Argumentation schemes and topical relations

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One of the cornerstones of argumentation theory is the analysis of the structure of natural arguments. Dialectical and rhetorical arguments cannot be investigated by simply using the logical categories drawn from the formal meaning of quantifiers and connectors. While formal rules merely transfer the truth value of the premises to the conclusion, natural arguments are characterized by the notion of acceptability. What argumentative reasoning conveys from the premises to the conclusion is the hearer's attitude towards the state of affairs or the judgment expressed by a dialogue move (Rigotti 1995: 8). However, if we take into consideration the speaker and the hearer of a message in analyzing argumentative reasoning, the traditional formal systems become inadequate to investigate natural arguments, as they cannot capture the very purpose of argumentation, i.e. the modification of the interlocutors' attitudes and commitments, their perception of reality (Krabbe 2013).

In this wider perspective on reasoned argumentation, the pragmatic purpose of a dialogue move needs to be taken into account. Reasonableness (Rigotti, Rocci & Greco 2006), which is irrelevant in a formal approach to arguments, becomes the cornerstone of the pragmatic approach to natural arguments. What matters in argumentative inferences is not only *whether* the conclusion follows from the premises, but *how* it does. Even though the affirmation of the antecedent in a conditional necessarily leads to the affirmation of the consequent, not all antecedents reasonably support the consequent (Rigotti 2006). The logical axioms of inference cannot account for the pragmatic dimension of reasoning, which needs to be explained by rules of a different level, governing the reasonableness of a passage from premises to conclusion.

The ancient model of topics, which was introduced by Aristotle in his *Topics* and developed in the Latin and Medieval tradition, provided criteria based on the ontological structure of language for exploring the semantic-ontological boundaries of inference. Rigotti made this intuition, interpreted in coherence with the categories of modern linguistic and argumentative theories, the cornerstone of a new practical approach to argumentation that systematically took the uses of an argument to persuade an audience into account. By setting out the connection between semantics and reasoning, the *Argumentum Model of Topics* (*AMT*, Rigotti 2006, 2008, 2009; Rigotti & Greco Morasso 2006) provides rules of reasonableness of an inference, by embedding it into ontology, semantics, pragmatics and argumentation.

The purpose of this paper is to show how this innovative proposal can be used for developing a semantic approach to argumentation schemes (Walton, Reed & Macagno 2008). This proposal would integrate the logical approach provided by formal dialectics with a semantic-ontological dimension, combining together two distinct theories and traditions. For this purpose, in the first section we will show first the crucial relation between reasoning and semantics, analyzing how discourse coherence, or rather the relevance of a discourse move, can be interpreted as an argumentative relation. In the second section, this argumentative relation will be investigated and represented using the ancient model of topics, which are developed in the *AMT*. The types and the structure of the ancient *loci* will be inquired into in the third section, which will be focused on the distinction between their semantic content and logical form. The last section will be aimed at showing how argumentative relations can be conceived and formalized as combinations between semantic content and rules of reasoning, of which argumentation schemes represent the most common and prototypical ones.

1. Argumentative inferences and the meaning of a discourse move

The relationship between the levels of semantic-ontological relations, argumentative inferences and pragmatics needs to be understood by bringing out, both from a linguistic and an argumentative point of view, the

characteristics of the move that the speaker makes in a dialogue. Argumentative inferences can be considered to be essentially bound to pragmatics, as they represent the purpose of a dialogical move, or rather what we intend to accomplish by performing it. According to Ducrot (1972: 20; Ducrot & Anscombre 1986: 88) the meaning of a discourse move – or speech act or discourse sequence– consists in the effect it produces on the interlocutor, i.e. how it modifies the latter's communicative situation by restricting the paradigm of his possible replies. On this perspective, the purpose of a move lies in the inferences that it triggers, or rather the conclusion the interlocutor needs to retrieve and reply to. The notion of semantic congruity (Rigotti 2005) links the semantic dimension of the sentences expressed by dialogue moves with the pragmatic goal of an act of discourse. In this perspective, the argumentative connection between premises and conclusion becomes a component of the meaning of an explicit or implicit connective predicate (Rigotti 1993; Rigotti 2005; Rigotti & Rocci 2001). Such a predicate, which developed the previous notion of "rhetorical predicate" (Grimes 1975: 209) and "coherence relation" (Hobbs 1979: 68; Hobbs 1985), represents the communicative intention of the speaker, and connects the distinct moves or sequences performed imposing them specific conditions. The purpose of a discourse move can be reconstructed and retrieved starting from the semantic-ontological relations between the sequences. For instance, we analyze the following arguments:

I. (A) True peace is not just freedom from fear, but freedom from want. (B) Our war in Afghanistan freed the Afghans from fear and want. (C) Therefore it was an act of true peace.

In this argument, used by Obama in his *Nobel Peace Prize Acceptance Address*[1], the connectors between the two sequences express a relation of "motivation" (sequence *x* expresses a reason to believe sequence *y*) (Rigotti & Rocci 2006). (I) was aimed at justifying a classification, i.e. the attribution of the predicate "to be an act of 'true peace'" to "our war in Afghanistan." The communicative intention can be expressed as a relationship between the premises and the conclusion, i.e. a semantic and argumentative link. Such a

[1] Barack Obama, *Nobel Peace Prize Acceptance Address Oslo*, Norway December 10, 2009. Retrieved from http://www.huffingtonpost.com/2009/12/10/obama-nobel-peace-prize-a_n_386837.html on 11 April 2013.

link imposes on the sequences that it connects not only linguistic and structural conditions, but also logical ones. In particular, the purpose of the first sequence is to provide a definitional principle for the attribution of the predicate "to be an act of 'true peace'" expressed by the second sequence (Kempson 1975: 109-110). This argumentative presupposition emerges clearly when we modify the argument using premises having a different semantic structure:

I* (A) Fast fighting leads to true peace. (B) Our war in Afghanistan was a fast war. (C) Therefore it was an act of true peace.

I** (A) True peace is fast. (B) Our war in Afghanistan was fast. (C) Therefore it was an act of true peace.

I*** (A) True peace is a fast war. (B) Our war in Afghanistan was a fast war. (C) Therefore it was an act of true peace.

I* is grounded on a major premise that cannot be considered to be definitional or classificatory. For this reason, the argument itself is unreasonable. In I**, (A) is a classificatory principle, but it cannot be considered to be definitional from a purely linguistic perspective (it cannot be convertible with the subject matter, as the alleged definiens belongs to a different category – quality). For this reason, also in this case, the reasoning is unreasonable. In I***, (A) is presented as a definitional principle, but it cannot be thought of as such from a meta-semantic point of view. As the alleged *definiens* is a species of the *definiendum*, it cannot be convertible with it, and all the more it cannot be a definition of it. The conditions that the connector imposes on the arguments cannot be limited to a simple order of the propositions affirmed or denied. They need to account for requirements of a different level, expressing semantic-ontological relations. This level represents how language mirrors the structure through which we organize reality. In this sense, these relations are also logical only because the semantic-ontological bounds are forms of implication or equivalence.

