergent arguments can have a rigid boundary. Additionally it is unacceptable to label even some of the most obvious convergent arguments as linked and so this test fails.

2.4 Introduction to Disjunction

The range of tests has shifted from questioning whether both premises are absolutely necessary for the other to be relevant, all the way down to whether there is any connection or synergy between the two premises at all. There is a line to be drawn around the distinction Yanal highlighted. There is a small class of situations, a type of relationship to which Yanal's algorithm correctly calculates the combined probability. This is when the premises speak to disjointed hypothetical worlds.⁷⁷ I will call this class disjunctive premises and it is characterized by complete independence⁷⁸ of the premises involved, as opposed to examples 2.10 (postman) and 2.11 (kitchen) above where the premises loosely interacted. There are a number of ways premises may be disjunctive with one another.

A) The premises may be separated as an over determination.⁷⁹ If two premises both promise the same conclusion and work at the same time yet only need be accepted to

⁷⁷ I will hold off defining this difficult term until the start of the third chapter.

⁷⁸ Meaning it is appropriate to take the original sum of the premises, the weight of the first premise plus the weight of the second applied to the uncertainty left by the first.

⁷⁹ Overdetermination is a term which usually implies the outcome is assured. Its origin in psychoanalysis worked from an observed effect to multiple independently sufficient causes. Its use here is a slight variation

endorse the conclusion, then they are disjunctive. This characterizes the dice example as well as the sharpshooter method from example 2.8.

Ex. 2.8	P1	Al shot at the target.	(0.7)
	P2	Bob shot at the target.	(0.6)
	C	Therefore the target was hit.	(0.88)

B) A slight variation on the above would be if the premises were over determining yet separated sequentially, as is characteristic of an 'even if you had/hadn't' phrase:

Ex. 2.12	P1	You had no ride to the movie theatre.
	P2	Even if you had, they would have refused you entrance.
	C	You did not see the movie.

C) The ordinary sum also works for partitions of evidence in which only one need be satisfied:

Ex. 2.13	P1	It may have rained this morning.
	P2	It may have rained this afternoon.
	C	It rained at some time today.

There are likely more types that can be identified. In all these examples, if we were to provide explicit probabilities the conclusion would be calculable and correctly done so with the ordinary sum. This relationship will be examined in great detail in the chapter 3.

Unfortunately this class of cases does not cover some of the most obvious examples of independent premises. The number of ways premises normally interact with one another has been entirely underestimated. Notably, evidence accumulation

since the effect is merely argued for and may still be not guaranteed. From our perspective though we may say that the premises intend to overdetermine the conclusion, though they may not succeed. Hence I find over-determination to still characterize the intended relationship of the premises. Strictly speaking 'intended over-determination' may be the most accurate term.

arguments, such as examples 2.7, 2.10, 2.11, always involve some sort of interaction between the premises. The degrees of support test that Yanal proposes cannot distinguish between these cases and arguments that have a stronger connection between the premises. It should be fairly easy to recognize that this approach cannot survive these difficulties. Hence cases such as the evidence accumulation argument in example 2.1 must be labelled convergent:

Ex. 2.1	P1	Crow 1 is black.
	P2	Crow 2 is black.
	.	
	.	
	.	
	PN	Crow N is black.
	C	All crows are black.

The insufficient support tests and degrees of support tests wanted to recognize examples like this as linked. It might even be tempting under other headings such as, 'they fill in each other's logical gaps' or 'they are part of the same line of reasoning'. The amount of support for the conclusion definitely jumps in this example; there is a synergy between the premises. But as we have just shown, simply having this synergy cannot be the standard for linkage as some of the most obvious convergent arguments share this property. This example must be recognized as a specific type of convergent argument, where the premises work together as part of an inductive inference.

2.5 Walton's Hybrid Test

Walton ultimately argues for a flexible hybrid test for the linked-convergent distinction that pulls together characteristics from many of the accounts already looked at. This test will feature four factors that are relevant in making the distinction. "1) Structural evidence of the type of argument; 2) textual evidence- the indicator words; 3)

contextual evidence of the purpose of the discourse; and 4) the Degrees of Support Test."⁸⁰ Structural evidence involves recognizing an argument as an instance of an inference or argument scheme such as an argument with deductive reasoning is a good reason to believe the premises are linked.⁸¹ Textual evidence involves paying attention to indicator words that might hint at the arguments' intended structure.⁸² For instance, if the argument exclaims 'P1, moreover P2...' there is good reason to believe P2 is convergent with P1. Contextual evidence is an appeal to many of the motivations surrounding the suspension/insufficient proof test, such as a shifting of the burden of proof in a discussion.⁸³ Finally Walton argues that the degree of support test, an enhanced version of Yanal's algorithm, is the best actual test to indicate that premises are linked or convergent, even though it is sometimes problematic.⁸⁴ No single factor in this theory is enough to show an argument is linked or convergent, they are all imperfect indicators.

Goddu criticizes this theory as being merely a proto-theory, given that Walton gives little answer on how to actually employ or especially combine these different elements.⁸⁵ Beyond this lack of detail, there are some strong reasons to be sceptical about such an approach. It is difficult to combine so many different motivations and intuitions behind the linked-convergent distinction into one theory. The theory itself will not take the form of a real test, but instead become some malleable justification people would use to enforce whatever intuitions seems strongest to them. A person would naturally emphasize a particular indicating factor and thus come to whatever result seems right to

⁸⁰ Walton, Douglas (1996), p.152.

⁸¹ Walton, Douglas (1996), p. 178.

⁸² Walton, Douglas (1996), p. 178-179.

⁸³ Walton, Douglas (1996), p. 179.

⁸⁴ Walton, Douglas (1996), p. 181.

⁸⁵ Goddu, G. C. (2007). "Walton on Argument Structure". In: *Informal Logic*. Vol. 27, No. 1. p. 13.

them and claim it justified. This test does not settle the issues found above. Furthermore, the degree of support test has fundamental flaws in its approach to convergence. Goddu demands, and I concur, that if this test is to be developed, the degrees of support test must be dropped.⁸⁶

So where do we go from here? None of these tests can survive failing some fairly obvious counter examples, although it now appears that the 'irrelevancy tests' were the closest to the intuitive distinction intended to be made. All three of these tests have centered themselves around questioning the amount of support towards the conclusion the premises carry. In order to find a suitable test we must move beyond framing the question in terms of support for the conclusion and revisit the motivation for making the linked/convergent distinction in the first place.

2.6 Motivation for the Linked/Convergent Distinction and the First Sufficient Condition

Linked and Convergent definitions are used in argument evaluations to make a statement about the relationship between two premises to aid in the audience's ability to analyze and evaluate a particular argument. Declaring two premises linked implies that the two premises function as one unit/reason in the argument. A good theory should not consider some marginal interaction between two premises as a reason to diagram them as linked together as the degrees of support test implied. Instead, calling two premises linked should be reserved for situations where the two premises don't just interact with one another, but are essential to the understanding of one another. Most premises interact, they are offered together to reach a single conclusion after all. Linked premises build on

⁸⁶ Goddu, G. C. (2007), p. 15.

each other so that the reading of either single premise gives an incomplete picture of the argument.

In chapter one it was argued that in evaluating an argument, one should first evaluate the strength of each premise then consider the relationship of the premises with one another. Diagramming two premises together as linked is then an indication that these premises do not get considered independently but only as a unit. It says in essence 'wait to read both premises before evaluating this reason'. A common expression about linked premises is that they fill in each other's logical gaps, and this seems to be the right direction to pursue.

Now let us define how this works without appealing to 'support for the conclusion' terminology. Let us take convergent premises as the natural state of a premise, i.e. assume every premise is independent even though it may interact with other premises. This would mean that it should be rational to ask of each premise, 'what support does it hold for the conclusion?' This introduces us to the first reason to declare a premise as linked. If the answer to either question is none, if either premise is irrelevant on its own, then the premise must be linked in its support:

Ex. 2.14 P1 A witness saw a black mustang driving away from the crime.
 P2 Jake owns a black mustang.
 C Jake committed the crime.

The support of either premise by itself to the conclusion is non-existent. In asking the strength of these premises, one can only find relevancy by considering them as a unit. This is an unavoidable reason to declare two premises linked with one another, this condition is sufficient for linkage. This is essentially just the weak version of the

suspension/no support test. Using the weak version has some helpful differences for properly labelling premises linked. This raises a couple of potential problems though. The first is that, if only one premise fails to support the conclusion, how should one know which premise it is to be linked with in three or more premise arguments? The second problem concerns arguments with irrelevant premises, if a single premise is irrelevant to the argument then it would fail to independently give any support to the conclusion but should not be considered linked. This sufficient condition for linkage should then be amended, 'If a premise fails to give any support to a conclusion by itself but would if considered in connection with another premise, then it should be considered linked with that premise.' This would save the problem of calling premises convergent simply because one of them could be argued to provide support for the conclusion by itself. Let us call this the weak suspension/no support test or the single premise irrelevancy test.

2.7 Deductive Inference Scheme Test

There still remains the problem of situations where two premises appear linked yet both provide some support on their own. This appears to be the case with examples 2.4 and 2.5 from earlier:

- | | | |
|---------|----|--|
| Ex. 2.3 | P1 | This book is on Physics. |
| | P2 | This book is on Chemistry. |
| | C | Neither of these books is on philosophy. |
| | | |
| Ex. 2.4 | P1 | Pigs are mammals. |
| | P2 | No mammals lay eggs. |
| | C | Pigs don't lay eggs. |

These arguments appear linked yet the falsity/no support test, the suspension/no support test, and the just stated single premise irrelevancy test all would label this as

convergent. So how do we capture the connection between these two premises without having to get into an expression of the support 'jumping' in some way.

In these situations the audience seems to employ a pattern in the evaluation of the argument that has a deductive characteristic. Example 2.3 seems to take the form, P1 - $\sim A$ (Book A is not on philosophy), P2 - $\sim B$ (Book B is not on philosophy), C - $\sim(A \vee B)$ (Neither book is on philosophy). Example 2.4 has the form, P1 - A (Pigs are mammals), P2 - No A are B (No mammals are egg layers), C - Not B (Pigs don't lay eggs). Example 2.9 has the form: P1 - A or B (She's either in the study or the kitchen), P2 - Not A (She's not in the study), C - B (She is in the kitchen). Example 2.14 resembles the form: P1 - If A then B (If you own a black mustang then you may have committed the crime), P2 - A (Jake owns a black mustang), C - B (Jake *may have* committed the crime). Examples 2.3 and 2.4 are explicitly deductive while 2.14 is far from deductive. Let us call arguments that are either deductive or not deductive but resemble the deductive form, instances of deductive inference schemes.

It is important to talk about deductive inference schemes because many linked premises we will hope to analyze in this way are not actually deductive but only take that form in the audience's mind while trying to make sense of the argument. Example 2.14 is a good example of this, P1 simply implies if you drive a black mustang you may have been the person who committed the crime. This premise alone doesn't give any reason for the conclusion, 'Jake committed the crime'. In the context of the argument, when trying to make sense of the relevance of the premises, it takes the form 'if A then B', 'if you own a black mustang then you may have committed the crime'. The second premise is a simple statement from which the inference of the conclusion cannot be drawn without the first

premises' general statement. Thus the second premise takes the form 'A', 'Jake owns a black mustang.' This seems like the appropriate way to see the relationship between the premises in the context of this argument. The two premises in this example fit the recognizable form of modus ponens, even though the conclusion is far from being deductively drawn out. The audience takes the deductive form while recognizing the relevance of the premises, but then must evaluate the argument inductively. Although the language will be difficult in pursuing a test along these lines, I believe it grasps at the very intuitive reason one would naturally label such an argument linked.

Mark Vorobej recognizes the close association between deduction and linked arguments. He calls this the validity requirement for a linkage test, there is "a widely accepted requirement that (virtually) all deductively valid arguments are linked,"⁸⁷ He follows by recognizing what we have just pointed out, that many deductively valid arguments, "contain no premises which are independently irrelevant to the argument's conclusion,"⁸⁸ making the irrelevancy tests give the wrong result. His solution to this problem is to use a type of degrees of support test, but one that asks if the level of support is affected. Vorobej breaks down arguments into 3 levels of support; maximal support, mediate support, and null support, depending on whether a conclusion is supported by its premises conclusively, some degree of non-conclusive support, or no support.⁸⁹ His 'TRUE' test for linkage then asks if there is a difference in level of support between two premises taken together as a unit rather than independently.⁹⁰ This test works well for two reasons that we have already seen. First, we should strengthen this test by taking it to be a

⁸⁷Vorobej, Mark (1994). "The TRUE Test of Linkage". In: *Informal Logic*. Vol. 16, No. 3. p. 149.

⁸⁸ Vorobej, Mark (1994), p. 149.

⁸⁹ Vorobej, Mark (1994), p. 151.

⁹⁰ Vorobej, Mark (1994), p. 151.

weak version test when concerning null support, even though I do not believe it was intended to be; if a single premise moves from carrying null support to carrying some support then the premises are linked. This allows the test to capture the single premise irrelevancy condition mentioned earlier. Secondly, it can capture the validity requirement that seems to also be true.

The problem with this test is that not all jumps in support fall within these nicely constructed lines. There are examples then in which two premises may be seen as instances of a deductive inference scheme, yet only provide non-conclusive support to the conclusion. Furthermore either premise could be seen as providing some support for the conclusion independently of the other. In this situation, the TRUE test would call the premises convergent even though it seems they should still be considered linked.

Ex. 2.15 P1 Molly hates bugs.
 P2 There will be lots of bugs at the cottage this weekend.
 C Molly will not be at the cottage this weekend.

Either premise alone still gives some reason to accept the conclusion in this example. Also it is important to note that the conclusion is not certain taking the premises together. The argument goes from having two partially supporting premises by themselves to one partially supporting reason when taken together. While the amount of partial support is increased in this example, it does not cross any support thresholds. Even if we were to redefine or add more levels of support, it would always be possible to find an example which is linked but fails to shift levels. For this reason, employing the concept of deductive inference schemes is preferable to this modified degree of support test. Let us try out this definition then, 'two premises are linked with one another if they employ a

deductive inference scheme to a conclusion.' A deductive inference is an inference which preserves deductive validity. A deductive inference scheme is an inference which resembles a deductive inference. Resembles here is obviously tough to define and a good deal of time could be spent on this topic. To openly skirt the question, let us simply say that an argument resembles a deductive inference if the audience member can justify interpreting the argument as a member of some such inference. This seems like a good place to look since premises sharing a deductive inference scheme together form a tight bond with one another. Let us call this the deductive scheme test.

This test should preserve all of the positive qualities of Vorobej's test, classifying any deductively valid argument as linked, and be applicable to those non-deductive cases which mimic this close relationship. An important question is whether this test needs to be supplemented with the single premise irrelevancy test or whether every situation where that test applies is also employing some deductive inference scheme. This is a difficult question which we will address after the following aside.

One interesting cautionary case should be recognized about this definition, the disjunctive introduction inference: $P1 - A, P2 - B, C - A \text{ or } B$. This is a tricky situation because it seems like it should be considered linked under this new test even though it is intuitively convergent, since there is no interaction between the premises here to reach the conclusion. Either premise is sufficient for the conclusion. To avoid this problem, it should be emphasized that the test requires that both premises work together as part of a deductive inference scheme in order to declare them as linked with one another. In this situation either premise alone is enough to deduce the conclusion.

