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LOGIC, REASONING, ARGUMENTATION: Insights from the wild

Abstract. This article provides a brief selective overview and discussion of recent research into natural language argumentation that may inform the study of human reasoning on the assumption that an episode of argumentation issues an invitation to accept a corresponding inference. As this research shows, arguers typically seek to establish new consequences based on prior information. And they typically do so *vis-à-vis* a real or an imagined opponent, or an opponent-position, in ways that remain sensitive to considerations of context, audiences, and goals. Deductively valid inferences remain a limiting case of such reasoning. In view of these insights, it may appear less surprising that allegedly “irrational” behavior can regularly be produced in experimental settings that expose subjects to standardized reasoning tasks.

Keywords: argumentation; fallacy; inference; reasoning

1. Introduction

We provide a selective overview and a brief discussion of more recent research into natural language argumentation. Insights obtained can inform the study of human reasoning on the assumption that arguments *externalize* inferences. Typically, or so this research shows, arguers seek to establish *new* consequences from prior information. Moreover, arguers typically do so in view of a real or an imagined opponent, or an opponent-position. Particular premise-conclusion-transitions may therefore be viewed to issue invitations, addressed to an interlocutor, to accept the corresponding inference. Formally, this may be modelled as a projection of linguistic form elements onto logical form elements [Pietroski,

2015]. Deductively valid inferences, where a conclusion, C , follows with logical necessity from a premise set $\{P_1, \dots, P_n\}$ remain an important limiting case. But the majority of real-life cases of reasoning and argumentation are *not readily* open to a deductive reconstruction, for various non-overt elements (aka “hidden premises”) will have been *supplied* before the inference is in fact deductively valid. Since this requires an additive intervention on behalf of analysts, such reconstructions significantly deviate from the natural language material one seeks to reconstruct. Crucially, a defeasible argument may thus be turned into a non-defeasible one.

It is a general truth that natural language argument and the episodes of reasoning that in the widest sense correspond to it — be it good or bad reasoning relative to some normative standard — are constrained by goals, contexts and audiences. Although modern logic has developed tools to model, or reconstruct, such reasoning, a strong deductive paradigm has in large parts of social psychology, philosophy, economics, and elsewhere perpetuated the view that *good* reasoning and argumentation must satisfy standards of deductive validity. This view entails that the evaluation of an episode of reasoning/argumentation as non-good, fallacious, or even irrational, may proceed without concern for the contexts in which these episodes arise naturally.

The following seeks to provide reasons why this assumption cannot be maintained without important qualifications. Besides providing an ultimately incomplete overview of major influences to the study of argumentation, we seek to explain why a decontextualized notion of validity remains deeply problematic. Often by means of providing verbatim quotes, the following touches upon Toulmin’s and Perelman’s reorientation of logic and rhetoric, respectively (Section 2.1, 2.2), particularly Toulmin’s notion of substantial argument (Section 2.3), and shows how some of his demands have been addressed by more recent contributions to logic. For many of these contributions may be read as formalizations of informal ideas conveyed in Toulmin’s (in)famous diagram (Section 2.4), e.g., in logics for defeasible reasoning (Section 2.5), but also including natural language templates for defeasible reasoning known as argumentation schemes (Section 2.6). Via Hamblin (Section 3), we reach the notion of a fallacy as a suboptimal move relative to the rules of a dialogue game (Section 3.1–3.3), and contrast this with an understanding of fallacies as reasoning errors (Section 3.4). Finally, we critically discuss some of the experimental research on reasoning in the light of the foregoing (Section 3.5), and end with a brief conclusion (Section 4).

2. Logic, reasoning, argumentation

2.1. Forbidden books

The following quote by a contemporary logician may help to appreciate the (ever somewhat tense) relation between scholars of logic and scholars of argumentation,

I have been interested for a long time in the connections or lack thereof, between logic, general argumentation theory [...] and legal reasoning [...]. And that interest came from reading ‘forbidden books’ in my days as a logic student, namely, [Chaim] Perelman & [Lucie] Olbrechts-Tyteca ((1958[1969])) and [Stephen] Toulmin (1958). Both Perelman and Toulmin knew modern logic well, and became disappointed with what it delivered in terms of understanding real [...] argumentation. Both then abandoned it in favor of other approaches (traditional rhetoric, new styles of argument analysis) in a way that created alternative schools. Both authors also looked for a counter-weight to the mathematics-centered modern logic, turning to the Law as the major other paradigm of reasoning in human culture, at least as old as mathematics. [van Bentham, 2009, 14f.]

Toulmin’s having moved away from logic, as it was predominantly practiced in the mid-20th century, thus helps explain the contemporary divide between approaches to logic and those to argumentation. Nowadays, logicians are heavily influenced by model-theory *à la* Saul Kripke, and tend to view it as an approach to natural language semantics [cf. Burgess, 2008, 2011]. Few logicians would presumably disagree that logic has since its beginnings primarily offered a generality-aspiring treatment of the *syntax* of inference, rather than treating the *substance* of particular premise-conclusion-transitions that many argumentation theorists focus on. Midway in between is the argumentation scheme-approach [see, e.g., Walton et al., 2008], where argument-templates likewise aspire to generality, but do so at the level of natural language. Though the boundaries remain blurry, genuine approaches to natural language argumentation have mostly remained non-formal. Indeed, some are outright anti-formal — a development that van Bentham criticizes. He nevertheless welcomes Toulmin’s and Perelman’s orientation towards the law having resulted in a focus on *procedural* aspects of argumentation, where ‘procedural’ most clearly refers to formalized, or regimented, aspects of argumentation such as are traditionally studied in dialectics, the area that some view as the historical origin of what is presently called ‘logic’.

As van Bentham also makes clear, some scholars had already then developed the state-of-the-art in some areas of logic beyond the mainstream version of “classical logic” against which Toulmin had critically reacted.¹ Other areas followed. In fact “[w]ith a time lag of a few decades, logic has absorbed similar ideas to Toulmin’s [notably the task-relativity of inference-validity standards], largely through meetings with computer science and artificial intelligence” [van Bentham, 2009, p. 17].