In order to show how the interrelation between semantics and argumentation works, we represent the structure of Obama's argument mentioned above in the following diagram:

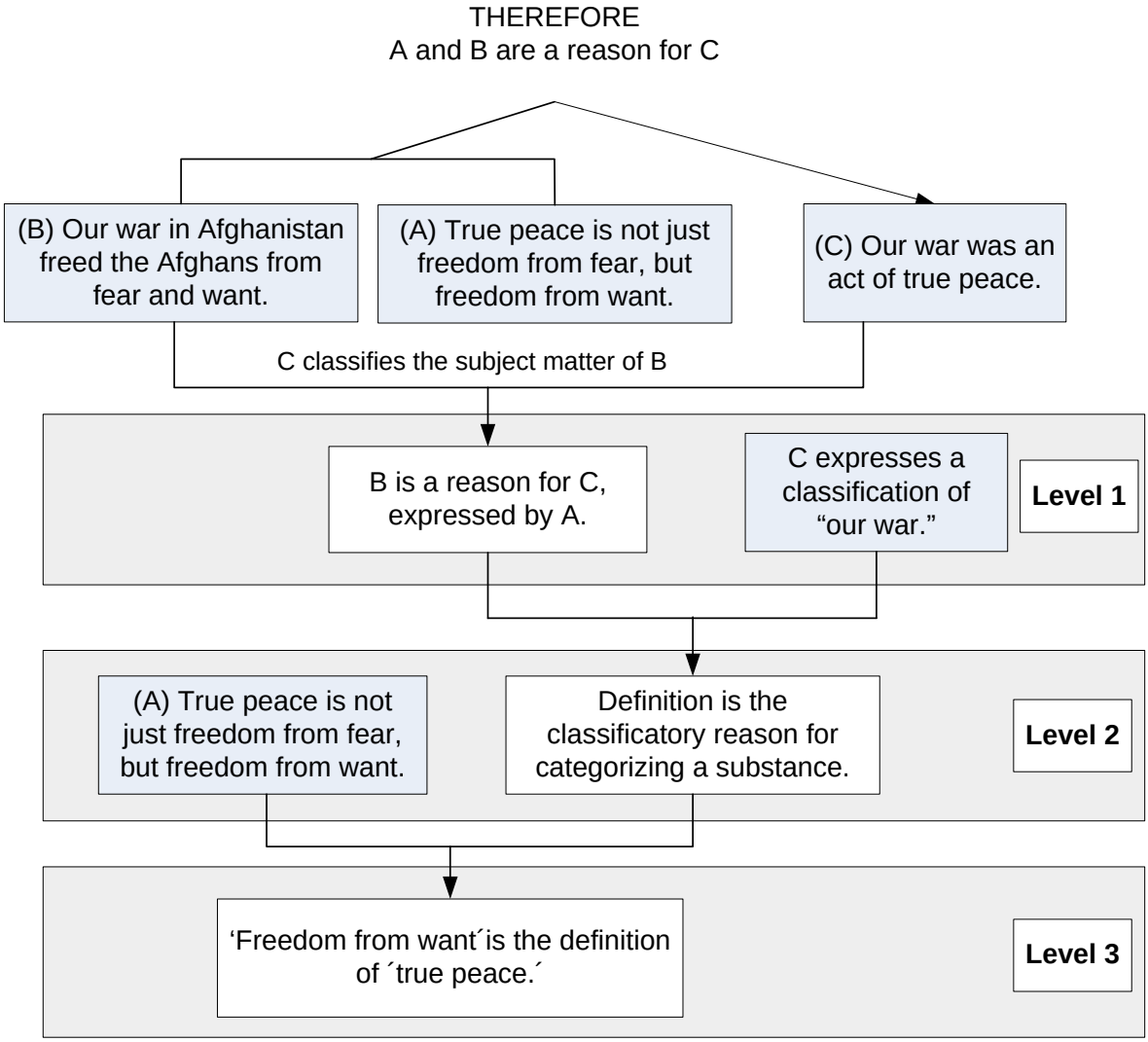


Figure 1: The semantics of inferential relations - definition

Here the argument is reconstructed starting from the connector, the predicate that links the discourse moves. This abstract predicate (expressing motivation in this case) is further specified by integrating its variables with the content of the sequences (Level 1), so that the specific function of (A) is reconstructed as a definitional principle (Level 2). This reconstruction allows one to retrieve the unstated premise necessary for motivating the passage from premises (A) and (B) to conclusion (C), i.e. the redefinition of "true peace" (Level 3).

This structure can be used to analyze more complex arguments, in which the major premise is left implicit and needs to be reconstructed. For instance let us consider the following argument:

II. (A) Bob is violent. (B) He punched his brother.

In (II) the linguistic connector is implicit, but we can reconstruct it based on the order between the motivated and the motivating state of affairs. In this case, its function is the same as the connector "as." The purpose of the conclusion (A) is to attribute a quality to the subject. However, the second sequence, motivating the first one, describes a particular action carried out by the subject. Therefore, the specific semantic relation can be represented as a sign: (B) provides a possible effect of the stable disposition indicated in (A). The semantic relations presupposed by this argument can be represented as follows:

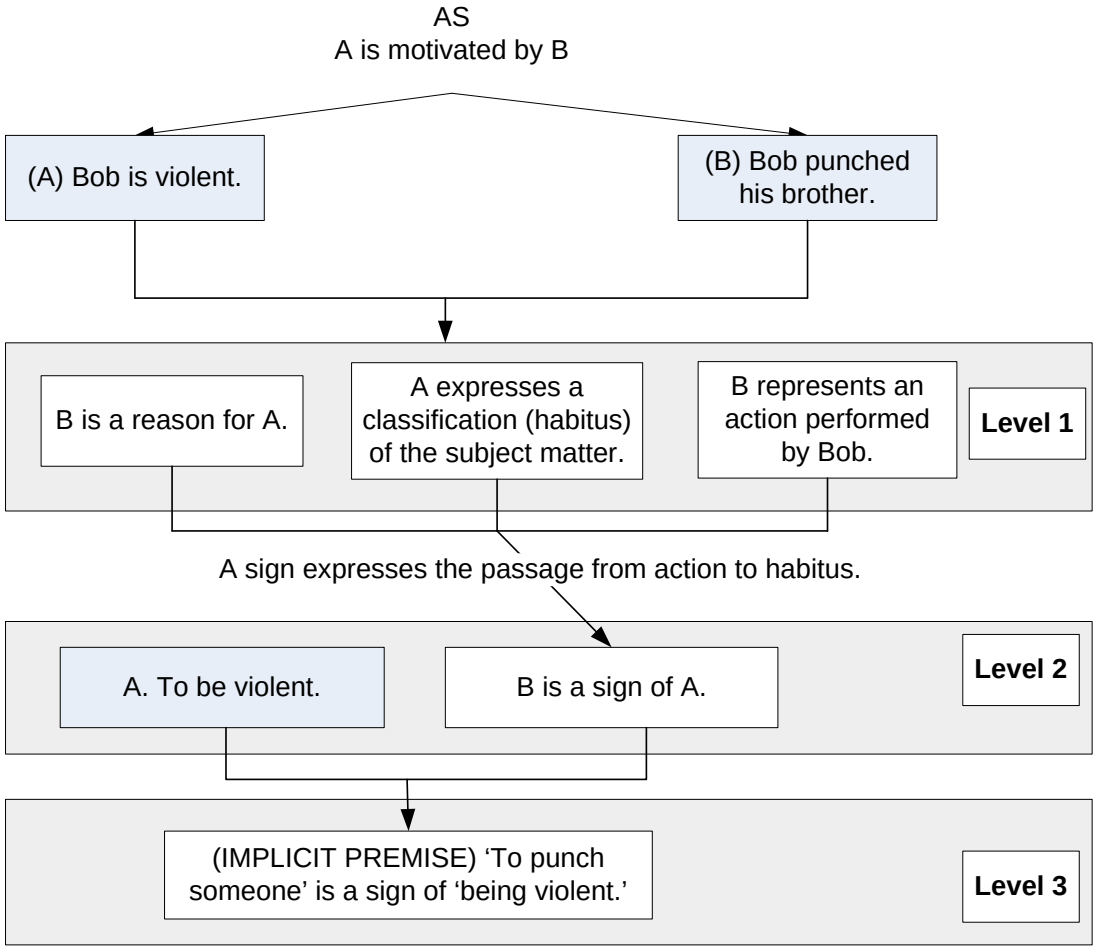


Figure 2: The semantics of inferential relations - sign

In both the examples analyzed above (I and II), the analysis needs to continue and take into consideration the further implicit conclusion that can be drawn.

In both cases the ultimate goal of the argument is to provide the hearer with a reason bearing out a specific value judgment on the subject matter of the fragment of dialogue. In case I, Obama aims at associating the war in Afghanistan with the possible inferences that can be drawn from the concept of "peace" (it is good; it shall be promoted…). In case II, the speaker intends to lead the interlocutor to evaluate Bob negatively, based on the specific commonplaces usually associated with the idea of "being violent" (violent people are bad / dangerous / should be avoided…).

If we consider arguments from a linguistic and pragmatic perspective as moves aimed at a specific conversational conclusion, we need to take into account how a premise can lead to a certain conclusion. The implicit or explicit premises need to fulfill certain conditions that an abstract predicate (the logical-semantic connective) imposes on them, together with the other elements that constitute a discourse move (the co-text, the interlocutors, their common knowledge). In particular, the connective imposes specific semantic-ontological constraints on the relationship between the premises and the conclusion, which in its turn determines the semantic roles of the predicates expressed in the sequences. The semantic dimension becomes thus an integral part of the argumentative and pragmatic level of a move, the presupposition of the logical rules that describe the abstract inferential structure. The crucial problem that this consideration raises is how to describe, evaluate and model these logical-semantic rules. For this purpose, we need to go back to the medieval approaches to argumentative relations, in which inferences were investigated from both a semantic and logical perspective.

2. Natural arguments and topics

The rules of inference used in natural language were one of the most important issues in the medieval dialectical works, where key differences between logical (formal) syllogisms and the dialectical and rhetorical ones were investigated. The most insightful perspective on this issue was developed by Abelard, who pointed out the distinction between formal and semantic relations (Kienpointner 1987: 283). Abelard compared the following types of reasoning, representing a logical syllogism and a dialectical inference:

Logical syllogism	**Dialectical syllogism**
If he is a man, then he is an animate being. This is a man. Therefore, he is an animate being.	He is a man. Therefore, he is an animate being.

The first syllogistic inference is based on a formal rule, indicating the relationship between the position of the terms or the propositions (Abealardi *Dialectica*: 262), in this case, "if the antecedent is affirmed, the consequent will follow." However, the same rule does not apply to the dialectical syllogisms, where the major premise is not formally expressed. The second inference, however, is necessarily valid, even though its validity does not depend on the disposition of the terms or the propositions. What guarantees the validity and soundness of this argument is a semantic (and meta-semantic) principle. In this case, the principle on which the reasoning is based is that "animal" is the genus of "man," and the inference is based on the rule that, "whatever is predicated of the species is predicated of the genus as well." On this perspective, dialectical inferences depend on rules called *maxima propositiones*, which govern the relationship between the logic-semantic properties of the concepts expressed in the premises and the conclusion, such as genus, definition, and property. This type of connection indicating a semantic-ontological relationship was called *habitudo*[2] in the medieval tradition (Walton, Reed & Macagno 2008: 290; Rigotti & Greco Morasso 2010: 494).

Abelard pointed out how the *maxima propositiones* are abstract, and refer to meta-semantic concepts (genus, definition…) or generic classes of semantic-ontological relations (cause, effect…). The passage from abstract categories to specific concepts needs to be mediated by assumptions and intermediate steps of reasoning (see Rigotti 2006). For instance, if we analyze the aforementioned dialectical inference, we realize that there is no direct connection between the inferential link from species to genus (what the

[2] unde sit locus, requiritur, a specie respondemus scientes 'hominem' ad 'animal' secundum hoc quod species eius est antecedere; cuius quidem interrogationis sententiam diligenter inquiramus. (Abealardi *Dialectica*, 264) ; Itaque tam ex loca differentia quam ex maxima propositione firmitas inferentiae custoditur, alio tamen et alio modo; ex differentia quidem hoc modo quod ipsa in antecedenti posita uim inferentiae tenet secundum habitudinem ex qua consequenti comparatur. Oportet enim in ipso antecedenti semper de loco differentia agi [qui] secundum habitudinem ex qua ad illatum terminum inferendum adducitur (Abealardi *Dialectica*, 263-264).

species is said of, the genus is said of as well) and "man" or "animate being" (Macagno & Walton 2008: 533). Further endoxical information is needed, and additional classificatory inferences need to be drawn in order to provide all the premises for the conclusion to follow. First, it is necessary to specify the specific relationship between the terms that represents the *habitudo*: in this case, "animate being" is the *genus* of "man." Then, the *maxima propositio* has to be specified accordingly, replacing the abstract categories with the particular ones (in this case, "what man is said of, animate being is said of as well"). Only then it is possible to draw the final conclusion from the factual premise. Abelard represented this complex pattern of reasoning as follows (Abaelardi *Dialectica*, 315; see also Stump 1989: 36 for the reconstruction of this mechanism in Boethius' *De Topicis Differentiis*):

Concequence	If Socrates is a man, he is an animate being.
Maxim	What the species is said of, the genus is said of as well
Assumption	But man, which is the species of "animate being" is said of Socrates; also therefore animate being, which is clearly its genus.
Assumption 1	Man is a species of "animate being".
Syllogism 1	What the species is said of, the genus is said of as well. Man is species of "animate being". Therefore, if man is said of anything, "animate being" is said of it as well.
Syllogism 2	If man is said of anything, "animate being" is said of it as well. Socrates is a man. Therefore Socrates is an animate being.