Now we need to check this test against the single premise irrelevancy test we found to be sufficient for linkage earlier. What is the overlap in application between the single premise irrelevancy test and the deductive inference scheme test, do they both have a limited range over the intuitively linked examples. This will decide whether we can simplify down to a single test or if some hybrid of the two is needed, and most importantly where problems for this theory may be. This is a difficult question, there seems to be no way to categorically explore this question and a simple stress test against a series of examples can be only partially convincing. Nevertheless we should look at some more key examples to attempt an answer to this question.

Let us first recount all of the examples seen so far in this chapter and make sure the test performs well.

Example	Falsity/No Support Test	Degrees of Support Test	Deductive Inference Scheme Test	Intuition ⁹¹
2.1	Convergent	Linked	Convergent	Convergent
2.2	Linked	Linked	Linked	Linked
2.3	Convergent	Linked	?	?
2.4	Convergent	Linked	Linked	Linked
2.5	Convergent	Convergent	Convergent	Convergent
2.6	Uncertain	Linked	?	?
2.7	Convergent	Linked ⁹²	Convergent	Convergent
2.6	Convergent	Convergent	Convergent	Convergent
2.9	Linked	Linked	Linked	Linked
2.10	Convergent	Linked ⁴³	Convergent	Convergent
2.11	Convergent	Linked ⁴³	Convergent	Convergent
2.12	Convergent	Convergent	Convergent	Convergent
2.13	Convergent	Convergent	Convergent	Convergent
2.14	Linked	Linked	Linked	Linked
2.15	Convergent	Linked	Linked	Linked

Table 2.1

Example 2.6 seems to be particularly interesting. Let us revisit it:

⁹¹By intuition I mean, intuition about the argument given our investigation of the topic so far. Hence, calling evidence accumulation arguments convergent even though other theorists may intuitively disagree.

⁹²The degree of support test intended to call these examples convergent but cannot because of the problem explained earlier. Examples 2.7 and 2.11 are actually indecisive but we can just call them linked for simplicity.

- Ex. 2.6 P1 It didn't rain this morning.
 P2 It didn't rain this afternoon.
 C It didn't rain today.

As for the falsity/no support test: If either of the premises is false, the other premise still provides some support for the conclusion, yet it wouldn't really matter since the conclusion would be decidedly false. It is an interesting question whether one should still consider the other premise as providing support. In this question the theory seems unresolved but the suspension/no support test would call this convergent and it is safe to say that this would be Copi and Cohen's response too. The degrees of support test would easily call this argument linked. Let us assume that the day is simply broken down into two parts, morning and afternoon. Using the deductive inference scheme test, this comes out as a linked argument of the deductive form: P1 - A, P2 - B, C - A&B. This is called the conjunction introduction scheme. If we did not make the above assumption, then these two premises together only partially support the conclusion and this would no longer be labelled linked. This raises a problem; suppose we have 6 premises that say that it did not rain on six different days of the week, Monday through Saturday, towards the conclusion that it did not rain for the entire week. This argument would be labelled convergent, but then we add one more premise that says it did not rain on Sunday either, which under the current deductive inference scheme test magically changes all the premises to being linked with one another. Examples of this type are called perfect inductions and seem to fit some middle ground between inductively and deductively arguing. The TRUE test for linkage would also come to this puzzling conclusion. Should there be something in the concept of linkage which re-labels premises linked when they

become conclusively true together? The alternative would be to abandon this particular deductive inference scheme from those that suggest linkage.

I believe the best way to resolve this issue is to deny that the conjunction introduction inference is an inference scheme that indicates linkage. This makes sense as the conclusion is merely the sum of the premises; there is no special reasoning leap from the premises individually to their combined strength. If some of the premises were missing the conclusion would still be supported proportionally strong to the amount of premises remaining. Furthermore, it far from satisfies the original motivation for the distinction, that the premises need to be taken together to be understood properly. This inference scheme creates an interesting set of examples that we will make more sense of in chapter 3. The next question becomes; should this be a reason to abandon our current test or is it acceptable to just amend it to avoid this problem? Let us examine the rest of the deductive inferences to see if any others appear problematic:

Rule	Formulation	Linked Scheme?
Modus Ponens	$A \rightarrow B, A \vdash B$	Linked
Modus Tollens	$A \rightarrow B, \sim B \vdash \sim A$	Linked
Modus Ponendo Tollens	$\sim(A \wedge B), A \vdash \sim B$	Linked
Conjunction Introduction	$A, B \vdash A \wedge B$	<i>Not Linked, Cumulating Evidence - Convergent</i>
Simplification	$A \wedge B \vdash A$	Not Linked, 1 Premise
Disjunction Introduction	$A \vdash A \vee B$	Not Linked, 1 Premise
Disjunction Elimination	$A \vee B, A \rightarrow C, B \rightarrow C \vdash C$	Linked
Disjunctive Syllogism	$A \vee B, \sim A \vdash B$	Linked
Hypothetical Syllogism	$A \rightarrow B, B \rightarrow C \vdash A \rightarrow C$	Linked
Constructive Dilemma	$A \rightarrow P, B \rightarrow Q, A \vee B \vdash P \vee Q$	Linked
Destructive Dilemma	$A \rightarrow P, B \rightarrow Q, \sim P \vee \sim Q \vdash \sim A \vee \sim B$	Linked
Bi-conditional Introduction	$A \rightarrow B, B \rightarrow A \vdash A \leftrightarrow B$	Linked
Bi-conditional Elimination	$A \leftrightarrow B \vdash A \rightarrow B$	Not Linked, 1 Premise

Table 2.2

At least on the surface the majority of these deductive inference schemes appear to represent cases of linked premises. The only obvious exceptions to this are the three inferences which only involve one premise and the interesting Conjunction Introduction. It makes sense then to treat this one inference as an exception rather than rethink the test.

they are justified in calling it linked for that reason, but it is not necessary. Chapter one explored the problems of deductivism to some extent. Although we are only talking about inference schemes here, it would be falling into the same sort of trap to say that this argument ought to be interpreted in that way. Instead, for most people, the conclusion is reached merely through a comparison between the premises; at first it was there and now it is not. There is no need to force this sufficiently understandable form of reasoning into a deductive scheme.

The second thing of note is that Ex 2.17 is linked nonetheless as it fails the single premise irrelevancy test (by failing I mean at least one premise satisfies the condition of being irrelevant to the conclusion independently). In fact, it is difficult to think of a situation where two premises might fit this exception of failing deductive inference scheme test and the conclusion isn't reached in some sort of comparing one premise against the other. Therefore the single premise irrelevancy test is also needed to label certain cases linked that the deductive inference scheme test misses.

It is worth mentioning here that James Freeman reaches many of the same conclusions that I have drawn in his book *Argument Structure: Representation and Theory*. Freeman begins formulating his test by exploring the idea that linked premises are two premises which are taken together in an inference rule from which the conclusion is drawn.⁹³ Inference rules Freeman likens to Peircean guiding principles which extend beyond simply valid or reliable rules such as deductive principles.⁹⁴ Convergent premises then could be defined as a set of premises the members of which individually employ an

⁹³ Freeman, James (2011). *Argument Structure: Representation and Theory*. NY: Springer p. 168.

⁹⁴ Freeman, James (2011). p. 165-166.

inference rule to reach the conclusion. Freeman however finds a fault with this approach when he considers examples of conjunction introduction and evidence accumulation arguments similar to examples 2.1 and 2.6. Both of these examples employ a multiple premise inference rule and yet Freeman agrees with my conclusion that they ought not to be considered linked premises.⁹⁵

From there Freeman revises his test to its final form, "An argument involves linked structure if and only if two or more premises of the argument directly support a conclusion and the leading principle or inference licence of the sub argument consisting of those premises and conclusion contains at least one mediating element."⁹⁶ Freeman continues, "We may then define a mediating element in a multi-premised inference rule as a predicate (or predicate schema) shared by at least two premises of that rule and which does not occur in the conclusion."⁹⁷ A mediating element is meant to capture the role that a middle term plays in a deductive inference. For instance, in Modus Ponens, $A \rightarrow B, A, \vdash B$, the middle term is A which appears in both premises but not the conclusion. Indeed every deductive inference rule from the table above contains a middle term except for those three which we had already ruled out of characterizing linkage. Freeman essentially reaches the same test here as my deductive inference scheme test. The only main difference is in the language used to apply this test to natural language arguments. Example 2.16 for example does not directly fit a deductive inference rule nor does it contain a middle term. Nevertheless both Freeman and I argue that it is properly understood in those terms. Whether one wants to say that an audience member interprets

⁹⁵ He reaches this conclusion from earlier arguments of his that relevancy should be the primary attribute, and that considering any premise in either of these examples incomplete on its own is confusing the question of relevancy with sufficiency. Freeman, James (2011). p. 170.

⁹⁶ Freeman, James (2011). p. 176-177.

⁹⁷ Freeman, James (2011). P. 174.

the argument structure through its resemblance to a deductive inference scheme or whether the audience member makes use of the deductive inference rule to move from the premises to the conclusion, the move seems to be the same between our theories.

That being said the choice left is which terminology is better to use. Freeman's mediating element does function well in separating deductive schemes which do characterize linkage from those that don't. I am however still tempted to retain the deductive inference scheme expression for two reasons. Firstly, in order to employ inference rules with a mediating element it seems to require one to know and be employing a deductive inference scheme. From an educational perspective it seems the deductive inference scheme is the more basic concept and so Freeman's expression begs the employment of the deductive inference schemes. Secondly, I feel uneasy with Freeman's inference rule with a mediating element because it may accidentally give rise to a larger field than simply those deductive inference schemes. Although an example escapes me, I feel it might be possible for an audience to see two premises as sharing a mediating element even though they should be recognized as convergent. I am doubtful that any example of premises with a mediating element that is not a deductive inference scheme should be linked. For these reasons I find my expression simpler, although I am obviously biased. Ultimately there is, I believe, little difference between these tests.

A more important point is that Freeman seems to have missed the other essential expression of linkage. Example 2.17 we discovered to be linked and yet not properly characterized using a deductive inference scheme. It is also therefore not an example of an inference rule with a mediating element, unless the example is greatly reconstructed out of its natural form. This example shows the need to also retain the single premise

irrelevancy test, which Freeman fails to recognize. I believe this to be only a slight oversight by Freeman as he is astute in recognizing the primary role relevance plays in the distinction. Neither he nor I at the moment can deliver a single comprehensive test to separate all cases of linkage from those of convergence. While it is worthwhile to continue to investigate a possible single test that might get at the root of what linkage is, it may be possible that this is a permanent impasse for the distinction.

We have found that there are at least two different sufficient conditions for linkage; the single premise irrelevancy test and the deductive inference scheme test. These two tests seem to get at the heart of the reason why two premises may be considered linked with one another and hence should be considered the actual tests for linkage and not just by-products of some more obvious test. There does not seem to be a lot of possibility for counterintuitive results within these tests although the deductive inference scheme test obviously admits a certain degree of vagueness in declaring an argument linked or convergent. The last and most important question becomes whether there are any arguments in which the premises ought to be linked which would not be labelled so by either one of these two tests. Even though there are countless ways to phrase and reason in argument and it is tempting to say there will always be exceptional cases, although these tests may need minor touch ups, I remain cautiously optimistic there may not be such a case. This chapter has explored many difficult examples and we have reached a point with this test where all the examples thus far can be appropriately labelled what they ought to be. It is worth mentioning again that it should be considered standard to label all premises as convergent/independent with one another unless shown to need to be taken together. The next chapter will be entirely focused on further

identifying premise relationships within the convergent field. It is linked premises I have hoped to define in this chapter. I believe these two tests make explicit that concept.

Chapter 3 - The World of Implications and Premise Relations

One of the main discoveries from the last chapter was that premises that seem independent from one another often interact in some complicated way. On the surface convergent premises appear to be independent and are usually treated as such, but when we take a closer look we notice that they do often affect each other, whether definably or indefinably, in their support for the conclusion. Case based statistical reasoning began to help us grasp that premises must be combined into one 'world' for their true combined weight towards the conclusion to be discovered. This chapter will expand upon that discovery and develop it into one theory that can account for a wide variety of cases. Furthermore I shall outline some important sets of relationships that can be identified with this theory.

3.1 Epistemic Responsibility and the World of Implications

The wrong way to approach convergent arguments would be to take each premise as an independent argument towards the conclusion, assess the weight of the premises to the conclusion, then claim that the weights of each premise simply 'add together' in some way (Yanal's Algorithm). This is also the most tempting approach for most theorists. The language consistently used describing convergent arguments suggests we evaluate such arguments this way; that they are independent arguments, each premise standing on its own like independent cable wires holding up a weight. Outside of labelling premises as linked with one another, most theorists do not have the ability to do anything but consider premises to be independent and isolated from one another. All of this contributed to the difficulties in defining the linked-convergent distinction; particularly the degrees of support method which was a strong, but ultimately flawed, attempt to resolve the

problem. There is an important step in assessing premises that is missing from these systems. Convergent arguments often were declared linked on the degrees of support test because the worlds to which they spoke were interacting.

The lesson that must be learned from this is already obvious in holistic epistemology. It can be found in Robert Brandom's description of the epistemic responsibilities:⁹⁸ A subject is not allowed to simply make a judgement; he is responsible to integrate that judgement with the commitments he has already made and develop a synthetic unity of apperception.⁹⁹ This involves three steps; a person must be critical, ampliative, and justificatory. To be critical is to find and weed out all materially incompatible commitments so that a consistent set is formed.¹⁰⁰ Meeting the ampliative responsibility requires the subject to discover all the implicit commitments he is responsible for endorsing as a consequence of the new commitment and the collaboration of the entire set so that the set is complete.¹⁰¹ He must also be prepared to justify each commitment he endorses in relation to his other commitments.¹⁰² Brandom applies this theory to judgements a subject is willing to make as opposed to considerations he is simply evaluating, as is the situation in argumentation, but this theory translates into a similar set of requirements in argumentation evaluation.

While the content of the argument is not endorsed beliefs or judgements, argumentation theory conceives of the subject as hypothesizing about certain beliefs or judgements. The statements that are offered as premises are not necessarily accepted by

⁹⁸ Brandom, Robert (2007). *Woodbridge Lectures: Lecture 1*. <http://www.pitt.edu/~brandom/index.html>. p. 7.

⁹⁹ Brandom, Robert (2007). p. 11.

¹⁰⁰ Brandom, Robert (2007). p. 11/12.

¹⁰¹ Brandom, Robert (2007). p. 12.

¹⁰² Brandom, Robert (2007). p. 12.

an audience member, but must be hypothetically considered by him. In this process of hypothetically considering premises, the epistemic responsibilities mentioned above become relevant again. In assessing the weight of a premise, one cannot simply consider the premise in isolation, one must also respect all the epistemic implications of considering that premise. Here Brandom's arguments for ampliative and critical responsibilities become relevant. Suppose there is a premise A in an argument that is being evaluated. This premise must be evaluated as to how acceptable and relevant it is to the conclusion. This involves hypothesizing about the premise and comparing it as a hypothetical belief against other beliefs. Instead of considering the premise in isolation, the subject has to create a hypothetical world around the premise, thereby fulfilling the ampliative epistemic responsibility he would have when adopting the premise as a belief. This world consists of all the other contents one would have to adopt if one adopted the premise. After that, this hypothetical world is then weighed against one's already accepted beliefs or perhaps against other hypothetically considered premises. By this, the subject fulfills his critical responsibility (by taking care of possible incompatibilities between the premise's world and other worlds). Thus I argue, when a premise is being evaluated it must first be amplified into its hypothetical premise/world, this premise/world is then involved in the critical function of comparing the assertions made in the hypothesis against other assumptions made. The critical dimension can be exercised in two different ways. The first is considering a premise against one's already accepted beliefs. The second is a more complicated matter of comparing sets of hypothetical commitments between premises in an argument. Let us work through these concepts in more detail, first

exploring critically comparing a premise to one's already endorsed beliefs, leaving the question of how to critically compare hypothetical beliefs for later.