2.2. Logic and rhetoric

The influence of Toulmin’s “anti-logic book”, as some called his 1958 *The Uses of Argument*, had initially been most pronounced in rhetoric and speech communication [Conley, 1990, p. 294–296], later in discourse analysis, law, and artificial intelligence, everywhere being marked by the ubiquity of his well-known diagram (see Section 2.4). Through Jürgen Habermas’s work in political philosophy, a modified — and some say an improved [see Goodnight, 2006] — version of Toulmin’s ideas entered political science and sociology, among others. *Cum grano salis*, Toulmin and Perelman both contend that standards of argument validity, of whichever “logical breed” they may be, do at any rate depend on contexts and purposes. To say as much, Toulmin spoke of *field-dependent* forms of argument validity, where ‘field’ remained an ill-defined term variously referring to “informal practices of communicative reasoning, professional decision-making, or political advocacy” [Goodnight, 2006, p. 41]. The basic idea was that validity standards depend on the forms of life that sustain argumentation as a distinctly *social* phenomenon, thus contrasting most readily with a mathematical demonstration, or “proof,” for instance, whose validity is regularly assumed not to depend on contextual elements [cf. Aberdein and Dove, 2009; Lakatos, 2015].

As a rhetorician, Perelman preferred to not relate fields (whatever these may be exactly) to validity standards; he rather related these standards directly to human agents enacting such fields. Perelman also construed a hypothetical group of agents, the so-called “universal audience” (*auditoire universelle*), that bears out an ultimate standard of *reasonable* argumentation [see Tindale, 2004, p. 127–155]. Habermas’s

¹ Van Bentham mentions the dialogue games of Lorenz and Lorenzen [1978] which inspired the work of Barth and Krabbe [1982], which in turn inspired both the pragmatodialectical school (van Eemeren et al. [1996], van Eemeren and Grootendorst [2004]), and Walton and Krabbe [1995].

discourse ethics builds on similar ideas, which originate with Charles Sanders Peirce's notion of truth as ideal assertability [Habermas, 1996, Sect. 1.1.4] and — independently of Perelman or not — also surfaces in Karl-Otto Apel's [1975] notion of an “unbounded communication-community”. Particularly to Perelman, not only the validity of arguments, but in fact *everything about* arguments, depends on audiences, for he finds that “[s]ince argumentation aims at securing the adherence of those to whom it is addressed, it is, *in its entirety*, relative to the audience to be influenced” [Perelman and Olbrechts-Tyteca, 1969, p. 19; *italics added*].

Perelman's successor, Michel Meyer, has developed the approach of the *Brussels School of Rhetoric* so as to assign a role for the passions, which were largely absent in Perelman's work. Notably, the universal audience appears to lack any form thereof. Following an Aristotelian lead [Dow, 2015]), Meyer invokes the passions to explain *why* we argue at all, pointing to the social background against which acts of arguing take place, particularly to the hierarchies of individual and collective values organizing this background (Fig. 1). On empirical grounds some aspects of such hierarchies may arguably count as universal, for similar values have been found to be so-constituted in a variety of cultures.² Importantly, the relative importance of values appears to shift not so much across *but within cultures*, as a function of age or social standing [Schwartz, 1994, 2012; Schwartz and Bardi, 2001; see Hofstede, 2001]. It should be obvious how including passions and values, and giving them a functional role in argumentation, shifts attention away from standards that are presumed to transcend contexts, such as the bivalence principle, ‘*p* or not *p*’, or the law of non-contradiction, ‘not (*p* and not *p*)’.

² Arranged into four main categories, Schwartz and Bardi [2001] postulate ten basic values. Pairwise, these give expression to value-conflicts that pursuing specific actions may generate. (1) Self-Direction: *Independent thought and action*, choosing, creating, exploring; *Stimulation* — Excitement, novelty, and challenge in life; (2) Self-enhancement: *Hedonism* — Pleasure or sensuous gratification for oneself; *Achievement* — Personal success through demonstrating competence according to social standards; *Power* — Social status and prestige, control or dominance over people and resources. (3) Conservation: *Security* — Safety, harmony, and stability of society, of relationships, and of self; *Conformity* — Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms; *Tradition* — Respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides; (4) Self-transcendence: *Benevolence* — Preserving and enhancing the welfare of those with whom one is in frequent personal contact (the ‘in-group’); *Universalism* — Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature.

	Ethos	Logos	Pathos
Collective values (They present themselves as nonproblematic. Rhetoric dominates, as if what is presented was obvious.)	The difference between life and death (life)	The difference between male and female (nature)	The difference between parents and children (family)
	Physical goods (health, the body, respect for aged people)	Economic goods	Political goods (norms)
	Personal ends (salvation, pleasure, ethical and aesthetic interests)	External ends (economic interests)	Social ends (general interests, the value of persons)
Equilibrium point between the collective and the individual	Identity	Negotiation	Difference
Individual standpoints (problematicity increases with individual values)	Status	Income	Power
	Rights (liberty)	Power	Duties
	Desires	Needs	Pleasures
	Virtues	Capacities	Passions
	Opinions (individual knowledge, implications)	Facts (signs, causes)	Questions

Figure 1. Table of values [Meyer, 2010, p. 413]

For Meyer, then, “rhetoric is the negotiation of the distance (or difference) between individuals (*ethos* and *pathos*) on a given question (given through *logos*)” [Meyer, 2010, p. 408]. So for any question or issue that can be settled, or treated, *in more than one way*, one may associate what in analogy to the law might be called ‘proof standards’, to decide if a specific act of arguing is valid, permissible, or reasonable, while another such act isn’t. Argument validity thus becomes dependent on, or derivative to, the *question* to be addressed, or the issue to be treated. (Also see Jaako Hintikka’s logic of questions [Harrah, 1987].)

2.3. Toulmin’s notion of substantial argument

Like Perelman, Toulmin stressed procedural aspects of argumentation, focusing on the law as a comparatively regimented, institutionalized

sphere of argumentation.³ Here, he hoped to obtain insights into the latter of two aspects he distinguished in argumentation: the *analytical* and the *non-analytical*, or *substantial*. For in his view, the logic of his time could only inform the analytical aspect.