Figure 3: The complex mechanism of dialectical reasoning

The Argumentum Model of Topics developed by Rigotti can be considered as a modern interpretation and development of this ancient model, combining the ancient meta-semantic and semantic categories (predicables and predicaments) with the modern linguistic concepts of paradigmatic and syntagmatic relations. On this view, a *locus* is a 'sub-generator' of argumentative procedures consisting of one or more maxims that bind the truth value or acceptability of a conclusion to the acceptance, by the interlocutor, of propositions referring to specified ontological dimensions of the conclusion (Rigotti 2006). The ancient *habitudo* is regarded as the

ontological dimension of the standpoint that the maxims of a certain *locus* refer to. The maxims are considered as inferential connections having the form $p \rightarrow q$, establishing a link between two factors of the same ontological relation (Rigotti & Greco Morasso 2010: 496). When a maxim is applied to its proper *endoxa*, i.e. propositions accepted by the public opinion, an argument is generated. The structure of a dialectical inference can be represented by the following analysis of argument II above (see Rigotti 2006):

(A) Bob is violent. (B) He punched his brother.

This argument is based on the relationship between acts and habits, and in particular a negative act is regarded as a cause of a negative habit. As Thomas Aquinas put it, "habit causes act by way of efficient causality: but act causes habit, by way of final causality, in respect of which we consider the nature of good and evil" (Thomas Aquinas *Summa Theologiae* 25, 1a 2ae, 71, a3; see also 51 a2). This principle specifies a more abstract topical relation, the one from cause to effect. The complex mechanism of dialectical inference can be represented as follows (adapted from Rigotti & Greco Morasso 2010: 499; see also Rigotti & Palmieri 2010: 90; 95)

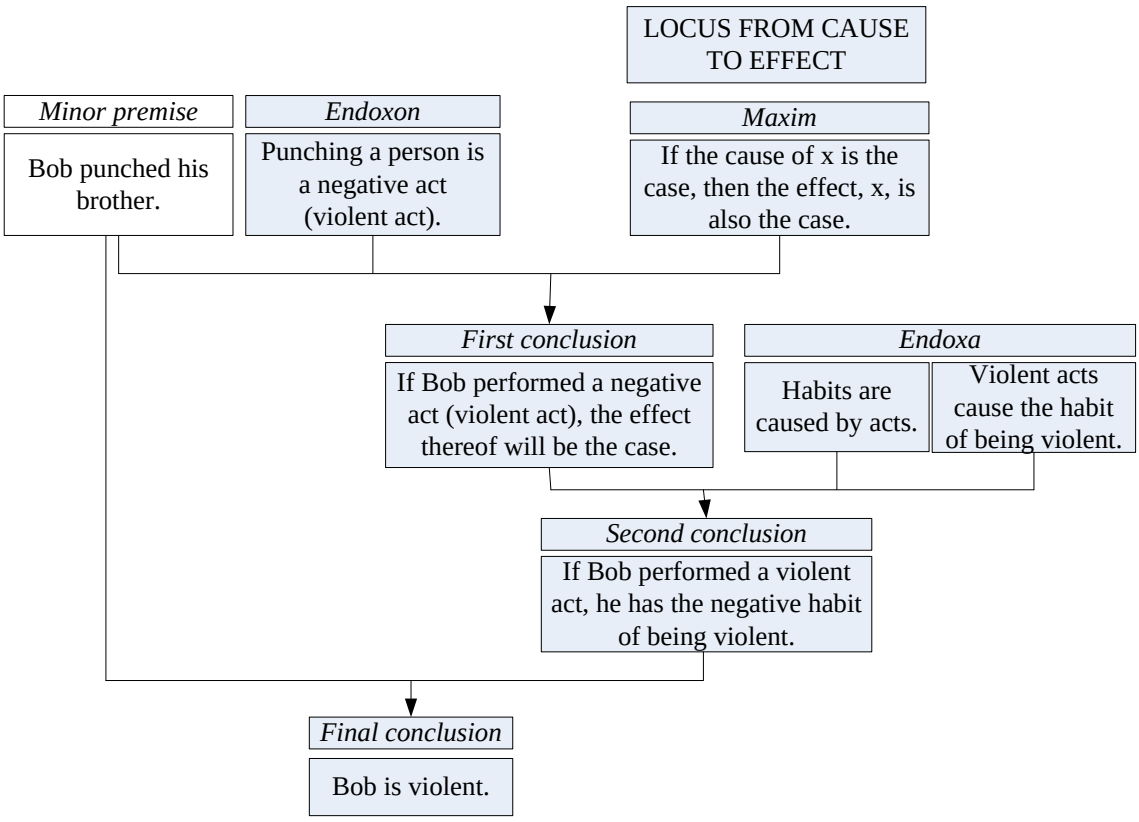


Figure 4: Mechanism of the Argumentum Model of Topics

This reconstruction is based on deductive inferences drawn from endoxical premises. This argument, however, raises a crucial problem concerning the possibility of having a complete and fully descriptive system of argument reconstruction based solely on semantic-ontological relations. As a matter of fact, the diagram above adapts the actual argument to the structure of the maxim setting out the causal relationship. The problem is that it risks representing an ideal argument, the one mirroring the dialectical categories and relations, but not the actual and potentially fallacious one. The fact that a person committed *one* violent action is not necessarily a cause of a violent habit (only several acts cause a habit, as Thomas Aquinas pointed out in the passage above). However, at the same time this conclusion cannot be said to have been unreasonably drawn from the premise; rather, the premise seems to bring some probative weight onto the conclusion, even though as a whole the argument is only presumptive and subject to default. On the one hand, even though the premises do not instantiate a correct deductive type of reasoning, the conclusion is still somehow reasonable. On the other hand, even though

the ontological relation is a cause-effect one, the conclusion drawn proceeds from a weaker logical pattern of reasoning than deduction.

The crucial problem is that in this case the ontological connection operates in the inferential link backwards, as the act is regarded as a sign of a cause, and not as a cause leading to a specific effect (see Rigotti & Greco-Morasso 2010: 495). On this view, not only is a habit the result of previous acts, but also an act is efficiently caused by a habit. In the aforementioned argument the act considered as a sign, or rather as a possible explanation, of an event is found by means of a generally accepted specific causal maxim. This inference does not affect the ontological connection, but rather the form of the reasoning, which no longer follows a deductive rule, but rather an abductive one.