As was said before, a premise does not just support a conclusion, it instead supports an entire epistemic 'world' that is supposed, in which the conclusion's truth is necessary or probable. This 'world' is the set of tangent beliefs that surround the acceptance of the premise. The audience is liable to try to evaluate the premise not just by itself but with respect to the entire world it implies.

There seems to be two ways of interpreting this ampliative responsibility to hypothetically considered evidence. The epistemic state¹⁰³ that one is responsible for adopting by fulfilling these two dimensions of the ampliative responsibility, taken together, constitutes what I shall call the premise/world - the hypothetical epistemic world surrounding a premise.

The first part of the ampliative responsibility is the implied necessary conditions involved in accepting a premise. Suppose Joe argues that he knows the Red Sox lost yesterday because he listened to the game on the radio in his car on his way home from work. A whole set of commitments is involved in accepting this premise as a meaningful belief. (Commitments to the existence of the Red Sox, the way radios work etc.) Evaluating the acceptability of the premise is not a simple matter of asking how trustworthy Joe is, although it may in some cases reduce to this, instead one must take the

¹⁰³ Epistemic state is obviously vague but other notions such as beliefs or propositions are insufficient to characterize the premise/world. Indeed this is why the term 'world' is introduced to best capture what is meant here. It will be described later as the collection of necessary beliefs for accepting the premise and those other beliefs that the premise makes likely/probable. Probable inferences are so fluid that other notions are inappropriate and the premise/world must be understood as not having an explicit or rigid structure.

whole world of commitments and compare them to the rest of one's epistemic commitments. Most premises carry a wide range of background commitments implied by the premise, many of which are inconsequential but some may become very relevant. Notable necessary conditions for accepting this premise are; the game took place during the afternoon, Joe was in his car leaving work at that time, and the game was on the radio. If the audience to this argument has any evidence that counts against these commitments, for instance that the game took place at night, then the acceptability of this premise would be hurt. If this epistemic conflict comes from one's private evidence (already accepted beliefs) then it places a high weight demand upon the premise to override this previous belief and be held acceptable. Evaluating the premise involves recognizing the hypothetical world the premise is involved in and attempting to exercise the critical epistemic responsibility, to integrate this belief with already accepted beliefs.

The second type of implications the hypothetical world must bring out are those that are probabilistically¹⁰⁴ implied by a premise. This makes the implications involved in the premise/world a fuzzy notion, exactly how probable should an implication be to be part of this world? Instead of either admitting or rejecting a probable implication into the premise/world based on its level of probability, a probable implication should continue to be recognized as only being implied as probable by the premise. There will obviously often be a great deal of probable beliefs accompanying a single premise, all of which make up the complex entity that is the premise/world, most of which are of no importance to the evaluation of the premise. During the evaluation, attention on these necessary or probable implications will shift to those made relevant in the context of the

¹⁰⁴ By probable I am not speaking of a mathematical probability. I am instead taking the term in its looser sense what others may prefer to call plausible.

argument and the audience member. For instance, suppose a premise carries a wide range of probable implications, one of which provides a picture of the mental state of person X at time T. None of these implications would be relevant in an evaluation unless some secondary evidence exists (private evidence or another premise in the argument) that also makes a claim about person X's mental state at time T. If secondary evidence exists that either corroborates or challenges the picture of person X's mental state given by the first premise, then that part of the premise/world becomes relevant and the secondary evidence either increases or decreases the acceptability of the premise in question to some degree. If on the other hand person X's mental state never becomes relevant to the argument, that particular part of the premise/world demands no attention.

For an example of this second type of ampliative responsibility, suppose one was to argue that Tom would not be showing up to a particular party because he has a big assignment due the following week which he is nervous about. There are parts to the premise/world in this example that are not simply a matter of necessary commitments but are instead probable inferences. It seems reasonable from this premise to assume that Tom is at home working hard on his assignment and not in any mood to attend parties. Suppose again that the audience to this argument had another piece of private evidence that Tom was talking about the party all day at school. It is then difficult to accept the premise in question because the premise implies he would have likely been nervous at school or at least not planning on going to the party. This is not to say that the audience member has reasons to reject the conclusion in general, if the premise instead suggested that Tom was grounded when he came home from school or that his car broke down, the private evidence would not count against accepting either of these premises or therefore

the conclusion. It is specifically the premise/world of the first premise which is challenged in the private evidence. This of course is not a definitive challenge since it easily could still be possible to accept both the first premise and the private evidence, but it does give some reason to be hesitant to accept the premise.

It would be helpful to go over a few further examples to help identify these worlds. There are many situations where the world implied by the premise does not extend much further than the conclusion itself. If I heard on the radio that it was going to snow today, there is little I am committed to in accepting this premise other than the conclusion that it will snow today. Of course there are some small inconsequential peripheral commitments such as I was listening to the particular radio station and that the radio station did report the weather at a certain time, but these commitments are unlikely to ever become relevant. The premise/world is the one including all of these small commitments and from which the conclusion can be inferred.

Let us go through another example where the premise/world proves to be necessary in the evaluation of the evidence. A friend of mine had a personal experience where he believes he witnessed a ghost. If this experience were taken independently then it may be reasonable for him to believe in the existence of ghosts, but this belief carries ampliative responsibilities. My friend also happened to be an atheist who claimed not to believe in a soul. If he were to accept that he witnessed a ghost then it would also imply that people have souls and even that there is a God (by most understandings). Even though the physical evidence supports the idea that there is a ghost, this evidence promotes a premise/world which is more difficult to accept. In this situation he might reason that despite what he believed to have observed, believing in ghosts is something

he cannot endorse since it would require him to also believe in souls and God. The evidence he has against those beliefs in this situation outweighed the significance of his visual data. Hence the ampliative hypothetical world was not justifiable given his previous stronger beliefs, and so the weight of the premise is weakened.

The critical responsibility that is involved in hypothetically considering premises is not just to compare a particular premise/world against one's already accepted beliefs; hypothetical premise/worlds must be critically compared to one another too. One premise can challenge another in a number of ways. The premises may be immediately contrary, 'I heard the Red Sox won' 'I heard the Red Sox lost'. A premise may challenge another premise's premise/world, 'I heard they won at 3pm' 'they played a night game'. Or in some situations they may not appear to conflict with one another, 'I heard they won live at 3pm' vs. 'I heard they won live at 8pm'. In the first case the premises support opposite conclusions and so the weight of the premises must be compared against one another as in conductive reasoning. In the second scenario the second premise acts as a defeater for the first premise and so the weight of that premise undermines the weight for the first. Again conductive reasoning provides tools for this analysis, since the function of the second premise is again only to diminish the strength of the first.

Of particular interest in this paper is the third situation, where the premises both positively support the same conclusion, yet conflict with one another. This type of argument presents two pieces of evidence that support the same conclusion but conflict between their premise/worlds. When considering premise 1 the conclusion is supported to some degree and a weight is assigned to the premise. When evaluating the second premise the same process applies. Let us suppose that in neither situation there is private

evidence against the claim being considered. Each isolated premise/world offers some degree of positive support for the conclusion. When we go to combine the weights of these premises we notice the problem. On the simple account where we take the premises to simply 'add' together to reach the conclusion, the conflict between these premises would be lost and an inappropriate evaluation made. The weight that was given to each premise does not belong to the premise in isolation; it belongs to, and is inseparable from its larger premise/world. Combining the premises in the evaluation means combining their worlds and reflecting on the relationship each world has with the other. This is what is epistemically required in argumentation, consistent with the ampliative and critical requirements. The above example, where the first premise has someone exclaim, 'I heard they won live at 3pm' and in the second a different person claims, 'I heard they won live at 8pm' highlights a case where the two premise/worlds have a conflicting relationship with one another. Accepting what is implied by one premise requires rejecting what is implied by the other. This type of relationship I will call contrary premises and will be explored at length below.

Let us restate this theory to be clear. When weighing a premise in an argument, one may not simply assess the premise as a simple statement independent of other factors. One must consider the premise as it is connected to an entire world of hypothetical implications. The premise/world shall be defined as the wide epistemic stance of considering a premise in connection with all those tangent necessary and probable beliefs that the premise implies, in agreement with the ampliative responsibility. The weight that a premise carries is made relative to and inseparable from this hypothetical world. An audience is then responsible to critically evaluate this premise/world against its own

beliefs and against those other premise/worlds in the argument. Let us call this the Hypothetical World of Implications theory (HWI). When faced with two or more convergent premises in an argument, the question about how to combine the weights of the premises becomes a question about the relationships between their hypothetical worlds. Evaluating convergent premises is different whether their premise/worlds are inconsistent or consistent with one another. This theory will be justified further and its importance will be felt as we explore specific types of relationships between premises later in this chapter.

It may seem more natural for some to consider much of what this hypothetical world of implications theory says under the more familiar language of enthymemes or missing premises. HWI involves recognizing other essential implications that one is responsible for while considering a premise. Perhaps it would be a good suggestion to fulfill these epistemic commitments by making the premise's implications explicit in the argument. The ghost example above might be usefully analyzed in this way. Let us reconstruct the example as follows; P1) experience of the ghost, IP2¹⁰⁵) there is a soul, IP3) there is a God. It is difficult to see how to diagram these premises in support of the conclusion that ghosts exist because IP2 follows from P1 and IP3 follows from IP2 but the conclusion seems to only follow from P1. Let us assert for simplicity that the premises are linked together supporting the conclusion. This could then be argued to undermine the support of the argument since the audience has private evidence to count against IP2 and IP3. In this example it may be possible to properly evaluate the argument using enthymemes.

¹⁰⁵ IPX - Implicit Premise X.

In many other examples, however, this is not the case. There are many reasons why enthymemes are not sufficient for analyzing premise/worlds. For starters it would be very hard to fit world implications as enthymemes into an argument diagram. The implications of a premise do not fit as reasons to accept the premise and most of the time does not fit as an intermediary between the premise and the conclusion. These proposed enthymemes also cannot be given the strength of convergent premises since they are essentially attached to the particular premise they are implied from. To put them into the argumentation as stand alone premises misrepresents them as independent considerations and might lead to misinterpretations. In most instances, they would have to be taken as linked with the premise in question. But that too would be unnatural since they do not help support the conclusion but only provide background for belief in the premise. There are also far too many commitments, big and small, involved in the epistemic responsibility of considering premises to turn them into enthymemes. Premise/worlds are just far too vast and fuzzy a concept to be reduced to enthymemes. Although I have argued that in a particular argument likely only a few particular aspects of the premise/world will end up being relevant to the evaluation, in some situations the relevant feature of a premise/world may be irreducible to particular expressed statements. Although it often may seem that these hypothetical worlds of implications function like hidden assumptions in an argument, it is better to think about them as premise/worlds that need not be stated until they become relevant in the evaluation of a premise.

It may be easier to get most of these ideas across using simpler language. One might simply say; statements are acceptable if it is reasonable to accept them. It is not

reasonable to accept them if they imply (deductively or with strong probability) propositions that are unacceptable. This is similar to the enthymemes suggestion but without the requirement that the implications be brought explicitly forward in the argument analysis. For the most part this language is sufficient for evaluating arguments, and most of the function premise/worlds are not more complicated than this, but there are still reasons to prefer vaguer language. It is not always possible to understand conflicts between a premise and one's private evidence or between two premises as a conflict with some particular propositions that they imply. Often people do not know exactly why a particular premise is more or less strong for them than it is for others. Often it is not particular implied propositions that are used to evaluate a premise, it is instead a vague sense of what the premise means. For some reason an audience member might feel that a premise just doesn't mesh with what they already believe, and are therefore more resistant to it. The notion of premise/worlds relates to this meshing of two epistemic perspectives which is exactly what happens when evaluating premises. For almost all of the examples in this paper, the conflicts/synergy that will be explored can be explicitly observed for the sake of simplicity. This is not always the case. Let me say one more word about the ontology of premise/worlds. A premise/world is an epistemic perspective, it is a hypothetical web of beliefs (to borrow from Quine) that a particular audience member would be responsible for if they chose to accept that premise.

The rest of this paper will explore how premise/worlds may interact with one another. The relationships between hypothetical worlds often become very complicated and there are likely countless and indefinable ways that two premises interact with one another. In the most difficult of these circumstances the best we might be able to do in

evaluating the argument may be some sort of natural intuition as to how to combine the weight, but even in this enterprise it will likely be helpful to remember to respect HWI. Nevertheless, there are some popular and easier relationships that convergent premises hold with one another that are identifiable and can be characteristically evaluated. I will now conduct an analysis into how to identify and evaluate these sets. Four main sets will be identified; Contrary, Disjunctive, Standard Supportive and Coincidental reasoning, all of which are subsets of convergent arguments. The term independence at this point has become complicated. I shall call convergent premises 'independent' premises and disjunctive 'complete independence'.

3.2 The Line between Disjunctive and Contrary Premises

The set of Disjunctive premises was explored in chapter 2 but much more must be said on this topic. For starters, the distinction between disjunction and contrary premises is extremely tricky. This section will explore what defines each group and distinguishes them from each other.

To revisit, disjunction is the relationship between premises that models complete independence. The easiest thing to say is that two premises are disjunctive with one another in relation to a conclusion, C, iff their weights towards the conclusion are properly combined¹⁰⁶ using the disjunctive probability formula/Yanal's algorithm, $W_c = W_{p1} + (1 - W_{p1})W_{p2}$. This set of situations was described earlier as including the following forms;

¹⁰⁶ If explicit probabilities are possible this can be mathematically shown, otherwise this can admittedly be seen as begging the question.

A) The premises may be separated as an over-determination.¹⁰⁷ If two premises both promise the same conclusion and work at the same time yet only need be accepted to endorse the conclusion, then they are disjunctive. This characterizes the dice example as well as the sharpshooter method from example 2.8.

Ex. 2.8	P1	Al shot at the target.	(0.7)
	P2	Bob shot at the target.	(0.6)
	C	Therefore the target was hit.	(0.88)

B) A slight variation on the above would be if the premises were over-determining yet separated sequentially, as is characteristic of an 'even if you had/hadn't' phrase:

Ex. 2.12	P1	You had no ride to the movie theatre.
	P2	Even if you had, they would have refused you entrance.
	C	You did not see the movie.

C) The ordinary sum also works for partitions of evidence in which only one need be satisfied:

Ex. 2.13	P1	It may have rained this morning.
	P2	It may have rained this afternoon.
	C	It rained at some time today.

In each of these situations there is an explicitly correct way to calculate the sum of the weight of each premise. If we were dealing with a situation in which we could ascribe a numerical value as to the probability of each premise, mathematics would dictate that the sum should be calculated using the formula above. This implies that even in situations where an accurate numerical value is not possible, the conceived strength of

¹⁰⁷ Over-determination is a term which usually implies the outcome is assured. Its origin in psychoanalysis worked from an observed effect to multiple independently sufficient causes. Its use here is a slight variation since the effect is merely argued for and may still be not guaranteed. From our perspective though we may say that the premises intend to over-determine the conclusion, though they may not succeed. Hence I find over-determination to still characterize the intended relationship of the premises. Strictly speaking 'intended over-determination' may be the most accurate term.

the premises should fit together with one 'speaking to the amount of uncertainty left by the other.' These short examples and descriptions are however insufficient to grasp exactly how this class is to be identified and understood in less obvious situations.