Jurisprudence is one subject which has always embraced a part of logic within its scope [...]. If the same as has long been done for legal arguments were done for arguments of other types, logic would make great strides forward. Throughout human history, the study of human reasoning and argumentation has had two aims: (1) formal analyses of the inner links among the various statements in an ‘argument’ or chain of reasoning, (2) informal analyses of the ways in which the solidity of an argument [...] related to the features of the occasion on which, and the audience for which, it is presented. From the mid-17th Century, Modern Philosophers regarded formal issues as central – not least, because they could be discussed in general, ‘decontextual’ terms. So logic became equated with formal logic. [...] If we need, today [1992], to redress the balance between formal logic and rhetoric [or informal logic], theory and practice, or the ‘analytical’ and ‘non analytical’ aspects of human reasoning, this is because those two broad areas of intellectual inquiry were put out of balance in the 17th century. [Toulmin, 1992, p. 5]

To put this quotation in perspective, the 17th century is widely recognized to mark the onset of reorienting the classical and medieval logical traditions. From the Renaissance onwards, “[t]he modern era saw major changes not only in the external appearance of logical writings but also in the purposes of logic,” which in Aristotelian scholarship was viewed as “a theory of ideal human reasoning and inference that also had clear pedagogical value,” wherefore it was natural that “[e]arly modern logicians stressed what they called ‘dialectics’ (or ‘rhetoric’), because ‘logic’ had come to mean an elaborate scholastic theory of reasoning that was not always directed toward improving reasoning” [Hintikka and Spade, 2012, p. 12]. Moreover,

[a] related goal was to extend the scope of human reasoning beyond textbook syllogistic theory and to acknowledge that there were important kinds of valid inference that could not be formulated in traditional

³ Meyer [2010, p. 406] lists the following among Perelman’s basic tenets on rhetoric: “Agreement is always relative and ambiguous, often based on misunderstanding or the use of fuzzy notions with which everybody agrees. Only in court can and must real conflicts be resolved. Legal reasoning is then *the* model of rhetoric.” For a brief synopsis of Perelman and Olbrechts-Tyteca [1969], see Conley [1990, p. 296–299].

Aristotelian syllogistic. But another part of the rejection of Aristotelian logic (broadly conceived to include scholastic logic) is best explained by the changing and quite new goals that logic took on in the modern era. One such goal was the development of an ideal logical language that naturally expressed ideal thought and was more precise than natural languages. Another goal was to develop methods of thinking and discovery that would accelerate or improve human thought or would allow its replacement by mechanical devices. Whereas Aristotelian logic had seen itself as a tool for training ‘natural’ abilities at reasoning, later logics proposed vastly improving meagre and wavering human tendencies and abilities. [Hintikka and Spade, 2012, p. 12]

In more modern terms, non-analytical (or substantial) arguments remain *defeasible*. Logically speaking, such arguments instantiate a *non-monotonic* consequence relation.⁴ On Toulmin’s ‘DATA, WARRANT, *ergo* CLAIM’-schema (see Sect. 2.4), by contrast, the warrant of an analytical argument includes, explicitly or implicitly, information that is conveyed in the claim. Generally, “[t]his distinction, between data [or fact] and warrants, is similar to the distinction drawn in the law-courts between questions of fact and questions of law [...]” [Toulmin, 1958, p. 100]. For instance: ‘Anne is one of Jack’s sisters (DATA). All Jack’s sisters have red hair (WARRANT). *So*, Anne has red hair (CLAIM)’. In a *substantial* argument, by contrast, the relation between warrant and conclusion is not of this inclusive kind. In most contexts, for instance, the following will normally *not* be considered unacceptable, or invalid: “It feels cold in here (DATA). The thermometer reads 15 degrees Celsius (WARRANT). *So*, we should turn on the heat (CLAIM)’.⁵

⁴ An inference which a natural language argument invites a hearer to accept maps onto a *monotonic* consequence relation if, besides the conditions of *transitivity* and *reflexivity*, also *monotonicity* obtains. This demands that the conclusion, *C*, of a set of premises $\{P_1, \dots, P_n\}$ remain the same upon strengthening the set by adding a premise P_{n+1} , and does hold for what Toulmin called ‘analytical arguments’. By contrast, a *non-monotonic* consequence relation is had if premise strengthening (e.g., adding a premise that reports an exception to a rule) suffices to modify the content of the conclusion in view of an otherwise stable premise set [see Gabbay and Woods, 2002, 452f.; Strasser and Antonelli, 2016].

⁵ These characterizations should not be read as *definitions* of analytical or substantial argument, respectively. (They might provide necessary conditions, nevertheless.) See [Hamby, 2012] for the definitional problems Toulmin left behind. By and large, Toulmin’s “examples [of substantial arguments] all point to the idea that a conclusion may be reached legitimately, even if it is not [deductively] entailed formally” [Hamby, 2012, p. 130].

This example should have made clear that, insofar as a substantial argument such as the above is normally *not* considered invalid, deductively valid inference is of limited use as an abstract schema, or standard, in order to answer the question what it is that renders some natural language arguments valid, although the most faithful reconstruction renders them *deductively invalid*. Most mathematical proofs and clear-cut legal cases aside,⁶ arguers normally seek to establish, or conclude, information that is *new* relative to the premise set, i.e., to establish content *not* formally contained in that set. And so Toulmin was perfectly right to observe that,

[i]f the purpose of an argument is to establish conclusions about which we are not entirely confident by relating them back to other information about which we have greater assurance, it begins to be a little doubtful whether any genuine, practical argument could ever be properly analytic.’ [Toulmin, 1958, p. 126]

Here, ‘new information’ may be understood in at least two ways: the term pertains to *semantic content* whenever the conclusion materially differs from the premise set, in the sense that what C expresses is not already expressed by $\{P_1, \dots, P_n\}$. Alternatively, it pertains to the extent to which a conclusion is supported, in the sense that $P_0(C) < P_1(C) = P(C|P_1, \dots, P_n)$.⁷ The great majority of natural language arguments, then, deal with content-enlarging inference, and so constitute instances of *ampliative reasoning*. By and large, Toulmin called these cases ‘substantial arguments’. So his task was to elucidate conditions under which substantial arguments are valid, for which he

⁶ Though some proceed by induction, mathematical proofs tend to be deductively valid, if they are valid at all. So conclusions follow with logical necessity from the premise set. See [Aberdein and Dove, 2009] for the genuinely argumentative element in mathematical proof. Further, the standard model of applying a legal norm to a fact is *subsumption*, viz., a demonstration that the antecedent of a norm is instantiated by a description of a state of affairs, so as to derive (via *modus ponens*) the sanction that this norm describes. Weighing several such norms may also be understood as subsumption, given further assumptions [see Alexy, 2003].

⁷ With ‘ P ’ for probability, when subjectively interpreted ‘ $P_0(C)$ ’ abbreviates the *prior* degree of belief, or credence, in the conclusion, C , irrespective of the premise set, and ‘ P_1 ’ abbreviates the *posterior* credence in C , which is given as the conditional credence in C given the premise set, $P(C|P_1, \dots, P_n)$. For these interpretations of the probability calculus see Korb [2004], Hahn and Oaksford [2006a,b]. Godden and Zenker [2016] apply such expressions to study the RSA-criteria of informal logic (see Sect. 3).