This example shows how the ancient model of topics needs to account for types of reasoning that are not the deductive ones on which dialectics is based. The prototypical logical patterns used in the dialectical mechanism are different from a logical point of view from the more complex ones that we can find in natural arguments. This discrepancy can lead to developing the model by taking into account not only the level of the semantic-ontological relations, but also a more abstract one, the logical form according to which a conclusion is drawn from the premises. The starting point of this approach lies in the relationship between different levels of argument analysis, the semantic and the logical one, which correspond to different levels of abstraction.

3. Types of reasoning, ontological connections, and natural arguments

As mentioned above, the subject matter of an argument analysis is a linguistic event, a dialogue move aimed at a specific conversational outcome. The relationship between premises and conclusion can be reconstructed based on generic principles. However, what guarantees the inference is a specific major premise that includes the predicates occurring in the minor premise and the conclusion. As outlined above, this passage can be analyzed and reconstructed at different levels, as the specific maxim, warranting the inferential step,

instantiates a more generic one, based on semantic-ontological relations. Moreover, this analysis needs to be further integrated by taking into account how the conclusion is drawn from the maxim, i.e. the logical form of the inference. Therefore, in order to reconstruct and motivate the inferential structure, we need to distinguish between three different levels: 1) the specific principle of inference, which can be more or less prototypical; 2) the generic, semantic-ontological connection between the predicates of the argument; and 3) the logical rules governing the formal disposition of the terms or propositions in an argument. In this section, we will refer to these three levels of abstraction "specific topoi,", "generic topoi," and "logical rules of inference" (or logical form). In this fashion, the actual major premise will be distinguished from the operations conducted on it, belonging to the semantic-ontological and the logical levels of abstraction.

a. Specific topoi

The ground level of abstraction corresponds to the level of the prototypical major propositions that can be used in an argumentative inference. In the *Topics*, Aristotle pointed out a crucial difference between the *topoi* (or rather generic topics) and the *idia* (the specific topics) (see Rubinelli 2009: 59-70). According to Aristotle, the specific *topoi* represent propositions that relate to specific disciplines, such as ethics, law, or medicine, which are used to draw specific conclusions. For instance, in the third book of the *Topics* some specific principles of inference concerning the classification of "what is better" are set out (*Topics* 116a 13-18):

> First, then, that which is more lasting or secure is more desirable than that which is less so; and so is that which is more likely to be chosen by the prudent or by the good man or by the right law, or by men who are good in any particular line, when they make their choice as such; i.e. either whatever most of them or what all of them would choose; e.g. in medicine (or in carpentry) those things are more desirable which most, or all, doctors would choose; or, in general, whatever most men or all men or all things would choose.

Specific topics can be used both as an instrument for invention, namely for generating and finding the premises of an argument, and as premises warranting the conclusion (De Pater 1965: 134; Stump 1989: 29). For instance,

a specific *topos* concerning one of the possible ways of classifying an action as "better" than another can be directly used to support the conclusion. We can analyze the following case:

> Saving the money for buying a house is more desirable than spending it on expensive cars, because a house is more lasting than a car.

The reasoning can be represented as follows:

Minor premise	A house is more lasting than a car.
Major premise	That which is more lasting or secure is more desirable than that which is less so.
Conclusion	A house is more desirable than a car.

The specific *topos* indicating one of the possible "operational" definitions of "to be better" directly warrants the conclusion. In specific domains of knowledge, specific *topoi* can be listed as instruments of invention, pre-packaged arguments that be used for supporting prototypical viewpoints. For example, ancient and modern treatises on legal topics (or rather on the specific commonly accepted principles of reasoning) indicate hundreds of topics that can be used by lawyers in certain circumstances. A famous treatise is Everardus's *Loci Argumentorum legales*, from where the following specific *topos* belonging to the category of *locus a etymologia* can be found (Everardi *Loci Argumentorum legales*, 54, 13th paragraph):

> When a man and a woman refer to each other with the name of "spouse", marriage is not proven, but is presumable.

This proposition is used in law to support a specific conclusion, i.e. a *prima facie* case in favor of the claim that the two persons were married. In the legal domain, many rules of presumption of fact can be considered as specific topics, providing relations between specific concepts, such as act and intention or disappearance and death. A clear example of these prototypical inferences is given by the presumptions of intention, which are used to draw conclusions about the subjective element of the offence (the defendant's attitude and will) from his external actions. The following specific topic is frequently used in law (Lawson 1885: 262):

> Where a person does an act, he is presumed in so doing to have intended that the natural and legal consequences of his act shall result.

Specific *topoi* provide relations between specific concepts ("acts"), which are abstracted from their individual occurrences (this specific act). These specific rules of inference are the subject matter of a further process of abstraction, leading from concepts to categories of concepts or meta-concepts, the generic *topoi*.

b. Generic topoi

Generic topics, or rather maxims, on which the Argumentum Model of Topics is based, can be considered as abstractions from the specific ones, or more correctly, an abstraction from a large number of specific topics. They provide classes of both necessary and defeasible inferences. In the first class fall some maxims setting out definitional properties of meta-semantic concepts, i.e. concepts representing logic-semantic relations between concepts (*categoremata*), such as definition, genus and property. For example the *locus* from definition, which establishes the convertibility between definition and *definiendum*, represents also the essential logical characteristic that a predicate needs to have in order be considered as a "discourse signifying what a thing is." Other *loci*, such as the ones based on analogy or the more and the less, are only defeasible, as they represent only usual commonly accepted relationships.

In the *Topics*, Aristotle focuses most of his analysis on the topics governing the meta-semantic relations between concepts, i.e. genus, property, definition and accident. Cicero reduced the Aristotelian list of *topoi* to 20 *loci* or maxims, grouping them in generic categories (differences) and dividing them in two broad classes, the intrinsic and extrinsic topics. While the first ones proceed directly from the subject matter at issue (for instance, its semantic properties), the external topics support the conclusion through contextual elements (for instance, the source of the speech act advancing the claim). In between are the topics that concern the relationship between a predicate and the other predicates of a linguistic system (for instance, its relations with its contraries or alternatives). We can represent Cicero's topics as follows:

Intrinsic		**Extrinsic**
Directly from the subject matter	***From things somehow related to the subject matter***	
1. *definitio* • By material parts (definition by whole-part relation) • By essential parts (definition by genus-species relation) 2. *notatio* (etymological relation)	1. Coniugata (inflectional relations) 2. Genus (genus-species relation) 3. Forma (species-genus relation) 4. Similitudo (similarity relation) 5. Differentia (difference relation) 6. Contraria (4 types of opposite relation) 7. Adiuncta (relation of concomitance) 8. Antecedentia 9. Consequentia 10. Repugnantia (incompatibles) 11. Efficentia (cause-effect relation) 12. Effecta (effect-cause relation) 13. Ex comparatione maiorum, minorum, parium (comparison)	Authority

Figure 5: Cicero's classification of *generic topics*

This classification was the model that was taken into account by several dialectical theories. In particular, Boethius (*De Topicis Differentiis*) divided the topics taken from the terms in question in two categories: the ones that follow from substance and the ones that follow the substance. The first category includes only the topics from definition and description, while the latter encompasses the ones taken from whole, parts, or causes (*De Topicis Differentiis* 1188A 1-3). Boethius then distinguishes these two classes of intrinsic *loci* from the ones that "are posited extrinsically": the topics from judgment (or rather from the source or the authority thereof), from similar, from the greater, from the lesser, from proportion, from opposites, or from transumption (*De Topicis Differentiis* 1190A 23-25).

c. Forms of inferences and types of reasoning

While specific topics are abstractions from individual relations between entities or specific events to relations between categories of individuals and facts, generic topics proceed from this latter level of abstraction to relations between meta-semantic (genus, definition…), linguistic (such as the inflections

of words, paradigms…) or metaphysical (such as the different types of causes) classes of concepts.