Contrary premises are different from disjunctive premises in that accepting one premise forces one to reject the other. Let us start with an obvious example of this, where two witnesses present evidence against a particular conclusion but with conflicting assertions:

- Ex. 3.1 P1 Jim was in Mexico on New Year's Eve. (From witness 1)
 P2 Jim was in New York on New Year's Eve. (From witness 2)
 C Jim was not in Toronto on New Year's Eve.

Each premise would independently give some support to the conclusion in this example yet something more complicated happens when one tries to combine this support. The premises here do not simply support the conclusion independently. Each premise supports a world of implications in which it is relevant and these two worlds are in conflict with one another. Let us say that it is impossible for Jim to have been in more than one of these three locations on the day in question. In this situation, the first witness's testimony stands contrary to the second's. It could however be argued that this example is simply a case of over-determination, that each premise promises the same conclusion while working at the same time and needing only one to be satisfied - like the sharpshooter example. If it is properly recognized as such then the two premises do indeed work together in a disjunctive fashion. The obvious difference between these cases is that it was possible for both of the sharpshooters to be satisfied (both hit the target on the same attempt), while in this situation accepting one premise necessarily means denying the other.

Let us reword the sharpshooter example to make the difference here clear.

Ex. 2.8 (revised) P1 Al will hit the target
 P2 Bob will hit the target
 C The target will be hit

For this example, P1 -> (if accepted)W1 - Where Al shot at and hit the target, P2 -> (if accepted)W2 - Where Bob shot at and hit the target. Each of these premise/worldsimpliesthat the target was hit. In this situation accepting W1 does not conflict with accepting W2, both premise/worlds may be satisfied if both people shot accurately and hit (or would have hit) the target. The premises remain disjunctive (weaker than working together) with one another because there remains a conflict with the importance of each world in this example. Accepting one premise renders the other premise superfluous and vice versa. The two premises do not, strictly speaking, 'work together'¹⁰⁸ instead they simply back each other up.

In the New Year's example things are a bit different. P1 -> (if accepted)W1 - Jim is in Mexico on New Year's, P2 -> (if accepted)W2 - Jim is in New York. Again each world implies that Jim was not in Toronto but the conflict extends beyond that of importance. It is true that if P1 were accepted, P2 would no longer be needed to prove the conclusion and vice versa but unlike before it is not possible to accept both W1 and W2. The conflict between the premise/worlds becomes one of acceptability rather than importance. Let us treat the acceptability of the premises in these two examples as variable. In the sharpshooter example, as the acceptability of the premises (skill of the shooters) increases, it becomes increasingly clear that the target will be hit by one of them. In the New Year's example however, as the acceptability of the premises increases

¹⁰⁸ A better understanding of what this means will be explored later in the standard supportive section.

(reliability of the witnesses) there remains a strong doubt as to whether the conclusion should be adopted. Even if both people are believed to be extremely reliable, at least one of the witnesses must be mistaken and the reader is unable to decisively say where Jim was on the night in question. Granted, the case for the conclusion is still stronger with two contrary reliable witnesses rather than two contrary unreliable witnesses, but it is far more difficult to say whether two reliable contrary witnesses make a stronger case than one reliable and one unreliable contrary witnesses. This is a hard question that will be tackled later in the evaluating contrary premises section. Intuitively it makes sense that contrary premises should not be allowed to simply tack the support for one premise onto the uncertainty left by the other. The nature of the support between contrary premises is not the same as that of disjunctive premises.

3.3 Identifying Disjunctive Premises

However, there are far more complicated and boundary pushing examples than those explored above. How exactly can we distinguish between Contrary and Disjunctive sets then? Let us start with drawing out what it means to be disjunctive, separating such cases from contrary premises first before turning to the later. Over-determination and partitions are the easiest to describe. As we noticed with the sharpshooter example, over-determinations turn on there being no conflict between accepting the premises, but a conflict between the importance of each premise towards the conclusion. Namely that as one premise becomes increasingly weighty the importance of the weight of the remaining premise diminishes. This remains true for partitions as well, where each section is entirely independent from the others and only one need be satisfied. There is no problem *accepting* that each partition support the conclusion, but one is sufficient to make the

others superfluous. There is in fact almost no difference between over-determinations and partitions, only different ways of wording the same concept.

Sequential over-determinations are a little bit more complicated. In the ideal situation, they are clearly cases of disjunctive premises. Take for example a game show that asks 4 increasingly difficult questions. Let us say that Q1 stumps 30% of the people asked, Q2 - 60%, Q3 - 80%, Q4 - 90%. If I knew my friend Sarah was on the show, not knowing how she did I might argue:

Ex. 3.2	P1	She wouldn't have passed question 1.	(0.3)
	P2	She wouldn't have passed question 2.	(0.6)
	P3	She wouldn't have passed question 3.	(0.8)
	P4	She wouldn't have passed question 4.	(0.9)
	C	She did not win the game show.	
		(0.9944)	

Without any direct evidence, I could put forth an argument following the sequential over-determination scheme; P1 would stop her, even if it hadn't P2 would stop her, even if it hadn't P3 would stop her, even if it hadn't P4 would stop her. In this example, the explicit probabilities are properly combined using the disjunctive formula again. This example does not fit perfectly with arguments that have been made for the other disjunctive classes however. If we break down each premise in example 3.2 into its respective worlds, i.e. P1 -> W1 -She was stumped on the first question, there is a conflict between the premises on an acceptability level. If she was stumped on question 1 then she couldn't have been stumped on question 4 because she never made it to that question. Similarly with example 2.12, if we accepted P1 -'He did not go to the theatre', then P2 not only loses its importance but its acceptability too -'that he was refused

entrance to the theatre'. If P1 is accepted then P2 is not acceptable because he never made it to the theatre. How do we separate this class from contrary premises then?

The important distinction in these cases is that the premises are not asserting a particular world as described above. They are instead merely hypothesizing about worlds. P1 -> W1 - If presented with Q1 she will be stumped, P4 -> W4 - If presented with Q4 she will be stumped. Each of these premise/worlds is acceptable in a hypothetical context even though only one need be satisfied. The fact that they are sequentially separated makes no mathematical difference to the odds than if they were an instantaneous over-determination or partition. So long as the premises do not actually assert a particular world this remains disjunctive. Treating each stage of the argument as an a temporal¹⁰⁹ hypothesis removes the acceptability conflict and brings these situations back into the same guidelines as the earlier two, where disjunction is a conflict between the importance of premise/worlds not their acceptability.

To state this more generally, one can think about sequential over-determinations as a series of gates that must be passed in turn to reach the end. Each gate represents a different part of the argument and they are arranged sequentially backing each other up. The overall argument is that the end will not be reached because each gate is increasingly difficult/impossible to pass. Each premise/world describes a particular gate.¹¹⁰ To hypothesize these worlds in a disjunctive argument means being able to interpret the premise(s) as arguing, 'if this gate were approached, it would be so-and-so difficult to pass'. Alternatively, premises may instead assert a particular premise/world by giving

¹⁰⁹ A temporal may not be the right term here since not all sequential over-determinations are separated temporally. A sequential would be a better term if it existed.

¹¹⁰ It could be that multiple premises are used to describe a single world-gate.

evidence that a particular gate was approached and was not passed. The first dissolves the acceptability conflict and makes the example disjunctive while the second does not.

If example 3.2 were reconstructed with premises that asserted each particular world we reach a different conclusion as to the structure:

Ex. 3.3 P1 Susan says Sarah got the first question wrong.
 P2 Tom says Sarah got the last question wrong.
 C Sarah did not win the game show.

Here we no longer disjunctively add up the probability that each of our witnesses told the truth. The 'even if she had' prototype is broken by asserting the particular worlds in the sequence. Each premise/world is no longer acceptable given the other. Going back to example 2.12 again, if the premises were taken as asserting rather than speculating that he didn't have a ride or that he was turned away at the door, then this again would no longer be a case of disjunctive reasoning. The premises must be taken as indirectly noticing that a ride and entrance were difficult to come by in order to be interpreted as disjunctive. Hence an analysis into the interaction between premises must in some situations make an asserting/speculating distinction.

The over-determination and partition schemes are not sensitive to this asserting/speculating distinction. This sensitivity is circumvented in the one case due to a lack of temporality and irrelevance of temporality in the other. If one person asserted that sharpshooter 1 hit his mark, while another asserted sharpshooter 2 hit his mark, there remains no conflict in acceptability since they both had the chance to shoot and both indeed may have been accurate. In partitions, there is no sequencing of the premises, they are independent in the sense that each section may be tested, irrelevant of the results of

any other section. Even if it had rained in the morning, the afternoon will still either rain or not rain. Sequential over-determinations are then unique of the three in that certain steps may never become realized in actuality. This does not affect the weight that they carry towards the conclusion. These remain cases of disjunctive reasoning. It will be useful to provide each class of relationship that will be explored with an expression that captures the essence of the evaluation involved. The expression concerning disjunction that I will frequently use, which reflects the method of evaluation, will be premises 'backing each other up'.

3.4 Are Contrary Premises Really Different than Disjunction?

The main difference that has been recognized between disjunctive and contrary premises is one of conflict between the acceptability of premises. In this respect, contrary premises should first be recognized as two premises,¹¹¹ where accepting one premise forces an epistemic responsibility to not accept the other and vice versa. This group functions somewhat similarly to premises in conductive reasoning, where premises are presented for and against a claim. The difference between these situations is that premises for and against in conductive reasoning, if you choose to consider a conductive argument as simply one argument, never combine their respective weights. Instead the only calculation that is required between contrary premises in conduction is one of comparison - to see which side outweighs the other and by what margin. How to analyse and evaluate conductive arguments is an interesting question but it is not what we are focused on here. Instead we are focusing only on those situations where contrary premises are offered together, each premise directly supporting the same conclusion. This situation is not as

¹¹¹ This could be expanded to include sets of more than two premises.

rare as it might at first appear, as will be explained in the evaluating contrary premises section below.

The most obvious examples of contrary premises are when two premise/worlds are both asserted and are in an acceptability-conflict with one another. We have seen how sequential over-determinations are closely tied with contrary premises. If two different worlds are asserted by the evidence, as in example 3.3, then the premises are contrary. The situation is more or less the same even when the premises aren't separated sequentially. Going back to the New Year's example (3.1), the premises here present evidence about a single moment in time. Premise 1 asserts Jim is at location A, while premise 2 asserts Jim is at location B. Each premise/world leads to the conclusion that Jim is not at location C. This example is easily seen as exhibiting premise acceptability conflict and is thus contrary. Let us look at one last easy example before exploring complicated variations on the example. Let us take the situation where Paul is on trial for murdering Joe, in defence of the accused the defence offers arguments:

Ex. 3.4 P1 Holly says she saw Frank kill Joe.
 P2 Tom says he saw Sally kill Joe.
 C Paul may not have killed Joe.

This again leaves no difficulty to identify the relationship between premises as contrary, but what about the following:

Ex. 3.5 P1 There was DNA evidence from Frank at the murder scene.
 P2 Sally had a good motive to kill Joe.
 C Paul may not have killed Joe.

Here the premises do not seem to assert that Frank or Sally were the killers, the argument merely provides evidence that suggests they may have been the killers. It is

entirely possible to accept P1 and P2 at the same time. The conflict between the premises, if there is one, does not appear to be in their acceptability but somewhere in their relevance. How do we interpret the relationship in such a case? Clearly the premises do not directly support each other, support the same epistemic world, since we are assuming there is a conflict somewhere in the relevance of endorsing them.¹¹² Does this mean they are disjunctive then? Let us attempt to interpret this argument as a disjunction. We would have to claim that the premises suggest two different worlds; one where Frank is the killer, the other where Sally is. Each world is not specifically asserted, the evidence does not commit that either claim is actually the case, instead each world is only hinted at. Furthermore, as noted, there is no conflict of acceptability of the premises. One might reason then that each premise world might be thought of as over-determining the situation. Just as two sharpshooters aiming at a target, both premises aim at the conclusion, both may be acceptable but only one world need be accepted to satisfy the conclusion. To reason this way is to misunderstand the concept of conflict in acceptability.

The problem here is that the two premise worlds are not both acceptable in the same sense that two sharpshooters may both hit the same target. To 'hit the target' in example 3.6 means to believe there is a reasonable chance that Frank or Sally may have been the killer. It is not possible, assuming there was only one killer, that both Frank and Sally were the killer. While both pieces of evidence are mutually acceptable, the premise/worlds in which they are relevant are not mutually acceptable. It is not enough that it is acceptable to believe that both sharpshooters shot at the target, which is asserted, it must also be the case that it is possible for both sharpshooters to have been successful,

¹¹² This will be explained in the relevant section later.

both in fact hit the target - this is what makes it disjunctive. The sharpshooters back up the same conclusion by over-determining it.

The challenge may continue that in sequential over-determinations, the premise/worlds are not mutually acceptable. The first premise might suggest that gate 1 was not passed, while premise 2 suggests gate 2 was not passed. Only one of these worlds could actually be the case, if either. Our murder trial example mirrors this in that each particular world is not asserted. The question is whether the acceptability conflict in this example mirrors that of the disjunctive case, whether it can be treated as hypothesizing worlds and so eliminating the conflict.

To answer this let us approach the question from another angle. Going back to the key expression for disjunction, one notices that the premises in example 3.5 do not back each other up sequentially as the identified sub-group of disjunctive premises does. This makes the difference because in a sequential over-determination both premises can be argued to support the same positive conclusion. Such arguments exclaim; 'I'm not sure which gate was failed but I believe one of them would have been and so the end was not reached.' One premise/world backs up the other by applying itself to the amount of uncertainty left by the first - in congruence with the disjunctive formula. Example 3.5 contains two premises each of which are only relevant towards their individual specific conclusions, that each particular person could have been the murderer. Even though the premises both support the same conclusion, the weight that these premises carry do not 'back each other up' similar to sequential over-determinations because the premises speak to the same section of time. Because they both speak to the same time, the premise/worlds that they support can only be accepted at the rejection of the other. It is

not possible to treat the worlds as hypothetical challenges since only one person could have been the murderer. Even though it was only possible for Sarah to have gotten one of the questions wrong, the fact that they were separated sequentially, as opposed to directly conflicting, preserved disjunction. Example 3.5 does not fit with the sharpshooter example since it is not possible to accept both premise/worlds and it does not fit with the sequential over-determinations because the premises speak to the same time, and so can only be taken in acceptability conflict with one another.

To restate things, example 3.5 helps to explain how evidence can be connected to its hypothetical world of implications. A premise that says there was DNA evidence from Frank at the murder scene only carries weight towards the conclusion that Paul may not have been the killer within the hypothetical world that Frank may have been the killer. The hypothetical worlds in this example function almost as missing premises, where $P1 \rightarrow W1 \rightarrow C$ and $P2 \rightarrow W2 \rightarrow C$. The relationship between these premises is not just the relationship between the specific premises, which on the surface hold no conflict, but the relationship between the worlds in which they are relevant to the conclusion, which are in acceptability conflict with one another.