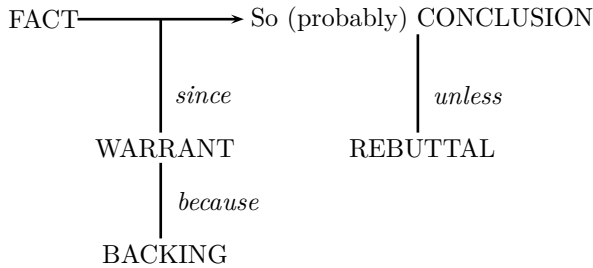


Figure 2. Toulmin diagram [Toulmin, 1958, p. 105]

sought inspiration in the law. Admittedly, he went about this task — do notice the phrase “from scratch,” below — in what was perhaps not the most historically-aware manner.

What, then, is involved in establishing conclusions by the production of arguments? Can we, by considering this question in a general form, build up from scratch a pattern of analysis which will do justice to all the distinctions which proper procedure forces upon us?

[Toulmin, 1958, 97f]

2.4. The Toulmin diagram

For better or worse, the pattern of analysis in Fig. 2, also known as the ‘Toulmin diagram’, became his most lasting contribution to argumentation studies, and is presently a standard in various academic departments. Normally six elements are distinguished: DATA (FACT); WARRANT, BACKING, REBUTTAL, CONCLUSION INDICATOR, CONCLUSION.

Mentally rotating Fig. 2 clockwise by 90 degrees, while leaving BACKING and REBUTTAL empty and suspending ‘probably’ from the CONCLUSION INDICATOR, immediately recovers an analogue to the classical ‘Major Premise, Minor Premise, *ergo* Conclusion’-schema. Properly saturated with natural language material, this yields a case of *deductive inference* (e.g., All men are mortal; Socrates is a man; Socrates is mortal).⁸ Further, adding ‘probably’ to the CONCLUSION INDICATOR yields

⁸ Toulmin’s [1958] standard example for the full scheme, below, is similar in content, but “unpacks” what in the Socrates-example would require to express, as a BACKING, something like: ‘it is a natural regularity that humans don’t live forever’, and mentioning as an EXCEPTION the case of a ‘supernatural human being’. The

a case of *inductive inference* (which may generally serve as a cover term for *all* forms of non-deductive inference [see Spohn, 2012]). Yet further, allowing for a REBUTTAL element yields a case of defeasible reasoning, e.g., as in default logic (see below). Finally, understanding the BACKING to provide a reason for (the acceptability of) the WARRANT yields iteration as a possibility, i.e., the entire schema can occur in the place of the BACKING until support or justification stops, conventionally or otherwise.

2.5. Defaults and defeaters

We now briefly look at Reiter's [1980] *default logic* and Pollock's [1987; 1995] *defeaters* as examples of formalisms that, as van Bentham had put it, "absorbed similar ideas to Toulmin's." Both examples standardly count as work originating in artificial intelligence, being discussed in detail by Verheij [2009]. Importantly, both examples are *formal* elaborations of *informal* ideas discussed by Toulmin.

[I]n Reiter's work two important ideas defended by Toulmin recur in a formal version. The first is the idea of defeasibility. [...] Reiter's defaults are a kind of generalized rules of inference, but of a defeasible kind. [Secondly,] defaults are contingent rules of inference [...], in Reiter's approach, defaults are part of the theory from which consequences can be drawn, side by side with the other, factual, information. One can therefore say that Toulmin's creed that standards of reasoning are field-dependent has found a place in Reiter's work.

[Verheij, 2009, p. 227]

More formally, *modulo* the qualifier and the backing element, Verheij exemplifies this with the following set-up:

t Harry
d(t) Harry was born in Bermuda
c(t) Harry is a British subject
r₁(t) Both his parents were aliens
r₂(t) He became a naturalized American

example is as follows: (DATA) Harry was born in Bermuda, (CONCLUSION INDICATOR) therefore (CONCLUSION) Harry is a British subject, unless (REBUTTAL) both of his parents were aliens or he has become a naturalized America, since (WARRANT) a man born in Bermuda will be a British subject, because (BACKING) the following states and other legal provisions:

When expressed in Reiter's [1980] default logic, this yields the following general form of a default, $d(x): M\neg r_1(x), M\neg r_2(x) \text{ ergo } c(x)$, and the default instance, $d(t) : M\neg r_1(t), M\neg r_2(t) \text{ ergo } c(t)$. In words: the conclusion, $c(t)$, is derivable from the premise $d(t)$ provided the reasons r_1 and r_2 are *false*. As Verheij observes, (i) Reiter's formalization allows for generic *and* specific warrants, e.g., some male *vs.* Harry being born in Bermuda makes him a British citizen; (ii) not only single sentences, but conjunctions or disjunctions can be treated; and (iii) all elements of Toulmin's schema may be the CLAIM of another such schema (iteration).

In view of Toulmin's work, Pollock's [1987; 1995] major contribution is to have made the REBUTTAL element more precise by distinguishing two kinds of defeaters: *undercutting defeaters*, according to Pollock, attack the inferential link between premises and conclusion; *rebutting defeaters* provide reasons to negate the conclusion. Generally, Pollock views premises as *prima facie* reasons for a conclusion.⁹ So upon adding undercutting and rebutting defeaters, the old premise-set may no longer support the conclusion at all, or may no longer support it to the same degree.

2.6. Argument Schemes

Related work in artificial intelligence has given rise to various computational approaches to argumentation that offer tools which aid analysts in reconstructing natural language argumentation — often based on argumentation schemes [e.g., Walton et al., 2008], and in principle up to the level of controversies [Betz, 2012]. Argument schemes can be viewed as analogues to Toulmin's more abstract notion of a *warrant* (see Sect. 2.4), and to provide a modern version of the *topics*. Importantly, schemes are said to be context-dependent, concrete, and defeasible (rather than universal, abstract, and strict).

Moreover, each scheme comes with associated critical questions that assist analysts and arguers alike in evaluating, and in producing, scheme-instances. For instance, consider this version of Walton's [2010] expert-opinion scheme.

⁹ See [Spohn, 2002] for a critique of the controversial, but within Pollock's own system indispensable epistemological assumption, according to which whatever appears to agent to have some property, e.g., the property of being red, is, without much further ado by that agent believed to *in fact* have that property, i.e., to *be* red.

Explicit Premise: Source E is an expert in subject domain S containing proposition A.

Explicit Premise: E asserts that proposition A (in domain S) is true (false).