In the Latin and medieval tradition we can find topics having as their subject matter not bearing any relationship with the concepts, or "terms" in question, nor with the extrinsic connections thereof with a linguistic, metaphysical, or ontological system. Such topics (including the topics from antecedents, consequents, and incompatibles) governed the form of reasoning and the disposition of the terms or the propositions in an argument. For instance, Cicero describes the topic from antecedents only taking into account the relation between a conditional proposition and the one affirming the antecedent thereof: if the antecedent is affirmed, the consequent follows necessarily (Ciceronis *Topica* 53, 1-25). These *loci*, used by the dialecticians according to Cicero, are not aimed at increasing the *acceptability* of a conclusion based on the *acceptability* of the content of its premises. Instead, they represent relations of *acceptance* (or commitment) between propositions. For instance, from the acceptance of – or commitment to – a conditional and the antecedent thereof, follows the acceptance of – or commitment to – the consequent. These "formal" topics were analyzed in particular in the dialectical theories of the 12th and 13th century. Such theories conceived the categorical syllogisms as proceeding from topics from the whole to the part, called "*dici de omni*" and "*dici de nullo*." These topics were grounded not on the semantic-ontological content of the propositions, but only on the meaning of the quantifiers (Green-Pedersen 1984: 256).

This distinction between semantic-ontological and formal topics suggests an analysis of the different rules of inference in which the semantic-ontological topics integrate the logical rules. Formal topics can be thought of as a representing the highest level of abstraction, gathering under more generic principles different and somehow similar argument structures, which can be necessarily or defeasibly valid. As Searle put it (Searle 2001: 19):

> It would be more accurate to say that the rule of *modus ponens* gets its validity from the fact that it expresses a pattern of an infinite number of inferences that are independently valid. The actual argument does not get its validity from any external source: if it is valid, it can be valid only because the premises entail the conclusion. Because the meanings of the words themselves are sufficient to guarantee the validity of the inference, we can formalize a pattern that describes an infinite number of such inferences. But the inference does not derive its validity from the

> pattern. The so-called rule of *modus ponens* is just a statement of a pattern of an infinite number of such independently valid inferences.

The ancient topics from antecedents or "*dici de omni*" formalize deductive patterns of inference that are normally used in dialectics. However, many acceptable and reasonable arguments, such as reasoning from example or sign, follow formal patterns different from the deductive ones (see also Blair 2007; Godden 2005). On this view, formal rules of inferences can be considered as a level of abstraction different from the semantic-ontological one, a distinct theoretical way of tracing the complexity of natural arguments back to most generic principles (see Rigotti & Greco-Morasso 2010).

Aristotle (*Rhetoric* 1357b 12-23) pointed out the existence of different types of arguments, distinguishing enthymemes (resembling deductive syllogisms) from arguments from example (similar to induction) and sign. In particular, he separated proper signs (or infallible, such as relation between a woman's giving milk and her having lately born a child) from the improper ones (or defeasible, such as the relation between breathing fast and having a fever). These latter signs can be classified neither as deductions nor inductions. In modern logic, arguments from improper signs are described as representing a distinct type of reasoning, called "abduction" (Pierce 1992: 140-141), "retroduction" (see Greenland 1998: 545; Poole 1988) or reasoning from best explanation (Josephson & Josephson 1996: 15). It is a kind of syllogism in which the conditional links the minor premise with a possible, or rather the best possible, antecedent. The major premise is reconstructed based on its conditional, and the conclusion corresponds to its antecedent. This account can be summarized in the table below, where three different types of reasoning (or categories of arguments of the highest level) are distinguished:

Type of reasoning (abstraction - form)	Deductive axioms	Induction	Abduction
Type of argument (abstraction - content)	Argument from definition, genus...	Argument from example	Argument from (improper) signs
	Argument from cause to effect	...	...
	Argument from commitment		
	...		

Figure 6: Types of argument and types of reasoning

This classification is of crucial importance, as it suggests the possibility of analyzing arguments from a multi-logical perspective, in which the logical form can be described using distinct *types of reasoning*, which in turn can include various *rules of inference* or *logical axioms* (*MP*, *MT*…). At the same time, however, this approach can raise several problems. The Latin and medieval account of *loci* treats formal rules of inference as maxims and not as distinct levels of abstraction. For this reason, the two levels (the ontological and the formal one) are treated separately, without considering the possible interconnections between them. This account places on the same level logical form and semantic-ontological principles, leading to the view that some arguments are drawn from logic-semantic characteristics, others from linguistic or metaphysical principles, while others from types of reasoning that we would classify as inductive, abductive or analogical.

The modern theories of argument or argumentation schemes inherited this model, and have put forward classifications essentially mirroring the ancient approach. The failure to consider the difference between formal and semantic-ontological topics as a difference in kind – of levels of abstraction – leads to treating forms of arguments at the same level as their content. This approach can be extremely helpful for rapidly identifying common characteristics in arguments that are frequently used. However, if the purpose is to describe, reconstruct or evaluate an argument, the failure to differentiate between the two levels can lead to some problems, such as the ones mentioned in section 2 above. A possible solution is to acknowledge the discrepancy of form and content as a divergence in kind, and try to show how these two levels can be interconnected. The starting point is the model that,

by merging the two levels, best mirrors the multi-logical approach to natural arguments: the model of argumentation schemes (Walton, Reed & Macagno 2008).

4. Imperfect bridges

Argumentation schemes are stereotypical patterns of inference, combinations between the semantic-ontological connections and the logical forms that represent the abstract structure of the most common types of natural arguments (see Hastings 1963; Perelman & Olbrechts-Tyteca 1969; Kienpointner 1992a, 1992b; Walton 1996; Grennan 1997, van Eemeren & Grootendorst 2004, and Walton, Reed & Macagno 2008). Argumentation schemes as conceived in (Walton, Reed & Macagno 2008) try to provide the most exhaustive classification of the most typical arguments. In this approach, however, abductive, analogical, and inductive patterns of reasoning are treated as argumentation schemes just like arguments from classification or cause to effect. Moreover, deductive patterns are generally based on a *modus-ponens* logical form, while other rules of deductive inference, such as the disjunctive syllogism, are classified as distinct argumentation schemes.