3.5 Identifying Contrary Premises

The previous section was primarily concerned with proving that certain cases of conflicting premises cannot be properly interpreted and evaluated using the disjunctive prototype. Contrary premises are a different type of relationship. The next question is then how to draw the boundaries of this relationship; should all premises that stand in stronger conflict with one another than disjunction be labelled contrary or are there other

possible relationships? In order to answer this question we must come to an understanding of contrary relationships independently of disjunction.

Of course it is impossible to perfectly identify contrary premises without knowing what one hopes to do with the class after it is identified, how the premise relationship is to be evaluated. Nevertheless, we should give a first attempt at defining this set. Contrary premises appear to fit the description of two premises which conflict with one another between either their acceptability or the acceptability of their hypothetical worlds in which they are relevant. There is no difference between premises which are themselves directly acceptability-conflicting and those which conflict in their worlds of implications. In either case the premises in question cannot be said to help make the same case for the conclusion nor back each other up as explained earlier. `Premise conflict` here refers to bi-directional conflict, meaning that accepting either premise/world causes one to deny the other.

3.6 One-Directional Acceptability Conflict

There seems to be a middle ground after all between disjunction and contrary premises, where the acceptability conflict only runs one way. This might not be a very common group, but it is important to distinguish it from the other two groups since it does function differently. The easiest way to find an example is to take a sequential over-determination and make one premise/world asserted while the other is hypothesized. Take this variation on example 2.12:

- | | | |
|---------|----|---|
| Ex. 3.6 | P1 | Paul's mom says he did not leave the house. |
| | P2 | Paul would have been refused entrance to the movie. |
| | C | Paul did not see the movie. |

Here premise one is asserted, while premise two acts as a hypothetical back up - if he had gotten to the theatre he still would have been refused entrance. This example seems to be a lot closer to disjunction than contrary because premise 2 does back up premise 1 in some way. A difference remains in that premise 2 does not back up premise 1 as much as in disjunctive cases. To see this, let us take the amount of weight premise one and premise two carry independently towards the conclusion as set at 0.8 and consider the two examples, one where neither premise is asserted (2.12) and the other where one premise is asserted (as above). In the first we recognize the example as disjunctive and calculate the combined weight of the premises as 0.96. The second example cannot hold as much weight from premise 2 towards the conclusion since the strength of premise 1 reduces the importance of premise 2. As such any weight given to the acceptability of premise 1 acts against the amount of weight premise 2 is capable of holding. This is a restriction beyond the typical limiting of premise 2 to the uncertainty left by premise 1 which also applies. A formula like the following must apply; $WP_2 = Wa_2 * (1 - Wa_1) Wr_2$,¹¹³ followed by the disjunctive formula; $WC = WP_1 + (1 - WP_1) WP_2$. With this formula, if we assume $Wa_1 = 0.8$, $Wr_1 = 1$, $Wa_2 = 1$, $Wr_2 = 0.8$, we get the combined weight of the premises to be 0.832. If we assume each premise is probable, then the arguer is more strongly committed to the assumption that gate 1 was not passed, that Paul did not leave the house, than if the premise were not asserted. Premise 2 then cannot, in light of premise 1's assertion, be as weighty towards the conclusion as it would be otherwise. If premise 1 were found completely acceptable, then even if there was uncertainty left by its relevance, premise 2 cannot provide any support.

¹¹³ If the 1-directional acceptability conflict doesn't lie with the premise itself but with the premise/world in which it is relevant this formula would have to be expanded to imply the acceptability of the premise/world of premise 1 by Wa_1 .

Suggesting that overall support is actually weaker in the case where one premise is asserted may seem counterintuitive, but all I am stating is that the amount of support offered from the back up premise cannot be held as strongly as in disjunctive reasoning. In contrast to this, asserting that gate one was not passed will usually carry more weight towards the conclusion than if it were merely hypothesized. Our construction above where premise 1 holds 0.8 weight in each example is therefore not a realistic construct. It will likely be the case that asserting a particular premise in a sequential over-determination will act as a double edged sword, increasing the weight of the one premise towards the conclusion while restricting the weight of the other.

3.5 Identifying Contrary Premises (continued)

There are likely other unknown relationships possible for premises that lie somewhere in the conflict range between disjunction and contrary premises. It is possible that there are even scenarios where some bi-directional acceptability conflicting premises behave differently than others, but we will leave further identification as a future enterprise. For now we shall take bi-directional acceptability conflict to be the defining feature of contrary premises.

As mentioned earlier, contrary premises may not seem like a very common relationship among premises in an argument but contrary premises are not uncommon. This form of argument is almost exclusive to negative arguments; arguments against a particular conclusion. Since the premises involved cannot be combined to present any single consistent world from which to draw a conclusion, because the premise/worlds do not match, it is only natural they are presented to argue against a particular outcome

without committing to a specific criticism. In this way the seeming inconsistency between the premises can be argued to be sidestepped and the weight of the premises combined. We saw this structure in the murder trial examples 3.4 and 3.5. The expression that will be used to capture contrary premises will be premises that 'stand at odds with one another'.

3.7 Evaluating Disjunctive Premises

This job has already been done for us. Yanal's algorithm or the disjunctive probability formula applied to premise weight reads $W_c = W_{p_1} + (1 - W_{p_1})W_{p_2}$, the weight of the first premise plus the weight of the second premise applied to the uncertainty left by the first. Instead of applying to all convergent arguments, we have found and defined a set to which it properly applies. In rare cases where the probabilities of the individual premises are calculable, with this formula the strength of the conclusion could also be calculated. In ordinary situations the explicit formula contains little value for evaluation. Nevertheless we will have a better feel for how to diagram and evaluate the premises towards the conclusion. This will be further enhanced by comparing this relationship scheme against the others that will be explored later and ordering the comparative relationship strengths.

3.8 Evaluating Contrary Premises

How to evaluate contrary premises is a difficult question. Let us first explore a wrong way of evaluating such premises before investigating what method is more appropriate. The first suggestion for evaluating such premises is that they operate essentially the same as any other convergent argument, where each premise helps lend support to each other in an independent way. The argument goes that even though the

premises are not consistent with one another, each gives a reason to accept the conclusion. Taken together the premises build a strong convergent case to accept the conclusion. David Griffin provides a nice metaphor for a convergent argument in his book, *The New Pearl Harbor*, which he calls cumulative (same as convergent). Griffin compares cumulative arguments to a cable holding a weight, where each premise acts as another strand in the cable;

"However, the argument for official complicity in 9/11 is a cumulative argument. This kind of argument is a general argument consisting of several particular arguments that are independent from each other. As such, each particular argument provides support for all the others. Rather than being like a chain, a cumulative argument is more like a cable composed of many strands. Each strand strengthens the cable. But if there are many strands, the cable can still hold a lot of weight even if some of them unravel."¹¹⁴

This section not only describes a convergent argument but hints at a method of evaluation, whereby each premise which is offered in support of the main conclusion 'additively' supports one another. This justifies his argumentative method of offering a barrage of disconnected evidence on the topic, including many contrary premises. This method of evaluation is inappropriate for contrary premises. As I have been arguing, the support from each premise to the conclusion cannot be held simply as an isolated event but must remain tied to the hypothetical world which it implies.

¹¹⁴Griffin, David (2004). *The New Pearl Harbor*. Northampton, Massachusetts: Olive Branch Press. Introduction p. XXIV.

Let us revisit the `Joe the murderer` examples 3.4 and 3.5 again. In these examples each premise supports the conclusion, but premise 1's support is tied to the world in which Frank is the killer while premise two's is tied to the world in which Sally is the killer. These premises cannot support each other in any way since their worlds are incongruent, they cannot be accepted at the same time. If the conclusion attempting to be supported is that Paul was not the killer, we could say that each premise acts as a strand supporting the conclusion but that the cables have different lengths and so do not aid each other in support.

How should we then calculate the combined support offered by contrary premises? There seems to be two reasonable methods one might suggest in light of the nature of the relationship. The first we shall call the strongest support theory and the second the pool of evidence theory.

3.9 Strongest Support Theory

We noted earlier that contrary premises usually are presented as evidence towards some negative conclusion since each of the two contrary premises supports its own conflicting positive world. It seems that the proper way to analyze such arguments then is to insert these positive worlds implied by the contrary premises as sub-conclusions to the main conclusion. In the simplest example P1 would now support W1 which supports C, while P2 supports W2 again leading to C. This can easily be expanded to include large sets of premises by breaking each premise down into the positive worlds (let us call competitive theories) which it supports on the topic, possibly listing the same evidence towards more than one competitive theory. Once the evidence has been divided into its

competitive theories, we must take each set of theories as a separate argument towards the conclusion.

Analyzing each competitive theory individually appeals to our analysis of the cable metaphor. If the competitive theories are the different possible lengths of cable, it seems that all one need do is determine which length contains the strongest of supports and determine if it is strong enough to support the weight. If the strongest competitive theory should fail to support the conclusion then the alternate lengths of cable should also break. Evaluating the weight of the conclusion would then be a simple task of evaluating which competitive theory seems strongest and judging whether that theory alone is strong enough to endorse belief or withhold judgement on the conclusion. Endorsing belief in the conclusion may in fact be even more difficult than this in the case of contrary premises since every premise with an acceptability conflict could then count against the support given by the strongest competitive theory. The strongest support theory must then ask whether the lesser of the competitive theories works against the support of the conclusion in general (better off omitted) or merely against the support for endorsing a particular competitive theory. Put another way; does each competitive theory after the strongest actually lower the amount of support towards disbelief on the topic, accepting the negative conclusion, or merely against endorsing the strongest competitive theory (if it even does that). Although it seems easy to say that the remaining evidence does act against endorsing any particular conclusion it is far more difficult to say it hurts the chances of raising disbelief. This seems too difficult a proposition to accept and therefore we shall assume they do not hurt support towards disbelief, remaining irrelevant in this regard.

Let us try this theory with an example extending argument 3.5; arguments against the claim that Paul killed Joe:

- Ex. 3.7
- P1 There was some DNA evidence from Frank at the murder scene.
 - P2 Frank does not have an alibi for the time of the murder
 - P3 Sally had a good motive to kill Joe.
 - P4 Ron says that Joe might have committed suicide.
 - P5 Paul and Joe were good friends.
 - C Paul may not have killed Joe.

Again we must imagine there is a body of evidence in the trial supporting the argument that Paul killed Joe, but we will ignore this to avoid discussing conductive reasoning. The defence in this example offers five pieces of evidence in the argument that Paul should not be found guilty. There are three different competitive theories being offered by the evidence. Premises 1 and 2 support the claim that Frank may have been the murderer, premise 3 supports the claim that Sally may have, while premise 4 argues it may not have been murder at all. Premise 5 does not argue for any particular conclusion, only against the general conclusion that Paul was the murderer. The evidence above can then be re-written as; [P1, P2, P5 -> W1] [P3, P5 -> W2] [P4, P5 -> W3] and [W1, W2, W3 -> C] where W1, W2 and W3 are all acceptability conflicting worlds. The reader should begin with an evaluation as to the weight each world carries for him to the conclusion. Following this, the strongest of these worlds shall become the sole candidate for challenging that Paul was the killer. For the sake of argument let us say W1 seems the strongest, the question becomes whether these premises alone are enough to carry the conclusion.

It is difficult to accept the idea that sets of evidence are properly treated through total disregard in contrary arguments. Total disregard may be overstating the matter since

each piece of evidence is given the chance to be evaluated with respect to its competitive world and only the weaker ones disregarded, nevertheless this is a concern worth noting. When the friction between the premises is now obvious, perhaps there is a way to still allow each contrary world to offer some support towards disbelief. This motivation is captured in the alternate evaluative method below.

3.10 Pool of Evidence Theory

Let us start with extending the findings from one-directional acceptability conflict. In that section we reasoned that the premise/worlds could still be combined loosely around the disjunctive formula so long as an additional restriction was met, that whatever value is given to the acceptability of the first (conflicting) premise must also be taken to act against the strength the second premise may carry. This was formulized as $W_{p_2} = W_{a_2}(1 - W_{a_1})W_{r_2}$, so that the weight of acceptability of premise two only speaks to the amount of unacceptability of premise one. This formula now needs to be modified for situations of mutually conflicting premises. It seems reasonable to suggest then that there is a single pool of acceptability ($\max=1$) from which the weight of acceptability for each competitive theories must be taken. Mathematically we might represent the acceptability restriction upon a set of contrary worlds $W_1 \dots W_n$ as $W_{a_{w_1}} + W_{a_{w_2}} \dots + W_{a_{w_n}} + X \leq 1$, where X represents the amount of acceptability support towards the conclusion being argued against (assuming this fits the example). This sum can equal 1 given the set is exhaustive of all possible competitive worlds, if this is not the case then the sum must be less than 1. This is the first obvious difficulty and it is two-fold. Firstly it is impossible in most situations to accurately gage the amount of unexpressed competitive worlds there may be on a topic. Secondly, and this ties in with the first, ascribing numbers to the acceptability

of premise/worlds gains a new responsibility under this theory, that they be conscious of the entire set of contrary worlds when ascribing weights. This is much more difficult than the isolated question of how likely I believe this premise/world to be true. It would be one thing if the set were closed before attempting to make these evaluations but how could one manage to deal with this responsibility in the face of an open premise set? The measure of responsible acceptability can of course be made after an isolated acceptability weighing by dividing the acceptability of a particular world by the sum of the acceptabilities given to competitive worlds; $W_{a_{wx}}^* = W_{a_{wx}} / (W_{a_{w1}} + W_{a_{w2}} + \dots + W_{a_{wn}})$, where x is any particular world and $\{1, \dots, n\}$ is the set of all competitive worlds including the conclusion being argued against and undefined worlds. This of course falls back into the same problem as before since a number must somehow be given to undefined worlds. Here we are again citing the inability of a numerical evaluation to be accurate and applicable but it is possible to step back and take away the larger implications of this theory.

The method for this theory is then as follows: Just as before, break the example down into its competitive worlds. Once this is done, each world can be evaluated as to its acceptability, minding the restriction above.¹¹⁵ Unlike the one-directional conflict, these weights are not then combined disjunctively since there is no sense in which they back each other up. Instead the weights at this point can be simply summed. This method can be visualized as creating a pie chart of the available competitive worlds, where each world gets a slice proportional to its acceptability on the topic, including slices for the

¹¹⁵ Here the discussion moves from premise acceptability into competitive world acceptability which is a transition that should be given a more careful analysis than there is room for. If we assert the competitive worlds as sub-conclusions leading to the general conclusion, then the acceptability of each world could be reached through the strength of the implications from its supporting premises.

claim being argued against and for unknown other theories. Interpreting this chart, we might find a particular theory worth positively endorsing if it alone represents a significant enough proportion of the evidence as a whole. If this is not the case, then one might be justified in accepting a position of withholding judgement (which satisfies the general conclusion that was aimed at in the argument in most cases of contrary premises). In cases of withheld judgement, the audience reasons that in the face of the collection of competitive worlds brought forward, the conclusion being argued against no longer carries enough force and a position of indecision is preferable. Thus, the conflicting premises do actually function together as they were likely intended, combining weights towards withholding belief.

Contrary premises are usually employed in situations where the conclusion being argued against is quite strong, likely the strongest single world, and the competitive theories are generally weak. It is therefore likely more difficult to reach indecision in practice than it seems theoretically. Nevertheless, this theory stands at significant odds with the alternative, strongest support theory. The former denies any support given from weaker conflicting theories to the strongest one, while the later envisions them acting together, diluting the pool of evidence to lower the potency of the conclusion being argued against. One thing they at least agree upon is that the relationship of contrary premises is the weakest of all types we will explore in this paper. There is the least positive relationship between the premises. So given two convergent premises with fixed weights supporting a conclusion, the combined weight of the premises will be greater if their relationship is anything but contrary (from those that will be identified). This is a good start but let us see if we can resolve which of these methods is more appropriate.