Conditional Premise: If source E is an expert in subject domain S containing proposition A and E says that A is true then A may plausibly be taken to be true (false).

Conclusion: A is true (false).

Associated to this scheme are critical questions such as the following, each of which comes with further sub-questions, whose exhaustiveness remains a matter of scholarly disagreement [see [Hahn and Hornikx, 2016](#); [Harris et al., 2016](#)]. These questions can naturally be read to occur in the position of Toulmin's REBUTTAL element or, when phrased as assertions, i.e., as answers, in the BACKING:

CQ1: Expertise Question. How credible is E as an expert source?

CQ2: Field Question. Is E an expert in the field that A is in?

CQ3: Opinion Question. What did E assert that implies A?

CQ4: Trustworthiness Question. Is E personally reliable as a source?

CQ5: Consistency Question. Is A consistent with what other experts assert?

CQ6: Backup Evidence Question. Is E's assertion based on evidence?

Though we cannot hope to give a complete overview of related formal work, Toulmin's wishes regarding a "redressing of the balance" have by and large been met by developments in formal and informal logic. In formal logic, however, this did rarely occur with explicit reference to Toulmin, whose role in this process therefore remains somewhat unclear. At any rate, the reconstruction of natural language argumentation can today draw on a variety of more or less related logical systems, or *logics*, including several we have not touched upon, e.g., the currently "trending" Bayesian approach, dynamic epistemic logic, or logics for belief revision. The same can be said for argumentation in a dialogue setting, for which formal systems have also been developed (see below).

2.7. Informal logic

In contrast to a somewhat dogmatic belief in *deductive validity* as a normative standard (see Sect. 3), moreover, it is today widely accepted that argument reconstruction and evaluation requires recourse to the

context, to the arguers' goals, and the attitudes of audiences.¹⁰ This becomes relevant whenever the question is addressed whether a reason-claim complex deserves to be called *valid*, or *cogent*, in a sense that differs from deductive validity, which of course continues to apply as a standard for Toulmin's analytical arguments. To provide a well-motivated assessment of this aspect of natural language arguments was one among the goals of the then-arising *informal logic* approach [Blair, 2011; Groarke, 2016]. Two of its founders, Ralph Johnson and Anthony Blair, describe their motivation as follows:

We [Johnson & Blair] were interested in something other than just the judgment of valid/invalid, or sound/unsound; we were interested in more complex ways of thinking about arguments, how to interpret them, how to understand their structure, and also how to evaluate and criticize arguments. [Johnson, 2011, p. 29]

These "more complex ways of thinking about arguments" did naturally lead to a resurgence of interest in the *fallacies*, to which we now turn.

3. Fallacies

3.1. De-contextualization

As we saw in Section 2, *substantial* arguments are at the focus of the study of natural language argumentation. And insofar as an episode of argumentation may be viewed to externalize a corresponding episode of reasoning, the focus is on *ampliative reasoning* rather than on content- or information-preserving transitions. For instance in court, at the workplace, or in a private discussion, arguers typically seek to establish new information *vis-à-vis* an imagined or a real opponent. That opponent may express doubt, or voice opposition, with regard to the conclusion aimed at, the premises invoked, the manner of construing the support relation, or the strength of the support being achieved. This is to say that proponent and opponent exercise mutual control over how the validity of a conclusion is established in a dialogue.

¹⁰ Deduction is nevertheless unsurpassed as a standard of criticism, for a deductive reconstruction assists in isolating the support-contribution of *single* premises towards the conclusion. Moreover, simply taking the conjunction of premises offered in support of a conclusion, and asking whether 'these premises deductively imply the conclusion' is an *acceptable claim*, provides perhaps the quickest way of diagnosing the quality of the support relation at hand.

Since classical times, certain ways of establishing conclusions were viewed as being deficient, or *fallacious*. Various more or less systematic examples of fallacies, and even something of a nomenclature, became established. But fallacies were broadly presented in ways that remained independent of considering the context in which they arise. This de-contextualized notion incurs interpretative challenges once contextual information is supplied and varied. As Walton reports his experiences in the 1970s:

Those of us, like me, who were asked or told by their departments to teach a section of logic on the subject of fallacies before or during the early seventies felt the impact of the [then] current state of knowledge in this area quite dramatically. Our more serious and gifted students pointed out to us, with some regularity and sometimes with satisfaction, that the examples of ‘fallacious’ arguments we were using were just not convincing. This was a sobering challenge to young and serious instructors, armed only with the given knowledge in their field. How could you convince your students that here was a field worth taking seriously? [Walton, 1991, p. 356]

Crudely put, under specification of some background conditions (i.e., in some context), or under some content conditions (e.g., when the relevant probability values are “right”), an alleged fallacy was *rather not* deficient. The expert opinion scheme (Sect. 2.5), for instance, is also known as the *ad verecundiam* fallacy. It counts as a deficient way of establishing *the truth* of a conclusion, come what may, for the simple reason that experts may at times err. So it cannot suffice to quote an expert who claims p in order to establish p as true. Nevertheless, in contexts such as a medical consultation, for instance, the expert claiming p regularly suffices to establish p as *acceptable* (not true).

To give another example, *denying the antecedent* (DA) and *affirming the consequent* (AC) rightly count as logical fallacies, given that classical logic provides the normative standard. When evaluating particular content-saturations of AC and DA structures against the standard of probability theory, however, the validity of such arguments is seen to depend on the *specific* probability values that are assigned to premises and conclusion [see Floridi, 2009; Godden and Zenker, 2015; Hahn and Oaksford, 2006a,b]). Notice that, on a probabilistic account, validity judgements do *not* seem to vary with contexts, but depend only on the probability values assigned to argument contents. Since the relevant probabilities often enough cannot be readily interpreted as long-run fre-

quencies, they are rather taken to represent subjective credences. In such cases, then, validity *fully* depends on prior beliefs of speakers and audiences (see Perelman on audience relativity in Sect. 2.2).

3.2. Hamblin's dialogical treatment

The need for renewed scholarly interest in the fallacies is echoed in the infamous quote from the opening pages of Hamblin's book *Fallacies* [1970], which marked a reorientation towards more systematic treatments. Hamblin's work strongly influenced those who developed formal dialogue systems, notably in AI, which in turn influenced philosophical logic.