In order to better understand the limits of argumentation schemes and how they can be developed, based on the insights of the Argumentum Model of Topics, it can be useful to take into consideration two examples of the most representative types of argumentation schemes, the argument from classification (Walton, Reed & Macagno 2008: 319) and argument from cause to effect (Walton, Reed & Macagno 2008: 168):

Argumentation scheme 1: Argument from verbal classification

Major premise	If some particular thing *a* can be classified as falling under verbal category *C*, then *a* has property *F* (in virtue of such a classification).
Minor premise	*a* can be classified as falling under verbal category *C*.
Conclusion	*a* has property *F*.

Argumentation scheme 2: Argument from cause to effect

Major premise	Generally, if *A* occurs, then *B* will (might) occur.
Minor premise	In this case, *A* occurs (might occur).
Conclusion	Therefore in this case, *B* will (might) occur.

The first scheme provides a generic defeasible *modus ponens* rule of inference applied to an ontological connection that in the traditional dialectical approach would have been described through the *loci* from definition, description, genus, and property. The argument from cause is also based on a defeasible *modus ponens*, which is combined with a causal relation between two events. In these two schemes the semantic-ontological level is merged with the logical one, and this combination represents only one of the possible types of inferences that can be drawn from the same semantic-ontological connection. The actual relationship between the two levels of abstraction is much more complex, as we will show in the following sections.

a. Causal relations and causal arguments

In order to show the limits of argumentation schemes, it can be useful to examine the structure of different common types of argument based on a causal relation. We consider the classic Aristotelian causal link between "having fever" and "breathing fast," and see how this cause-effect relation can be used to draw a conclusion on the basis of different logical rules:

1. He had fever. (Fever causes breathing fast). Therefore, he (must have) breathed fast.
2. He did not breathe fast. (Fever causes breathing fast). Therefore, he had no fever.
3. He is breathing fast. (*Only* fever causes breathing fast). Therefore, he has fever.
4. He is breathing fast. (Fever causes breathing fast). Therefore, he might have fever.
5. He is has no fever. (Fever causes breathing fast). Therefore, he may be not breathing fast.

These four cases illustrate four different ways to draw a conclusion from a causal principle. Case (1) proceeds from the rule of (defeasible) *modus ponens*, while in (2) the logical pattern is different, and corresponds to the the defeasible *modus tollens*. In (3) the sufficient and the necessary conditions of the causal premise are inverted, and the affirmation of the consequent can be reconstructed as a *modus ponens*. The fourth and fifth cases, however, raise some problems. In (4) the conclusion is drawn by affirming the consequent. Case (5) can be rephrased by contraposition as "not breathing fast is caused by having no fever," which leads to a conclusion drawn abductively (Walton, Reed & Macagno 2008: 173). In these two latter cases a different type of reasoning is used, distinct from the preceding defeasible patterns.

The distinction between type of reasoning (or logical forms) and semantic-ontological relations becomes extremely important when the major premise, or other components of the argument structure, are left implicit and need to be evaluated in order to assess the quality of the argument. In inductive and analogical reasoning the premise warranting the conclusion is almost always implicit, as it is reconstructed *a posteriori*. On the one hand, in arguments from example the maxim proposition (or the causal principle in this case) is drawn by a representative case by an operation inductive in nature (the Aristotelian example – see *Rhetoric* 1357a 14-16). On the other hand, analogical reasoning can be considered as a form of reasoning, distinct from induction and deduction (Juthe 2005), consisting in implicitly abstracting a generic category or relation from two similar cases (Macagno & Walton 2009). Both types of reasoning can apply to the same causal relation, as in the cases below:

6. You may have fever. When I had fever, I was breathing fast, and you are breathing fast.
7. You may have fever. When the cows have fever, they breathe fast, and you are breathing fast.

In (6) the causal principle is implicit, inductively abstracted from the specific past case, and then applied to the case at issue. In (7) the semantic causal relation is drawn analogically from two similar cases (the fast breathing of cows and human beings).

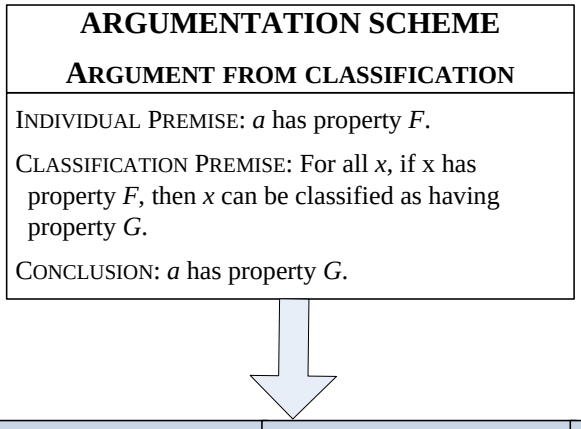
b. Classifications and arguments from definitions

Argument from classification is even more complex from the point of view of the relationship between logical forms and ontological connections. The concept of classification is extremely broad, as it refers to the use of a particular word to denote a fragment of reality (Walton & Macagno 2009). This argument can be based on different definitional or quasi-definitional relations, such as the definition by parts, etymology, description, illustration, metaphor (Victorini *Liber de Definitionibus*). The crucial problem is that some of these definitions establish a relationship of equivalence based on a material identity (genus-difference definition), while others only a univocal one (definitions by material parts). Metaphorical definitions are grounded on the non-convertibility between the *definiens* and *definiendum*, on a default of prototypical meaning that needs to be explained abductively (Black 1954: 280; Searle 1993). Finally, definitions by illustration provide an example from which it is possible attribute the classification inductively, based on the implicit reconstruction of common generic features. We can consider the following examples of these definitions:

A. Man is a rational animate being (*essential definition*).
B. Man is (a being made of) a head, two legs, two arms and has neither tail nor feathers (*definition by parts*).
C. Man, (is a being) such as Socrates or Aristotle (*definition by illustration*).

Essential definitions (by genus and difference) are convertible with their *definiendum*, and for this reason the conclusions can be drawn deductively by *modus ponens* or *modus tollens*. Definitions by parts (and other definitions, such as operational definitions or definite description) provide only exterior characteristics that can be used to distinguish the entity denoted by the *definiendum*. For this reason, they are signs that the entity can fall within the given category, and the categorization of an entity based on such a definition is abductive. Definition by illustration proceeds inductively: from specific cases (Socrates, Aristotle) it is possible to implicitly abstract common characteristics that will be then used to classify another entity (from Macagno & Walton 2009: 173). In case of argument from classification, the same "superficial" semantic-ontological relation hides more complex semantic

structures, which can lead to distinct types of conclusions based on various types of reasoning and axioms or rules of inference (Walton & Macagno 2010). An example of the complex deep structure of the argument from classification can be illustrated in the figure below:



SEMANTIC-ONTOLOGICAL RELATION	Essential Definition Ex: *Man is a rational animal.*	Definition by Parts Ex: *Man is (made of) head, body, two legs…*	Definition by Illustration Ex: *Man, such as Socrates...*
LOGICAL FORM	***Modus ponens*** • *a* fits definition *D*. • For all *x*, if a fits definition *D*, then *x* can be classified as having property *G*. • *a* has property *G*.	***Abduction*** • Generally, if *A* occurs, then *B* will (might) occur. • In this case, *A* occurs (might occur). • Therefore in this case, *B* will (might) occur.	***Example*** • In this particular case, the individual *a* has property *F* and also property *G*. • Therefore, *b*, which has property *F*, then also has property *G*.