3.11 Resolution to Evaluating Contrary Premises

To highlight once more the two methods above, let us look at example 3.8 but rewrite the premises as the contrary worlds, then ascribe weights and evaluate using each of the two methods above. The weights of each world will be evaluated independently of the other world.

Ex. 3.7*	W1	Frank may have been the killer.	(0.4)
	W2	Sally may have been the killer.	(0.2)
	W3	Joe may have committed suicide.	(0.1)
	W4	Someone else may have killed Joe.	(0.1)
	CW ¹¹⁶	Paul killed Joe.	(0.9)
	C	Paul may not have killed Joe. (Indecision)	

Let us assert that to endorse belief in a particular competitive world in this example, the support must be double the support against it, i.e. the weight for the world must be 66% of the weight between it and its competition. If the weight for the strongest world is less than 66% then a position of indecision is justified. The strongest support theory would have us take only the strongest competitive world to count against the weight for CW, while the pool of evidence theory would take the set of all weights on the topic as acting against endorsing CW. The evaluation from the strongest support theory would only compare CW (0.9) and W1 (0.4). The support for CW represents 69% of the weight on the topic, with the weights of W2, W3, and W4 being ignored. Hence CW is endorsable and therefore C not supported. The evaluation from the pool of evidence theory on the other hand would take the total set of weight on the subject to be 1.7. The support for CW would then represent only 53% (0.9/1.7) of the weight on the topic and therefore a position of indecision is justifiable and so C is supported.

¹¹⁶ CW - Competitive world. Let us assume the prosecution has presented some strong evidence towards CW, against C.

Clearly these two theories give different means of evaluating contrary premises so which, if any, is best? So far we have strictly used intuition to point towards proper techniques of argumentation but here we need to more definitively say what makes a method of interpreting arguments justifiably better. In pragmatic terms one method is preferable to another method if it makes an audience member more likely to reach the conclusion which is reflectively stable. Ideally one would like to say that the way one ought to evaluate an argument is with such a method that the conclusion reached through such method would universally provide the highest probability of reaching a reflectively stable conclusion compared to any alternative method of interpretation. This definition may be the correct ideal but it is impossible to apply in deciding between methods for many reasons. Instead we shall ask how possible it is with each method for that method to become corrupted and give false conclusions. Any method that is easily corrupted would be hard to endorse.

Let us start with the pool of evidence theory. It is hard to imagine a subject which does not lend itself to a potential infinite array of arguments. At will one might present more and more weak arguments and dilute whatever topic to force uncertainty. For instance, most people are reasonably sure of who their father is on a strong base of evidence. Nevertheless one might introduce a string of new evidence pointing towards other individuals as being potentially the biological father. Anyone who had the motive or situation or even a slight resemblance would have an argument towards being the biological father. Even though each suspect has very little weight supporting the idea that they might be the father, the collection of all the possible candidates could become so huge that one begins to doubt whether they do know who their dad really is. The pool of

evidence on the subject used to point almost entirely to one person but now it is diluted so that no one person holds more than half the arguments. This is obviously not good reason to withhold belief on the topic, this is an abuse of the pool of evidence system. The mere presence of many characters such as Pat the mailman is not enough to justify withholding judgement from the one person that carries a lot of evidence that they are your biological father. Returning to the pragmatic value of argumentation, this method would have everyone withhold belief on the topic but the vast majority are right and justified in who they originally believed to be their father. This is a corruption which is reflected in mistakes in everyday reasoning. If a person is overwhelmed with a lot of weak arguments on a topic they often become convinced even though each individual argument could be defeated. This is a method which makes some documentaries more influential than they should be. Often in such films a long string of convergent evidence is presented to convince the audience of the conclusion that is to be reached. Some times the evidence in these films is weak to critical scrutiny but the audience is not given an opportunity to challenge the ideas as they are presented and by the end of the film, even in bad documentaries, the overall pool of evidence feels so vast that the conclusion seems reasonable. A mistake in reasoning has taken place here by respecting the overall pool of evidence over any particular argument, this allows an audience to ignore or avoid challenging any particular argument and it shows confirmation bias by ignoring the mountain of weak evidence which could be accumulated against the argument. It would be very easy to pervert almost any argument in such a way. Instead I believe it should take at least one reasonably strong contender to challenge one's belief.

The method dictated by the strongest support theory has to face two challenges. The first is that it can be corrupted in the same manner as above by adding meaningless arguments, the second is that it can be used to ignore valuable arguments or options. This method can always be boiled down to a comparison between only two competing theories in the following way; if there are more than 2 competing theories, one may pick any two of those theories to compare exclusively to each other. Whichever theory appears to hold more weight will then continue against the next contender. Ultimately this process will separate the two strongest theories to be compared to each other to determine which, if any, is worth endorsing belief in. The addition of meaningless arguments then must always relate to a theory which will be judged. This makes the question not whether an endless list of possible theories could disrupt the process but whether presenting more and more arguments towards a specific conclusion may. Suppose there was a debate between whether the world circles the sun or the other way around. It could be supposed that a person with the intention of misleading presents a whole host of reasons for why the sun must circle the earth, this list of reasons could potentially be endless if allowed to carry little weight. But this is not the same problem for argument as the example above. All the arguments that are presented towards a single conclusion can become an ordered set from the strongest in weight to the weakest. Even though the line of arguments is potentially infinite, if ordered from strongest to weakest there would exist a certain point where no further arguments are contributing meaningfully to the conclusion. Despite this limit there may still be a flood of new arguments being presented to convince one that the sun revolves around the earth but this is exactly what we hope for through argumentation. Every new piece of evidence is relevant and directed towards a specific conclusion. In

this example, if the audience member is convinced towards the factually wrong conclusion it was not because of a perversion of the method but merely the failure of the audience to accurately weigh the evidence or provide counter arguments. The pool of evidence theory fails on these grounds since it cannot drop trivial pieces of evidence, instead preserving the weight of all evidence as part of the pool. The evidence presented also fails from an integrity stand point since they are not focused on any particular theory instead presented more out of an effort to confuse or overwhelm the audience member. So the strongest support theory survives attack from meaningless arguments while the pool of evidence fails.

The other challenge to the strongest support theory is whether the theory can be used to ignore useful premises. As mentioned earlier, this theory always involves a comparison between two competing theories. This method does not ignore any piece of meaningful evidence, since all evidence towards any particular theory will be weighed. All meaningful premises are given their chance lend their weight to the conclusion(s) they support and get judged on the topic. To assert that this method is ignoring evidence by only considering the two strongest theories when assessing whether to endorse or withhold belief is begging the question of whether this method is appropriate. There is nothing inherent in the strongest support process which simply ignores premises.

There is an amendment to the pool of evidence theory that must be considered. One might argue that trivial arguments may also be ignored in POE theory such that the pool is restricted to only the strong and relevant arguments towards the few strongest counter theories. As such the theory is not capable of being corrupted through a mere mass of arguments, the few counter theories that remain are focused and worthy of

consideration so that the integrity of the argument is maintained. Both of the considered theories accept that all these arguments and counter theories ought to be considered. The only essential difference between them is that the strongest support theory argues that, should the strongest counter theory fail to convince the audience member to withhold belief, the addition of the other theories ought not to succeed in doing so. In deciding between these two theories we cannot turn to which theory may be easily corrupted since both pass the above tests, neither can we turn to the original pragmatic question of which theory better serves one to reach stable positions. Any attempt to do so would involve investigating sets of examples which are incapable of coming to a definitive solution and by presenting a limited number of examples it would only serve my bias. Instead, the best I can offer is a couple intuitive arguments.

One strong piece of reasoning in favour of the strongest support theory is that when considering competitive theories on a topic, only one theory is capable of being true. Since only one theory can be right it makes more sense to favour the strongest support theory. Assuming that one competitive theory has solid ground over its nearest competitor then it should be endorsed despite however many other reasonably similar weaker competitors there are. Indecision requires that the weight towards the two strongest theories to be close enough to justify withholding belief. Allowing contrary premises on a topic to work together to support withholding belief appears to misrepresent the strength of the strongest argument. Some people may prefer to be cautious and withhold belief in many topics to avoid being wrong but this is not practical in most situations. Withholding judgement is not an ideal situation in many situations, life requires one to assume conclusions in order to continue functioning. It is usually best

to provisionally hold the strongest competitive theory as true so that we may make assumptions about what to expect in the future. Of course, if eventually the evidence swings in support of another conclusion then one will revise their assumption. This higher demand for tentative conclusions along with the knowledge that only one competitive theory may be correct gives seemingly strong reason to adopt the strongest support method in evaluating contrary premises. However I do consider this matter far from resolved and welcome future work on if this is indeed the best method for evaluation.

3.12 Standard Supportive

Contrary premises have been analyzed to show a conflict in the acceptability of the premise/worlds, while disjunctive premises exhibit a conflict in the relevance of the premise/worlds. In contrary premises the worlds stand at odds with one another, while disjunctive worlds back each other up. Both of these have been analyzed in terms of some degree of epistemic conflict between the premise/worlds. In chapter two we analyzed two examples, 2.10 and 2.11, which were clearly cases of convergent premises and yet were not properly evaluated with the disjunctive formula nor recognized as contrary. In both examples, examining 100 cases highlighted the fact that premises often don't react to each other independently in the disjunctive way. Instead, the presence of additional premises can often directly influence each other. This set is easy to interpret under the world of implications theory that has been put forth.

The most typical relationship for premises to stand in relation to one another is neither of these earlier prototypes. People usually offer premises for a conclusion which help build a shared single image or world. This can be thought of as a puzzle being put

together where each premise is a different piece, and they all work together to build the image of the conclusion. Premises in these situations fit our natural sense of additively contributing to the conclusion. Yanal believed he had found a formula to describe this 'additive' sense in which premises help each other however, as the two examples from chapter two highlighted, the disjunctive formula does not apply to this most basic type of relationship. The probabilities of premises in this relationship do not just combine, but interact to synergistically support the conclusion.

Let us bring up examples 2.10 and 2.11 again for analysis.

Ex. 2.10 P1 The Mail was delivered today.
 P2 Tom went to work.
 C It is a weekday.

Ex. 2.11 P1 She typically goes to the kitchen around this time to make a cup of tea.
 P2 I just saw her walking in the general direction of the kitchen.
 C Therefore she is in the kitchen.

Both of these examples fit this prototype in that each premise works to build a single world. In these examples, the image they are building is simply the conclusion. There is no conflict between the premises in the ways mentioned before, instead they simply work together. How do we evaluate this relationship? In chapter two we applied probabilities to the premises and combined them with case based reasoning to find what strength the conclusion should hold and if the disjunctive formula was appropriate for these examples. The results of this analysis showed that in example 2.10 the premises combine in a way that is stronger than disjunction, the premises give more information taken together than they do taken independently and then combined. 2.10 was an interesting but atypical example in which explicit probabilities were appropriate for the premises and a combination of them was perfectly possible to find. The probability

evaluation gives the correct answer for this example, the premise relationship here is moderately stronger than disjunctive premises.

Example 2.11 is much more difficult to solve and reflects those that more naturally occur. The first thing that should be mentioned is that probabilities cannot be naturally applied to the premises. By this I mean the premises are not worded in a way that can make sense of probabilities applied to them. In order to use probabilities the premises must be transformed into some form in which probabilities can make sense. In Goddu's analysis he took the premises to say that in 100 such cases when it is tea time or when I saw her heading in the direction of the kitchen, the conclusion applies X% of the time. He then had to assert the additional assumption that we are considering 100 cases in which it is tea time and I was in a position to witness her movements. Under these constraints, although the probabilities begin to make sense, the conclusion remained unsolvable. Ultimately, by relaxing the additional assumption, we found that the probability was restricted to a range between the disjunctive relationship at its strongest and a moderate range weaker. If this is an effective method for indicating the relationship in this example, then it would seem that standard supportive premises can fit anywhere weaker or stronger than disjunctive. There is reason to question this result for this example however.

The probability analysis was meant to be useful highlighting characteristics that apply to our natural way of appraising premises. In this example, the case based evaluation does not mimic the evaluative motions taken normally in reasoning. It is not enough to try to combine the probabilities that each premise alone may confer the conclusion, accepting the premises means accepting the situation where both of the

premises apply together. This combined probability isn't reached through the method above, it is a new value that must be given under the circumstance. The world in which both premises are true affects how relevant each one is. Because the audience knows that it is both tea time and that she was heading towards the kitchen, there is a boost in the weight carried by each premise. The worlds suggested by the pieces of evidence align and converge on the conclusion. Given both of these facts, there is a much stronger inference to the conclusion than when the premises are considered independently. The premises taken by themselves only hint at the conclusion but taken together they give a strong reason to accept it. Natural reasoning for this example is very different than the method employed in case analysis. The case based probability analysis ultimately functioned as an advanced disjunctive formula, taking certain cases to be guaranteed by the first premise and applying the second premise to cases of uncertainty. Thus the probability analysis is not just impossible in this example, but also inappropriate.

Before going further with clarifying this class, there is a distinction that must be made. The previous arguments seem to point towards an understanding that there is no sense in evaluating the individual premises first and then worrying about the combination of their weights. The weight of the premises react to one another and hence one is better off approaching the topic by asking what the weight of the premises are in the context of them being together - replacing the two steps of evaluating them individually and then combining the weight with only the one step of evaluating the combined presence. In certain situations this is the appropriate approach. An example that has been brought up in discussions with Dr. Pinto is the following;

- Ex. 3.8 P1 I like Ice Cream.
 P2 I like Mayonnaise.
 C I like Ice Cream with Mayonnaise.

On the surface it seems P1 and P2 taken independently are reasons to accept the conclusion but obviously the premises taken together require an entirely new evaluation as to their combined world. To evaluate this argument properly the premises should not be evaluated individually and then combined to reach the conclusion. The evaluator needs to know whether or not the conjunction is true, whether or not I like Ice Cream with Mayonnaise. Another example involves a deadly poison and its cure which, taken without the poison is also deadly.

- Ex. 3.9 P1 I took the poison.
 P2 I took the cure.
 C I will die.

Evaluating from the individual premises to the conclusion gives us no information towards reaching the actual combined weight. It is only the evaluation of the unique circumstance that the set of premises posits that is worth evaluating. Should this be the way we deal with all standard supportive premises?

There is a difference between these examples and the standard case for supportive premises. In these examples the nature of the combined weight of the premises does not follow from the weight of the individual premises, it is produced disconnectedly. In most standard supportive situations this is not the case. Even though the combined weight is affected by the presence of the other premises, it still follows from the weights of the individual premises. If both premises are weak then their combination is going to remain relatively weak compared to the combination of two premises which are stronger. In the disconnected situation we can say that there is an overriding missing premise involved

which captures the relationship of the two premises together. In example 3.9 it would be necessary to have the missing premise P3 - I do not like ice cream with mayonnaise together while example 3.10 requires the premise P3 - The cure taken when the poison is present will save your life. Without knowledge of the combined situation, evaluating these arguments is impossible. This may be a new class of relationship between premises, premises which share a synthetically disconnected evaluation, but we will not address this group further in this paper. In the standard case it seems that we can still move from the evaluation of the individual premises to the combined weight by giving credence to the relationship involved. This is greatly favourable because it allows for a better systemization of evaluation, preserving flexibility in our analysis.