The truth is that nobody, these days [1970s], is particularly satisfied with this corner of logic. The traditional treatment is too unsystematic for modern tastes. Yet to dispense with it, as some writers do, is to leave a gap that no one knows how to fill. We have no theory of fallacy at all, in the sense in which we have theories of correct reasoning or inference. Yet we feel the need to ticket and tabulate certain kinds of fallacious inference-process which introduce considerations falling outside the other topics in our logic-books. [Hamblin, 1970, p. 11]

Insofar as a fallacy arises in an argumentative dialogue, the formal treatment of dialogues allowed for a more systematic approach both to identifying fallacies and to explaining the sense in which fallacies are *deficient* argumentative moves, relative to the (conventional, instrumental, moral, or other) rules governing some dialogue game.

On Hamblin's model, which can be called a dialectical model in historical perspective, a disputed claim is shown to be acceptable if the arguments both for and against it are brought forward and allowed to interact with each other in a rule-governed dialogue in which it is shown that the pro side has the stronger argument. [T]wo participants interact [...] in a dialogue in which each takes turns making moves in the form of speech acts, such as making an assertion or putting forward an argument [or asking a question]. Each party has a commitment set and as moves are made, propositions are inserted into or retracted from each set. A commitment is a proposition that an agent has gone on record as accepting, and hence the two terms 'commitment' and 'acceptance' are very close to being equivalent in meaning.

[Walton and Johnson, 2011, p. iii]

Proponent	Opponent
1. Why S ?	Because T is true, and T implies S .
2. Why should I accept T ?	Because U is true, and U implies T .
3. I do accept U .	Do you accept T ?
4. Yes.	Do you accept S ?
5. No.	But you must, because T implies S .

Figure 3. Simple dialogue tableau

Such dialogue models are inspired by scholastic *obligations* games [Spade and Yrjönsuuri, 2014], and also provide a contrast to belief-desire-intention models of human behavior. For a commitment is publicly incurred through a speech act; it *need not* reflect what an agent believes, desires, and intents, or not. Dialogue models distinguish between *frame* and *particle rules*, such that: “particle rules impose restrictions on how to attack propositions and how to defend oneself against such attacks”, while frame rules “impose restrictions on when attacks and defences may take place in the dialogue” [Ehrensberger and Zinn, 2011, p. 2]. When chosen suitably, for instance classically or intuitionistically valid arguments can be modeled, giving rise to the notion of *dialogical validity*. Importantly, when dialogues are treated as games with a fixed set of rules, then players either do, or do not, have a “winning strategy” against their opponents. So a proponent whose position is favored by such a strategy may always bring an opponent to either concede the proponent’s conclusion, or can demonstrate that the opponent violates at least one game-rule. Jacot, Genot, and Zenker [2016] show how this can play out for classical first order logic, even when *explicit* “logical rules” are not introduced.

Depicted in Fig. 3 is a simple example of such a game, laid out in a Hamblin-style tableau. The respondent (or opponent) *would* “win” at the end of the last row, because the proponent must accept proposition S , provided she agrees that T does imply S (which this tableau leaves implicit), for she does accept T in line 4.

From here, it is but a small step to the insight that systematic variation of a dialogue game’s rules can yield a typology of dialogues, such that each dialogue type has distinct validity norms. For instance, an acceptable move in a *negotiation* dialogue (where, e.g., premise truth is normally less important than the outcome of the negotiation) need not be an acceptable move in a *deliberation* dialogue (where proposals may

be rejected when they are based on false premises). Though the empirical basis of dialogue typologies has remained a matter of disagreement, [Walton and Krabbe \[1995\]](#) distinguish the following types:

Type of dialogue	Initial situation	Participant's goals	Goal of dialogue
Persuasion	Conflict of Opinion	Persuade other party	Resolve or clarify issue
Inquiry	Need to have proof	Find and verify evidence	Prove (disprove) hypothesis
Negotiation	Conflict of Interest	Get what you most want	Reasonable settlement both can live with
Information seeking	Need information	Acquire or give information	Exchange information
Deliberation	Dilemma or practical choice	Coordinate goals and actions	Decide best available course of action
Eristic	Personal conflict	Verbally hit out at opponent	Reveal deeper basis of conflict

Figure 4. Dialogue types [Walton and Krabbe \[1995, p. 66\]](#)

Similar in spirit, but different in detail, [van Eemeren \[2000, p. 143\]](#) offers a range of *communicative activity types* which implement the following seven genres of communicative activity: adjudication, deliberation, mediation, negotiation, consultation, disputation, promotion, communion. These genres, in turn, fall into the domains of legal, political, problem-solving, diplomatic, medical, scholarly, commercial, and interpersonal communication. His notion of a communicative activity type is obviously related to that of a dialogue type, for also activity types are bound by social, cultural, or institutional norms and conventions.

Unlike on Walton's views, where a right and a wrong way of applying a particular argumentation scheme once will, and once will not, result in a fallacy, these conventions become relevant to fallacy judgments, because:

[m]ore often than not, fallacy judgments are in the end contextual judgments that depend on the specific circumstances of situated argumentative acting. The criteria for determining whether or not a certain

norm for critical discussion has been violated may be dependent on the institutional conventions of the ‘argumentative activity type’ concerned, that is, on how argumentative discourse is disciplined in a particular sort of case. [van Eemeren et al., 2012, p. 39]

3.3. Fallacies as suboptimal moves

It now becomes possible to identify fallacies — which arise as part of a dialogue, or as part of a communicative activity — by referencing the procedural rules that govern said dialogues or activities, or the properties of the argument forms that feature in them. A fallacy then *is* a violation of some rule or of some argumentation scheme. For instance, Walton sees fallacies arising whenever participants “twist” an argumentation-scheme (e.g., when a defeasible scheme is presented as a non-defeasible one), or when a dialectical shift occurs (from one dialogue type to the another, in which different rules obtain), or when an aggressive attempt is made at putting the proponent into an unjustified, advantageous position (e.g., by shifting the burden of proof, or by attacking the character of the opponent although the matter at hand does not depend on her character).

Similar to Walton’s view, but from the theoretical viewpoint of the pragma-dialectical theory of argumentation, van Eemeren and Grootendorst [2004] view fallacies as violations of the rules for a critical discussion relative to four discussion stages (confrontation, opening, argumentation, and concluding stage). More recently, this theory has been extended to not only *identify* fallacies, which is what its standard version had already allowed. Among others, the extended version also offers a functional explanation *why* fallacies occur. Roughly, one assumes that arguers seek to balance a *rhetorical* goal — viz. to decide a difference of opinion in one’s favor — and a *dialectical* goal — to appear reasonable *vis-à-vis* one’s opponent and one’s (single or multiple) audience. Fallacies thus arise when the rhetorical goal (to “win”) and the dialectical goal (to maintain an impression of reasonableness) are in conflict, and the former is pursued at the expense of the latter.