Figure 7: Definitions and types of reasoning

The types of inferences that can be drawn from a definition are partially determined by the semantic structure. Abductive inferences cannot be drawn from essential definitions, but a definition by parts support some conclusions deductively and other abductively.

c. Authority and arguments from authority

The schemes from cause to effect and from classification are based on two different types of intrinsic semantic-ontological relations. The complex combination between ontological connections and logical form can be also shown in the prototypical extrinsic topic, the argument from authority or expert opinion (Walton, Reed & Macagno 2008: 19):

Argumentation scheme 3: Argument from expert opinion

Major premise	Source *E* is an expert in subject domain *S* containing proposition *A*.
Minor premise	*E* asserts that proposition *A* (in domain *S*) is true (false).
Conditional premise	If source *E* is an expert in a subject domain *S* containing proposition *A*, and *E* asserts that proposition *A* is true (false), then *A* may plausibly be taken to be true (false).
Conclusion	*A* may plausibly be taken to be true (false).

Also in this case, the scheme can be analyzed from a logical perspective, starting from the most prototypical kind of argument from expertise, illustrated as follows.

i. Your leg must be broken. Doctor Smith, an orthopedic, claimed that (if Dr. Smith is an expert and he makes a claim within his domain of expertise, then his claim can be tentatively taken to be true).

The defeasible rule of *modus ponens* is used in this case, but only prototypically. From the same semantic-ontological relation different types of conclusions can be drawn. For instance, the argument from expert opinion can be used to draw a conclusion by *modus tollens*:

ii. Doctor Smith often makes wrong diagnoses in orthopedic issues. He is not an orthopedic specialist (a true orthopedic / a real expert).

Abductive reasoning can also support some conclusions based on the relationship between expertise and acceptability (or truth) of the claims:

iii. Doctor Smith was correct concerning my broken bone. He is a real expert.

Likely, it is possible to conclude abductively from the fact that a person is not an expert that his claims cannot be considered as true.

The same semantic-ontological relation can be reconstructed inductively by providing a past instance of a reliable opinion provided by the

expert, from which the interlocutor can draw a generalization on his future claims:

iv. Last year Smith was right about my problem in my knee. I think that what is claiming now about your leg may be true as well.

The implicit premise in this case is more complex to reconstruct. From a logical point of view, the interlocutor can retrieve the premise that if someone was right in the past, he can presumed to be right in the future as well. However, it would not be very reasonable to conclude that I can guess the color of a cart because I made a similar correct guess in the past. The reasoning in (iv) is reasonable only if we attribute to Smith a certain expertise that can be induced from his past behavior.

Finally, analogy can be also used to support a specific conclusion based on the implicit relationship between the source's expertise and the reliability of his claim:

v. You trust your mechanic when your car needs to be fixed. Why don't you follow what Dr. Smith says on your knee?

In this case the premise "what experts can be presumed to be true based on their knowledge" is abstracted from a similar case and used to support the wanted conclusion by analogy.

d. Argumentation schemes and levels of abstraction

Topical relations and types of reasoning (including the rules of inference) can be considered to be different levels of abstraction, distinct perspectives on complex data involving a multi-faceted combination of semantic relations and reasoning. The problem is to distinguish between these two dimensions and show how they combine in real arguments. Argumentation schemes can be thought of as imperfect bridges between the first and the second level of abstraction, providing the most common of the possible combinations between semantic-ontological connections and logical form. However, causal, classificatory or expertise relations can support conclusions that can be drawn deductively, abductively, inductively, or analogically. Prototypical patterns can be useful for providing rules of thumb in classifying argument. However, the

risk is hiding the discrepancy between the two levels, which need to be separated and analyzed independently from each other in order to assess an argument in its structure or reconstruct its tacit dimension. In this sense the Argumentum Model of Topics can become a cornerstone for future developments of the logic of arguments. The analysis of the structure of topical relations provides the semantic-ontological and linguistic core of natural inferences, which can be later articulated, distinguished and described in detail by investigating their logical structure.

5. Conclusion

The Argumentum Model of Topics is a bridge between several different perspectives on argument structure. It mediates between the tradition of the ancient dialectical theories and the modern developments of argumentation theory. It connects pragmatics with semantics and reasoning, opening a dialogue between disciplines that are usually considered as distinct and independent. This multidisciplinary aspect of the theory is important, because it bridges the gap between the high levels of theoretical abstraction of argumentation theory and the natural language discourse in which real arguments are being examined. It shows the essential role of meaning and semantic-ontological relations in the logic of arguments, designing a new perspective to look at natural arguments. The semantics of topical reasoning of Rigotti bridged the differing perspectives on the structure of arguments by, for the first time, drilling down to the fine-grained linguistic details and fitting this aspect into the abstract theories of logical argumentation. By showing how concepts and meta-concepts determine the structure of natural reasoning, the Argumentum Model of Topics reframes the categories on which traditional argument analysis was grounded. When examined in a realistic setting, the purpose of an argumentative move becomes crucial, like the meaning of the concepts used to achieve it. Necessity and reasonableness become grounded on ontological relations and not only on the simple disposition of the terms.

The Argumentum Model of Topics opens a new direction of research on the so-called argumentation schemes, or rather prototypical patterns of

natural arguments. Argumentation schemes blur the distinction between two different levels, the logical form and the semantic-ontological connections. In this fashion, they can be thought of as precise representations of instances of arguments that are commonly used, which can be useful for distinguishing types of arguments in prototypical situations. However, they describe the structure of typical arguments and not the complex mechanisms underlying how premises of a certain kind support specific conclusions. For this reason, the risk is identifying the process of invention and premise reconstruction with the invention and reconstruction of some specific arguments, however generic they can be. The distinction between the logical and the semantic-ontological levels of abstraction, drawn in Rigotti's work, suggests a new way to look at argumentation schemes. If their prototypicality is necessary somehow to provide a useful tool of argument identification, their structure can become deeper and more sophisticated by conceiving schemes as a matrix in which the logical form meets the semantic-ontological connections. Argumentation schemes become the interconnections between these two axes, allowing one to reconstruct and analyze the complex internal structure of natural arguments.

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