Let us assert then that the evaluation of premises that stand in a standard-supportive relationship with one another are stronger, taken together, than premises that stand disjunctively. If we imagine two premises with fixed weights, there is stronger reason to accept the conclusion when these premises work together to build a single world than when they simply back each other up, with conflicting premise relevancy. It seems natural to believe that in most situations of supportive premises this relationship should hold true even though it cannot be verified through probability analysis in the way disjunction was.

There is an interesting discussion on corroborative evidence in law that is particularly relevant to this discussion. Corroborative evidence is a situation where two independent pieces of evidence seem to boost the strength of one another. For instance, say one witness claims to have seen event X but this witness's credibility is somewhat questionable. Then another witness is presented who also claims to have seen event X.

The second witness corroborates the claim from the first witness and makes the first witness seem more reliable. The support for the conclusion is boosted for each witness through the agreement between them. Mike Redmayne has argued that the very notion of corroboration is a mistake since it leads to the fallacy of double counting.¹¹⁷ He argues that if we allow witness B to contribute to the probative weight of witness A then we can take the boosted weight of witness A to increase the probative weight of witness B. This routine can be continued to reach an infinite probative weight for each witness.¹¹⁸ Thus he argues that the weight for one witness cannot directly affect the weight of the other witness. This is a rather weak reply as there are many ways to restrict the concept of synergy between the witnesses without succumbing to this increasing probative loop.

Walton does just this in his paper, *Evaluating Corroborative Evidence*.¹¹⁹ He argues that the tricky notion of corroborative evidence 'boosting' each other's support is indeed reasonable under certain conditions. In the case of two eye witnesses agreeing with one another, Walton argues that the two cases are not entirely independent since they work for each other in answering one of the critical questions for an appeal to witness testimony. Walton employs his argument scheme to analyze such evidence:

Scheme for Appeal to Witness Testimony

Position to Know Premise: Witness W is in a position to know whether A is true or not.

Truth Telling Premise: Witness W is telling the truth (as W knows it).

Statement Premise: Witness W states that A is true (false).

Warrant: If witness W is in a position to know whether A is true or not, and W is telling the truth (as W knows it), and W states that A is true (false), then A is true (false).

Conclusion: Therefore (defeasibly) A is true (false).

¹¹⁷Redmayne, Mike (2000). "A Corroboration Approach to Recovered Memories". In: *Law Quarterly Review* 116 p. 151.

¹¹⁸Redmayne, Mike (2000). p. 151.

¹¹⁹Walton, Douglas and Reed, Chris (2006). "Evaluating Corroborative Evidence". Proceedings of the Conference of the International Society for the Study of Argumentation (ISSA). Amsterdam: SICSAT.

Five Critical Questions Matching the Appeal to Witness Testimony

CQ1: Is what the witness said internally consistent?

CQ2: Is what the witness said consistent with the known facts of the case (based on evidence apart from what the witness testified to)?

CQ3: Is what the witness said consistent with what other witnesses have (independently) testified to?

CQ4: Is there some kind of bias that can be attributed to the account given by the witness?

CQ5: How plausible is the statement A asserted by the witness?¹²⁰

Using this scheme, Walton argues that witness B increases the probative weight of witness A by responding to the possible attack that CQ3 might present.¹²¹ Because of witness B, CQ3 is satisfied for witness A and A is therefore stronger. Vice Versa, witness A contributes to the strength of witness B. Walton expresses this function as an enthymeme in the argument's diagram, while witness A and witness B are convergent premises towards the conclusion, they also must be placed as premises supporting the other witness. Walton diagrams this as follows:

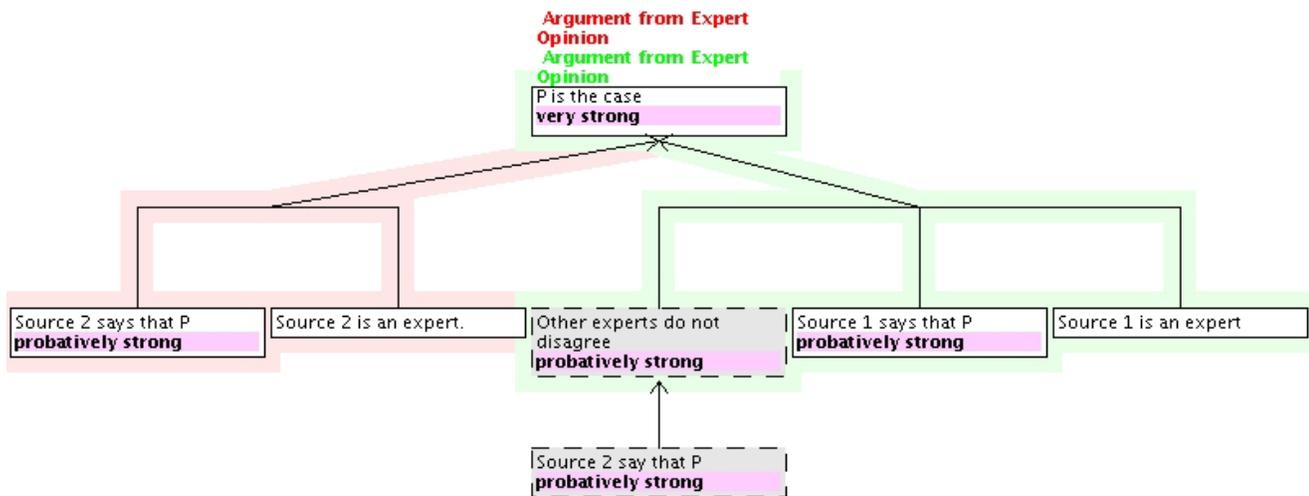


Figure 3.1¹²²

¹²⁰Walton, Douglas and Reed, Chris (2006). p. 10-11.

¹²¹Walton, Douglas and Reed, Chris (2006). p. 11.

¹²²Walton, Douglas and Reed, Chris (2006). p. 10.

There are strong similarities between this scheme approach to analyzing synergy between premises and our HWI theory. The reason the worlds between these two witness testimonies combine strongly is the same reason CQ3 is important. If witnesses agree about a certain set of facts there is a much stronger case for those facts than taking both of the witnesses independently. It is because of the corroboration that they become stronger, they 'boost' each other's support. Walton chooses to express important ways others premise/worlds might influence a witness's testimony in the form of specific premises and critical questions. This approach has strengths in fleshing out what is involved in evaluating evidence and understanding specific popular situations that arise. I believe these advantages make scheme analysis a very fruitful way of continuing to work with argument evaluation. There are however a few drawbacks which should be addressed.

There are a number of ways in which this approach is too narrow for all purposes. Transforming corroborative evidence that responds to a critical question into an enthymeme of the argument narrows the scope of the corroborative evidence to a simple standard. There are many different degrees to which witness B corroborates witness A's testimony. There is a great difference between two witnesses agreeing on a few essential points between their testimonies and those that are more fully congruent with one another. If the two witnesses agreed on all specific details of the event, synergy between them is stronger than those who only vaguely aligned. It is still an open question when two witnesses agree whether they might both be mistaken, whether other witnesses may disagree with their account. If the worlds the witnesses suggest align on even small specific details, the worry about having too small a sample size is lessened. These

degrees of synergy between witnesses can be respected using HWI but not (or at least not easily) using Walton's enthymemes.

A further problem is that requiring corroborative evidence to be interpreted as responding to a particular critical question restricts the range of what evidence will count as creating synergy. After arguing that mutually corroborative evidence does boost each other's strength in the case of witness testimonies, Walton goes on to argue that this is not the case when considering a single witness's testimony in connection with DNA evidence at the scene. Take the argument:

Ex. 3.10 P1 Witness A says they saw X near the crime scene.
 P2 Blood samples from the scene match person X.
 C Person X was at the crime scene.¹²³

Walton notices in this situation that the two pieces of evidence are entirely independent, convergent arguments. From this he concludes that it would be a logical mistake to believe they corroborate with one another boosting each other's support.¹²⁴ This is because neither premise requires the other to help back it up, they both stand on their own.¹²⁵ Walton admits that despite this 'independence' it is very tempting and common to believe they do in fact make each other more plausible, that the DNA evidence could make a questionable witness be seen as reliable.¹²⁶ We now are fully capable of understanding this confusion. The 'independence' that is being argued for is the disjunctive independence that does not fit this situation. Under the broader HWI analysis we see that the premises do indeed create synergy with one another. The witness alone creates a world in which it is somewhat reasonable to draw the conclusion. It is of

¹²³Walton, Douglas and Reed, Chris (2006). p. 17-18.

¹²⁴Walton, Douglas and Reed, Chris (2006). p. 18.

¹²⁵Walton, Douglas and Reed, Chris (2006). p. 18.

¹²⁶Walton, Douglas and Reed, Chris (2006). p. 18.

course very possible also that they were mistaken or lying. The DNA evidence alone too is only somewhat reasonable to draw the conclusion from since there may be a number of ways the evidence may have gotten there or even that the lab was wrong. When these two worlds combine, when we take the set of evidence together, they build a consistent image of what happened. From the combined world of these premises there is a very strong inference to the best explanation from which to draw that conclusion. This is stronger than the combination of the two premises independently. It is much more unlikely, given these premises together, that they both were mistaken. Here Walton's analysis of corroborative evidence is no longer sufficient to explain what should happen. HWI analysis also does not fall into the trap of creating an infinite loop of enhancing premises since it does not apply the synergy to the premises independently. The individual premise remains as strong as it always was, it is only the world created by the combined premises which carries a synergy boost on top of the individual premise weights.

Unfortunately there is little that can be done to clarify how much synergy is appropriate for the relationships in this class. There is no fixed way of calculating how amplified premises will be when taken together, this depends on the perceived relationship between the premises in question. Although the disjunctive and contrary premises had somewhat rigid guidelines for how to define and evaluate the relationship; this relationship is more of a trash can group which encapsulates a greyscale of synergies between premises. I am sure there are further sub-categories one might be able to identify within this general group, which may lead to more explicit evaluation methods and further work should be done on this topic but there is always likely going to be an overwhelming amount of examples which cannot be fit into any specific formula.

We can nevertheless test some of the boundaries of standard supportive premises to get a better sense of the shape of the group as a whole and notice some important factors. Going back to the puzzle metaphor, having two pieces of the same puzzle will usually give you a better sense of what the picture is than the pieces independently confer i.e. more than double the amount of information. Other factors can affect this synergy like how close the pieces are to each other, if they lock into each other. This can account for two premises sharing more or less synergy.

So far we are claiming that standard supportive premises share a relationship whose strength ranges somewhere between disjunctive at its weakest (no synergy whatsoever) to somewhere much stronger if the circumstances are just right. This brings us to the next relationship we will be analyzing which is really just a subset of the standard supportive model with fuzzy boundaries. The strongest examples of standard supportive synergy exist in what we will call coincidental premises.

3.13 Coincidental Premises

Calling this set Coincidental Premises is actually misleading, the relationship is one which is built off denying the coincidence. Say there are two premises that each by themselves give very little evidence towards the conclusion but because both premises are present it is difficult to imagine both premises holding acceptable and the conclusion being doubted. Take the following example:

Ex. 3.11 P1 I saw Gary in Germany while on my trip.
 P2 I saw Gary in Italy while on my trip.
 C Gary is following me.

This is clearly a convergent argument in which the premises individually carry little weight towards the conclusion. This is perhaps the most obvious example of the failure of the disjunctive formula to represent convergent arguments in general. Despite the little individual weight of each premise, the conclusion here is fairly strong. It would be quite a coincidence for both premises to be true and the conclusion false. How can we make sense of this evaluation? The best way to understand examples of this type are to see the premise/worlds as combining to strongly imply a particular conclusion. Here we have another sense of the epistemic responsibilities of accepting a premise. One moves beyond noticing the necessary implications of accepting a premise and into a process of drawing out inferences to the best explanation. In this example, we first see that the premises individually can only weakly infer the conclusion, a simpler explanation is that Gary just happened to also be vacationing at the same location. When we take the two premises together, we combine them into a single world and see that the inference is now strongly supported. The puzzle pieces alone were questionable as to their image, but put together make the image almost beyond question. This highlights the high potential for synergy that standard supportive premises can reach.

3.14 Weak Standard Supportive Synergy

Finally it must be analyzed whether it is safe to take disjunction as the lower limit for support between standard supporting premises. Example 2.11 showed a case where the probabilities combined in a less supportive way than disjunctive premises but we have argued that this method was inappropriate for the example. Nevertheless one can easily imagine situations where two premises overlap in their support in a way that makes the

combined strength less than two wholly distinct premises. Take for example the following:

- Ex. 3.12 P1 Frank says he heard on radio station 98.7 that school is cancelled today.
 P2 Julie says she heard the same thing from the same station.
 C School is cancelled today.

In this example the two premises overlap to produce less than two independent reasons to endorse the conclusion. Both of the premises support not simply that school is cancelled, but that the radio station 98.7 announced that it is cancelled. The two premises are part of the same piece of evidence that school is cancelled in some way. The two puzzle pieces are at least partial duplicates, sharing the same image. The acceptability of each premise in this example is enhanced by the presence of the other, it becomes very believable that the radio station did make such an announcement, but the relevance is not affected by the second premise. There is no further reason to believe that the radio station did not make a mistake or play a prank on the students.

In order to make sense of this condition one must take the conclusion being supported and imagine a set of 'primary evidence' for the conclusion. Primary evidence is evidence which is uniquely produced directly from or about the source. Both students in 3.11 have evidence from the same primary source which makes their evidence become, in terms of relevancy, only one piece of evidence. If the radio station happened to be wrong both premises would fall together and therefore they do not combine strongly or create synergy between themselves. I will call this distinction the difference between merely consistent evidence and congruent evidence. Let us call two pieces of evidence consistent with one another if they share a standard supportive relationship. Congruent evidence we

shall take as the additional restraint that they share a standard supportive relationship and cover different primary sources. In contrast to this let us call merely consistent premises those that follow from the same primary source. All congruent evidence is consistent evidence but not all consistent evidence is congruent evidence. Congruent evidence fits the relationship described earlier, where the two premises become stronger than disjunction by creating synergy between them. What we are now arguing is that merely consistent premises share a weaker relationship than disjunction, have less than two disjointed pieces of information between them.

What a primary source is changes for every argument. Sometimes the issue is as easy as distinct eye witness testimonies. If multiple people witnessed the event directly and saw the same thing, their evidence is congruent. If multiple people got their evidence from the same eye witness then their evidence is merely consistent. In another situation even a set of eye witness testimonies may be considered secondary sources. If the issue is deciding the true nature of some event which may appear misleading, the eye witness evidence may only be relevant in explaining what the event looked like, as opposed to what it is. In this situation it may easily be accepted from the set of witnesses that the event appeared a certain way, but this is only one part of the argument as to the true nature of the event. Hence the eye witnesses may be described as merely consistent with one another. There are many more complex situations that should be examined to come to a better sense of how to employ this condition but this will have to be left as a future enterprise as there is not enough space in this project. It is obvious that in many examples it may be impossible, or at least very difficult, to differentiate between what is a primary source and what is secondary.