Importantly, the fallacies thus become contextual, which provides one way of accounting for the observation that they have an *inconspicuous persuasiveness* about them. Simply put, each fallacy, F, is the “evil cousin” of a good dialectical move, so that F may be permissible under different constraints, rules, or in different contexts. For instance, the

pragma-dialectical theory regards an *ad hominem* attack¹¹ as an impermissible dialogue move *only* in the confrontation stage of a discussion, where the aim is to bring out the difference of opinion between interlocutors. Yet, at *this* stage, arguing *ad hominem* is fit to frustrate that aim. In the argumentation stage, by contrast, an *ad hominem* is not generally viewed as fallacious, for some differences of opinion do pivot on the character of interlocutors [Zenker, 2011].

To give another example, consider the *ad ignorantiam* fallacy, i.e., an argument that trades on the following assumption:

(A) If p is not known to be true (false), then p is false (true).

Provided the *closed world assumption* (CWA) applies in the relevant context, an argument based on (A) comes out as deductively valid. CWA is used for instance in Reiter’s default logic, and there allows arriving at a conclusion based only on what an agent (or a database) has registered as true (false) at a given moment, rather than having to investigate what has not been registered yet. Should the CWA not hold, then an argument based on (A) may be stronger or weaker. So an *ad ignorantiam* need not always be fallacious; rather, its strength depends on the particular case. Similar results are obtained in the Bayesian approach, mentioned above, where the validity of specific scheme-saturations — when probabilistically construed — depends on the probabilities that speakers and audiences assign to premises and conclusions.

The fallacies were thus “relocated” from logic, where they had come to lead the disparately organized existence that Hamblin criticized (see above), to language pragmatics. In fact, the fallacies thus “returned” to their ancient origin in dialectics. In sum, on the above theories, fallacies need no longer be viewed as externalized *errors of internal reasoning*, but can be viewed as suboptimal game-moves relative to the norms or conventions that (should) regulate the pursuit of relevant goals.

¹¹ With an *ad hominem* argument, a proponent seeks to establish that an opponent’s claim, C , is unacceptable, because either (i) the proponent of C has committed herself to *non C* (*tu quoque* variant); or because (ii) the proponent of C would benefit from C being accepted (circumstantial variant); or because of other characteristics of the proponent, such as beating his children, or being cruel to animals, etc. (personal attack). See [Zenker, 2011] for the second variant and its role in expert disagreement featuring in a public as opposed to a scientific context.

3.4. Reasoning errors

It is nevertheless fair to say that the above view on the fallacies has rather not had a strong impact on neighboring academic fields. Thus, consider the standard use of ‘fallacy’ in the heuristics and biases research tradition in psychology and cognitive science. By now, most any term has been fronted to form, e.g., ‘base rate fallacy’, ‘planning fallacy’, ‘conjunction fallacy’, ‘sunk cost fallacy’, etc. In each case, the term ‘fallacy’ denotes a cognitive (and in other cases a social) *deficiency*, i.e., an *error* relative to such normative standards as Pascalian probability theory for the infamous Linda problem, or deductive logic for the equally infamous Wason-selection task [see [Evans, 2002](#); [Kahneman, 2011](#); cf. [Hahn and Harris, 2014](#); [Oaksford and Chater, 1991](#)]. But this view now appears somewhat unfortunate, for already [Hamblin \[1970\]](#) had suggested to trade a deductive for a dialogical treatment of the fallacies. At any rate, he abandoned the idea that fallacies are errors of reasoning, rather holding that “[a] fallacy is a fallacious argument. Someone who merely makes false statements, however absurd, is innocent of fallacy unless the statements constitute or express an argument” [[Hamblin, 1970](#), chapter 7]. This obviously ties ‘fallacy’ to what is for the most part a genuinely *social* activity, viz. arguing with others.

[Walton \[2010\]](#) has offered to explain the deceptive character of a fallacious argument – its appearing “to be a better argument of its kind than it really is”, a formulation that [Hansen \[2002, p. 152\]](#) proposed to improve upon Hamblin’s perhaps rather ill-chosen characterization¹² – by invoking heuristics (“mental short cuts”). For this purpose, heuristics are equated with *incomplete* argumentation schemes, or *paraschemes*. Paraschemes lack some element of a full argument scheme which, if present, would make the argument better than it in fact is, for in-

¹² [Hamblin \[1970, p. 12\]](#) states that “[a] fallacious argument, as almost every account from Aristotle onwards tells you, is one that *seems to be valid* but *is not so*” (his italics). Among the better known issues with this characterization are the following: first, as [Hansen \[2002\]](#) documents, a good many logic textbooks published before Hamblin’s *Fallacies* simply do *not* tell as much. Second, for instance a threat (*ad baculum*) may well count as a fallacious dialogical move, but is not an argument in any standard sense. Third, if ‘valid’ is interpreted as ‘deductively valid’, then a circular argument (*petitio principii*) is fallacious despite *being* deductively valid, rather than *seeming* to be valid. Finally, the psychological ‘seeming’ is less helpful when attempting to construct a general theory of the fallacies, for things rarely seem to be the same to everyone. See [[Walton, 2010, 179f](#)] for a brief discussion.

stance by answering pertinent critical questions (see above). Hence, “[t]he parascheme [presumably] helps to explain why an argument seems better than it is, because it represents a heuristic that is a very natural way of unreflective thinking” [Walton, 2010, p. 181].

Walton here provides a *real* explanation-candidate, both for the occurrence of fallacies and the related observation that they tend to be inconspicuously persuasive, which invokes man’s *bounded rationality*, viz. being adapted only to *particular* rather than all contexts or ecological niches [Gigerenzer and Sturm, 2012; Gigerenzer et al., 1999; Simon, 1948, 1982]. Also referred to as the standard of reasoning in fact endorsed “in the wild”, or what Woods et al. [2002, p. 2] call “reasoning on the hoof”, such reasoning does by definition fall short of complete information and perfect modes of inference. Recognition of ecological rationality may in turn provide some support for the very endeavor launched by Toulmin, Perelman, and Hamblin, among others. As indicated above, also the *informal logic* movement downplayed the status of deductive validity as a normative standard for everyday argumentation. But as Johnson [2011] submits, this attempt has been rather unsuccessful so far.

In a paper for the 1998 World Congress of Philosophy, Blair and I unpacked some of the implications for philosophy of the Informal Logic Initiative, one of which we identified as ‘the end of deductivism’. [W]e did not attempt a definition but rather identified deductivism by the pithy saying attributed to MacIntyre — ‘all inference is either deductive or defective.’ Still it seems that we were premature in our announcement. For deductivism appears to be alive and well.

[Johnson, 2011, p. 17]

Johnson here refers to a view more commonly held in philosophy departments, for instance, and finds that deductivism is “seemingly hard-wired into logic” [Johnson, 2011, p. 19], calling logic the alleged gold standard for good arguments. Though this dogma has been fading with more recent applications of probability theory to natural language argument, a similar dogma would appear to be alive and well in some areas of experimental social psychology and cognitive science, a dogma that extends well beyond endorsing deductivism. For despite having been criticized, the choice of *any* normative standard that is used in experimental reasoning tasks (deductive or inductive) has often been treated as unproblematic — which, however, it is not.¹³

¹³ Particularly Stenning and van Lambalgen [2008] stress the importance of *rea-*

3.5. Normative standards

Although not always with respect to argument production or evaluation, the dogma regularly produces experimental setups that lead to results which have, with notable exception [Gigerenzer and Sturm, 2012; Oaksford and Chater, 1991; Stanovich, 1999, e.g.], been interpreted as evidence that human reasoning capacities are *not* closely attuned to the normative standard that is treated as correct.¹⁴ Moreover, such tasks are normally administered in low stake contexts, under conditions of high social trust, using mostly abstract contents, and mostly WEIRD samples (Western, Educated, Industrialized, Rich, Democratic [see Henrich et al., 2010]).

One may interpret, and then use, such results in at least two ways. On the one hand, much like Walton above had offered to integrate the use of heuristics with the occurrence of fallacies, one may claim on empirical grounds that the prevalence of deductive reasoning in the “wild,” as compared to inductive reasoning, is rather low. Support for this claim comes from a wide range of experiments constructed in such a way that, if subjects were to display the experimenter-expected behavior, then deductive logical capacities would be confirmed. The Wason selection task and the Linda problem have been widely interpreted in this narrow way. However, deductive logical capacities are rarely displayed, because — this is the perhaps most basic insight from this research — most participants do *not* construct (mental-)models where premises are assigned the value FALSE, which is what good logicians must ever do. Rather, lay reasoners seem to prefer models where the premises are true, which mirrors that the uttering of falsities is the pragmatically marked case. Indeed,

[i]f participants are instructed (as they traditionally are) to reason only on the basis of information given and to draw only conclusions that are logically necessary, then they are often being set up to fail, because

soning to an interpretation, rather than reasoning from an interpretation. Oddly enough, participants were seemingly thought to only do the latter, an assumption that is severely undermined by participants’ verbatim protocols.

¹⁴ Also see [Mercier and Sperber, 2011] for the view that reasoning has evolved for purposes of arguing with others, rather than *vice versa*. This view in fact embraces such “deviant” results, and attempts to provide an evolutionary account under which these results are “natural.” A related view, summarized in [Evans, 2008], has come to postulate two modes (or two systems) of reasoning: a heuristic and a deliberative one. See [Zenker and Dahlman, 2016] and references provided there, and [Frankish and Evans, 2009] for historical ancestors of this view.

they are asked to discard everyday reasoning processes that are both pragmatic and probabilistic or to disregard the ordinary meaning of the terms used to describe logical relationships. [Evans, 2002, p. 992]

An alternative interpretation to logical deficiency among humans is thus provided by a more critical stance towards presupposing the particular normative standard in an experimental task as an item that is *somehow given*, be it deductive validity, probabilistic validity, or “utilitarian validity” (to perhaps coin a new phrase). As Cohen [1981] has argued, relevant experiments would in fact show what they are normally taken to show *only if* (i) the choice of the normative “yardstick” is unproblematic, which, upon reflection, is easily seen not to be the case; (ii) if the meaning of terms such as ‘if... then ...’ would *uniquely* project into the truth-functional interpretation of the logical connective ‘ \rightarrow ’, or if the meaning of the particle ‘probably’ would not overlap with that of ‘plausibly’, which, upon reflection, is another unsustainable, but generally shared, assumption; and finally (iii) if laboratory behavior would in fact indicate what humans do outside the lab, which, upon reflection, turns out to be an unsolved problem for any research methodology that bases population-claims on evidence from a population-sample. Simply put, the critical charge is that

[t]hose who study first-order logic or variants thereof, such as mental rules and mental models, ignore the ecological and social structure of environments. The literature on cognitive ‘biases’ is full of examples in which evidence of ecological and social rationality [à la Gigerenzer et al., 1999] is mistaken as systematic error in logical reasoning.

[Hertwig et al., 1997, p. 106]

In the light of this critique, which we could here only sketch, a perhaps general conclusion may be offered in the form of the following cynical statement: *Evidently, behavior, or skill, that participants have not acquired yet is unlikely to be produced, especially when experimenter’s make its production more difficult than it already is.* Far from seeking to apologize reasoning that does violate some normative standard, we suggest that what can be, and has been, observed with respect to natural language argumentation in the wild, also occurs during reasoning experiments in the lab. In both cases, participant behavior is rather clearly misaligned to some expert-chosen normative standard. Similarly, argumentation as it occurs in the wild will regularly see, for instance, a dialogue shift from one type to another, or moves that frustrate the

resolution of a difference of opinion on the merit. Indeed, certain highly regimented institutional contexts aside, this appears to be the normal case. On this background, it should not surprise that experimental research reveals large parts of the current generation of undergraduate students, who constitute the primary demographic group being “tested” in these studies, to not yet be aligned to standards taught at universities, and in some cases even taught successfully.

4. Conclusion

We have provided a highly selective overview of research into natural language argumentation, on the assumption that arguments may be understood as invitations to accept a corresponding episode of reasoning. Crucially, such research shows that deductively valid premise-conclusion-transitions rarely occur in, and hence make for little more than important limiting cases of, natural language argumentation. Rather, humans tend to argue — for reasons as diverse as those studied in philosophy and rhetoric, respectively — in order to support conclusions whose content goes beyond that of the premises. To remain empirically adequate, such verbal interactions will therefore need to be mapped onto, or modeled by, instances of ampliative reasoning. Consequently, “the” logic of such reasoning must allow for defeasibility, and so will be a non-monotonic logic. As the latter third of this article has stressed, insights from natural language argumentation let the interpretation of fallacies as reasoning errors appear no more plausible than it is warranted to presuppose that a given formal standard of reasoning is correct without invoking broadly contextual considerations. At any rate, little in the way of a warrant for this presupposition becomes available in the study of natural language argumentation.

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