A second complication is that often evidence comes from a secondary source without the primary source being presented. If the two students merely claimed they knew the school is closed and ignored their source it would be impossible to tell if the evidence being presented share a strong or weak relationship. One might suggest in light of these complications that standard supportive premises range both weaker and stronger than disjunction and are even often indeterminable therefore the disjunctive formula is a perfectly appropriate means of combining support for the majority of these relationship. Disjunction serves to provide a definitive method that is also a decent estimate for most cases (being somewhere in the middle of the range of support). I would reject this temptation however. I am hesitant to give as much credence to merely consistent premises as I do to congruent premises. People generally argue in ways that are thought to be convincing and so I would expect the vast majority of cases of consistent premises to be instances of congruency. Merely consistent premises I shall take to be the exception to the general state of standard supportive premises. I shall therefore take standard supportive premises or consistent premises to indicate a relationship that is generally stronger than disjunction. The problems with defining and analysing these relationships aside, there are still some useful things to note from this section.

To begin with we have found that standard supportive premises can share a relationship that ranges anywhere from greatly stronger to weaker than disjunction. It also provides us with an imperfect means of determining situations where the relationship fails to share synergy between the premises. This may at least allow us the ability to label simple relationships congruent or merely consistent. Much further analysis is needed in all of the relationships described in this chapter but in particular standard supportive

premises as this class is such a diverse and complicated field. Unfortunately it seems the current discussion is limited to using this class as a trash can term for arguments which cannot be better defined. I am resolved nonetheless that this discussion has made some positive steps to better analysing such arguments and has brought the issue into the spotlight to allow even more fruitful analysis in the future.

Chapter 4 - Conclusion

Investigating the involvement of premise relationships in argumentation evaluation is obviously a big field with a lot of further work to be done. There are many other premise relationship prototypes that could and should be analyzed using the Hypothetical World of Implications, including some that have already been hinted at such as perfect inductions and synthetically disconnected premise evaluations. Unfortunately there is no more room in this paper to continue with this investigation and further research will have to be left as a future enterprise.

The premise relationships that have been identified in the last chapter already suggest some potentially significant changes to argument evaluation. To sum up these results I shall work through a lengthy example using the tools for evaluation that have been found.

- Ex. 4.1
- P1 Patty says Tom was out drinking till 2am yesterday at a bar in town.
 - P2 Tom has a history of calling in sick the day after he goes out drinking.
 - P3 Rachel believes Tom was sent on a big work trip leaving Thursday evening and returning the following Tuesday.
 - P4 Even if Tom was not on the work trip, Carol was the driver for the trip and she always gave Tom a ride to work.
 - P5 Tom had brought luggage with him to the office on Thursday.
 - P6 Hank confirms that Tom was involved with the work trip but doesn't know if he went on the trip.
 - P7 Tom often does not come in to work on Fridays.
 - P8 Tom should have arrived at work 30min ago.
 - C Tom will not be at work today (Friday).

Before this investigation into premise relationships, analyzing this argument would be rather simple and unfruitful. Every premise supports the conclusion directly and only P1 and P2 are linked with one another (The way I would interpret P2 is; 'if Tom is

out drinking the night before then he is likely to call in sick the next day'. Hence P1 and P2 follow a modus ponens inference scheme). Hence, aside from P1 and P2 every premise is convergent with the rest in support of the conclusion and we reach a diagram like the following:

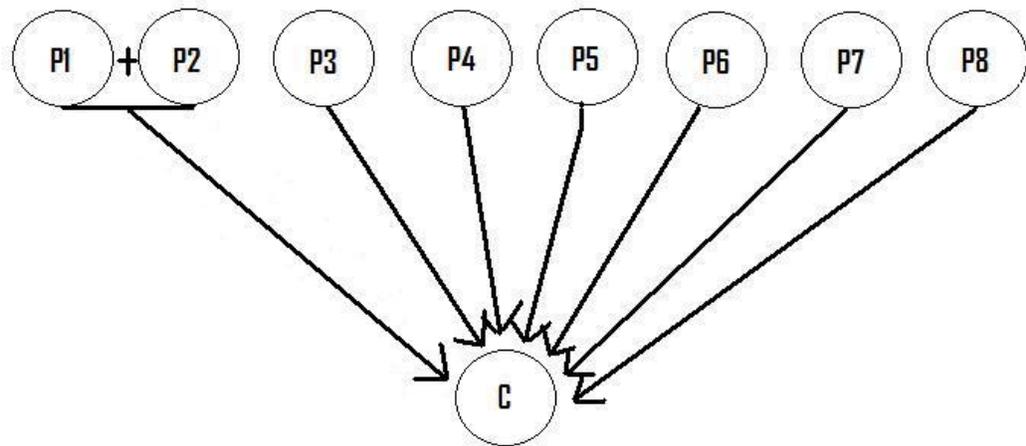


Figure 4.1

Obviously there is some deeper structure to these premise relationships than what is pictured in Figure 4.1. This simple method of declaring premises linked or convergent and diagramming them as above gets us nowhere in this example of understanding how to evaluate the premises. If we came to an understanding of how weighty each premise is in this example WP_x , the above diagram simply suggests these weights of each individual arrow be treated 'additively'. We now have some tools to move beyond this level and notice the more relevant structure.

The first thing we notice is that there are two sets of contrary premises, one which suggests Tom will not come in to work because he was at the bar late and got drunk, the

other suggesting that he is away on a work trip. Let us term these respectively W_1 and W_2 . Each world we should treat independently although much evidence will have to be diagrammed twice. The evidence supporting W_1 are P1 and P2 while P4, P7, and P8 are not contrary to this world but stand as neutral. The evidence supporting W_2 is then P3, P5, and P6 while P4, P7, and P8 are neutral. Within W_1 , P1 and P2 are linked and should therefore be evaluated as a single reason. The rest of the premises are standard supportive with P1/P2. Within W_2 , P3 and P5 are coincidental premises while P6, P7, and P8 are standard supportive with the rest. P4 is disjunctive with W_2 . Although we did not get into how to diagram these relationships I shall here present a diagram merely to highlight the general structure of the evaluation. This is not intended as a suggested diagramming method, merely a first glance at what one may look like.

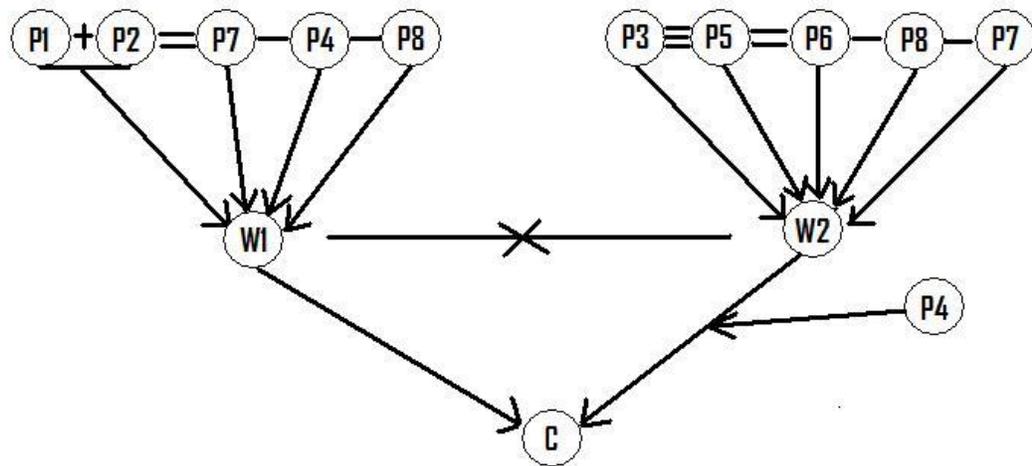


Figure 4.2

Some of the basic features are the same for this diagram, Linked premises are combined into a single arrow while convergent premises represent distinct arrows to their

conclusion. As per the method for evaluating contrary premises, the two competitive worlds have been inserted as the positive consequences of the premises instead of allowing them to support the conclusion directly. A line is drawn between the contrary worlds with an X through it indicating their complete rejection of one another. The disjunctive P4 in W_2 is drawn as an interfering arrow to the connection between W_2 and C, this is a nice way of indicating that should W_2 fail to support C, P4 might pick up its slack fitting its 'Even if he hadn't' role. Standard supportive relationships were taken to be a vague term for a varying degree of synergy between two premises, with coincidental at its strongest and merely consistent at its weakest. In this diagram I arranged the premises from left to right starting with the strongest synergy between the premises. I also diagrammed lines between the premises with the following intent; 3 lines - Coincidental, 2 lines - Strong Congruence, 1 line - Weak Congruence, and even though I did not use it in this example a squiggly line could indicate merely consistent premises.

Understanding the argument in this way makes a person far more prepared for evaluating the argument. For starters it is greatly helpful in evaluations to be able to accurately conceptualize the argument that is to be evaluated. Using these tools we have been able to do that. Secondly it is not so hard a task using this diagram to make an evaluation of the argument as a whole. One may argue again that this diagram is of little value to determining the overall strength of the argument and that a person may be better off using their general intuition about strength of the argument as a whole rather than breaking down the questions into parts and building it up. While I agree that to a certain extent evaluations must be intuitive and no numerical weight based evaluations will give accurate results, It would be very easy for a person to misrepresent the strength of the

evidence in support of C in this example if they did not make some measure to analyze the details about the evaluation before them. One last major advantage to this method is that this creates a system where the weight of the conclusion follows from an isolated measurement of the weight of each premise following the relationships set forth. This makes the system apt for translations into other fields, most notably natural language reasoning in AI.

I would recommend that a person attempting to evaluate Ex. 4.1 use figure 4.2 and ask themselves first which set of evidence seems stronger, W_1 or W_2 . Given the stronger relationship between the premises in W_2 , especially the coincidental evidence, so long as those premises were generally acceptable (as acceptable as the premises for W_1) this should be seen as the stronger competitive theory. The evaluator could then dismiss the entire left side of the diagram and proceed to evaluate what remains. These basic steps at least get the evaluation of the argument into the right ballpark and prevent misreading the evidence. The ultimate strength of the argument is, I have argued, a subjective matter that cannot be definitively provided.

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Appendix

Ex. 1.1	P1	Speeding leads to a higher chance of fatalities in accidents.	
	P2	Speeders do not get in more accidents than non speeders.	
	P3	Speeding is less fuel efficient.	
	P4	Speeding will save a significant amount of time.	
	C	I should/should not speed.	
Ex. 2.1	P1	Crow 1 is black.	
	P2	Crow 2 is black.	
	.	.	
	.	.	
	.	.	
	PN	Crow N is black.	
	C	All crows are black.	
Ex. 2.2	P1	Jim used someone else's work without citation.	
	P2	This event violated the school's plagiarism policy.	
	C	Jim should be punished.	
Ex. 2.3	P1	This book is on Physics.	
	P2	This book is on Chemistry.	
	C	Neither of these books is on philosophy.	
Ex. 2.4	P1	Pigs are mammals.	
	P2	No mammals lay eggs.	
	C	Pigs don't lay eggs.	
Ex. 2.5	P1	Jake didn't have a ride to the theatre.	
	P2	The movie wasn't playing.	
	C	Jake did not see the movie.	
Ex. 2.6	P1	It didn't rain this morning.	
	P2	It didn't rain this afternoon.	
	C	It didn't rain today.	
Ex. 2.7	P1	I saw Susie take her umbrella before she left this morning.	
	P2	The weather report yesterday said there was a good chance of rain today.	
	C	It is raining outside.	
Ex. 2.8	P1	Al shot at the target.	(0.7)
	P2	Bob shot at the target.	(0.6)
	C	Therefore the target was hit.	(0.88)

Ex. 2.9	P1	She's either in the study or in the kitchen.	(0.5)
	P2	She's not in the study.	(0.1)
	C	Therefore she's in the kitchen.	(1)
Ex. 2.10	P1	The Mail was delivered today.	
	P2	Tom went to work.	
	C	It is a weekday. ¹²⁷	
Ex. 2.11	P1	She typically goes to the kitchen around this time to make a cup of tea.	(0.8)
	P2	I just saw her walking in the general direction of the kitchen.	(0.75)
	C	Therefore she is in the kitchen. ¹²⁸	
Ex. 2.12	P1	You had no ride to the movie theatre.	
	P2	Even if you had, they would have refused you entrance.	
	C	You did not see the movie.	
Ex. 2.13	P1	It may have rained this morning.	
	P2	It may have rained this afternoon.	
	C	It rained at some time today.	
Ex. 2.14	P1	A witness saw a black mustang driving away from the crime.	
	P2	Jake owns a black mustang.	
	C	Jake committed the crime.	
Ex. 2.15	P1	Molly hates bugs.	
	P2	There will be lots of bugs at the cottage this weekend.	
	C	Molly will not be at the cottage this weekend.	
Ex. 2.16	P1	You criticized Joe's work yesterday.	
	P2	People don't like to be told bad things about themselves, even if it's the truth.	
	C	You should go and apologize to Joe.	
Ex. 2.17	P1	There is usually four paintings in my house.	
	P2	Today there is only three paintings.	
	C	A painting was stolen.	
Ex. 3.1	P1	Jim was in Mexico on New Year's Eve. (From witness 1)	
	P2	Jim was in New York on New Year's Eve. (From witness 2)	
	C	Jim was not in Toronto on New Year's Eve.	

¹²⁷ Goddu (2003), p. 225

¹²⁸ Yanal (2003) and, Goddu (2003) p. 226

Ex. 3.2	P1	She wouldn't have passed question 1.	(0.3)
	P2	She wouldn't have passed question 2.	(0.6)
	P3	She wouldn't have passed question 3.	(0.8)
	P4	She wouldn't have passed question 4.	(0.9)
	C	She did not win the game show.	(0.9944)
Ex. 3.3	P1	Susan says Sarah got the first question wrong.	
	P2	Tom says Sarah got the last question wrong.	
	C	Sarah did not win the game show.	
Ex. 3.4	P1	Holly says she saw Frank kill Joe.	
	P2	Tom says he saw Sally kill Joe.	
	C	Paul may not have killed Joe.	
Ex. 3.5	P1	There was DNA evidence from Frank at the murder scene.	
	P2	Sally had a good motive to kill Joe.	
	C	Paul may not have killed Joe.	
Ex. 3.6	P1	Paul's mom says he did not leave the house.	
	P2	Paul would have been refused entrance to the movie.	
	C	Paul did not see the movie.	
Ex. 3.7	P1	There was some DNA evidence from Frank at the murder scene.	
	P2	Frank does not have an alibi for the time of the murder	
	P3	Sally had a good motive to kill Joe.	
	P4	Ron says that Joe might have committed suicide.	
	P5	Paul and Joe were good friends.	
	C	Paul may not have killed Joe.	
Ex. 3.7*	W1	Frank may have been the killer.	(0.4)
	W2	Sally may have been the killer.	(0.2)
	W3	Joe may have committed suicide.	(0.1)
	W4	Someone else may have killed Joe.	(0.1)
	CW	Paul killed Joe.	(0.9)
	C	Paul may not have killed Joe. (Indecision)	
Ex. 3.8	P1	I like Ice Cream.	
	P2	I like Mayonnaise.	
	C	I like Ice Cream with Mayonnaise.	
Ex. 3.9	P1	I took the poison.	
	P2	I took the cure.	
	C	I will die.	

Vita Auctoris

Name: Matthew Stevens

Place of Birth: Brantford, ON

Year of Birth: 1985

Education: Waterford District High School, Waterford, ON, 2004

McMaster University, B.A., Hamilton, ON, 2009

University of Windsor, M.A., Windsor, ON, 2012