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A Mid-Blue Logic

As a rule, brighter colors are more casual than somber ones. A mid-blue suit, for example, is less formal than one in navy blue or charcoal gray. <https://www.gentlemansgazette.com/the-formality-scale-how/>, accessed October 4th, 2021.

Philosophy is that discipline which takes the abnormal to be the norm, e. g. hallucinations in perception, logically valid arguments in logic, neurotics in freedom of the will, and heroic self-sacrifice in ethics. [*Philosophy: A Commonplace Book*. Society for Philosophy & Culture: Wellington, NZ].

Abstract: I discuss Smokrović's work on the normativity of logic (Smokrović 2017, Smokrović 2018). I agree that the classical formal logic is not an adequate model for real-life reasoning. But I present some doubts about his notion of deductive logic and his proposal to model such reasoning in non-monotonic logic. No branch of formal logic by itself is likely to capture real-life inferential links (reasoned-inference). I use the logic of relevance as my case study and extend the pessimistic morals to modern systems of non-classical logic. Finally, I propose a more lax conception of normativity: there is a connection between logical assessment in the broad sense (as sanctioned by the notion of cogency) and the evaluation and criticism of reasoning.

Key words: normativity, non-monotonic logic, inference, relevance, consequence having, consequence drawing, informal logic.

1

For three decades or so I follow the work of Nenad Smokrović on the nature of human reasoning, with more intensive discussions in the last couple of years when we cooperated in the research project where he was the principal investigator. The title was characteristic for his work and dilemmas in this area: "Rationality: Between Logically Ideal and Commonsensical in Everyday Reasoning." We share interest in "real-life" reasoning and are both concerned about the usefulness and scope of classical logic in providing tools for the analysis and assessment of real-world reasoning. He insists on formal logic (or "deductive in a broad and weak sense"), I am

more open to the toolbox of logical assessment developed by the so called *Informal Logic Initiative*¹²⁴ (ILI). I think that the approaches are not or need not be exclusive.

I will discuss his latest and important work in this area (Smokrović 2017, Smokrović 2018) and present some critical remarks. One ought to agree with his view that every-day reasoning can assume different forms that are guided by different goals but the mainstream mathematical logic is not an adequate model for human argument and inference. Still, I have some doubts about the proposal to model such reasoning in logic which is non-monotonic and not strictly truth-functional but nevertheless *deductive* (Smokrović 2018: 459). This reminds one of the “chauvinism” of classical logic, sometimes ascribed to MacIntyre and sometimes to Sellars: “All inference is either deductive or defective.” The core of Smokrović’s views can be expressed by the following argument:

1. We should accept *logicism*, the claim that there is some connection between logical validity and the evaluation and criticism of reasoning.
2. But real-world reasoning in natural language is often probabilistic, context-dependent and content-sensitive.
3. Therefore, the appropriate way to model human reasoning is via deductive, although not classical logical systems (probabilistic, defeasible, non-monotonic ...).

Let me quickly summarize my views and express some hesitations. I basically agree with Smokrović – there has to be a connection between logic and the evaluation and criticism of reasoning. But I have doubts about the adequacy of *formal* validity. No branch of formal logic by itself is likely to capture real-life inferential links. I use the logic of relevance as my case study. Relevance logic was a project to reform (classical) entailment and offer a *realistic* theory of deductive reasoning. I think that the project failed, and the moral of this failure generalizes to contemporary defeasible, non-monotonic, default, auto-epistemic, ... formal systems discussed by Smokrović. Consequently, I present some considerations against (3). They are not decisive, but I propose a more lax conception of normativity: there is a connection between logical assessment in the *broad* sense (as understood by ILI) and the evaluation and criticism of reasoning.

¹²⁴ To use the description and abbreviation proposed by Koszowy and Johnson (2018).

2

Let me call the *Harman challenge* the view that logic is irrelevant for reasoning. Logic does not issue explicit prescriptions about what one ought to believe or how one ought to revise one's beliefs. As a vivid example take the classic Marx brothers movie *A Day at the Races* (1937). Dr. Hackenbush (Groucho, actually a veterinarian, a horse doctor) makes a famous observation: "Either he's dead or my watch has stopped." He is taking the pulse of Stuffy (Harpo Marx) who is jumping up and down on the chair. It is funny, because Stuffy is obviously alive, but also bewildering. If he really is dead, his pulse rate should be zero in, say, one minute. Not likely, given the circumstances. If the watch has stopped, his pulse rate should be, say, hundred and twenty in zero minutes – still not an indication that the person is dead. So let us assume that Groucho holds a pulsimeter and refers to this device as "a watch." As spectators we are led to believe that given the readings of the pulsimeter the person on the chair is dead (no beats). But the liveliness of this person contradicts the reading. The doctor's logical moves might then plausibly be:

- (1) The pulsimeter reads zero. (2) If the pulsimeter is reliable and it reads zero, then the person is dead. (3) This person looks alive. Therefore (4) either the pulsimeter is not reliable, or this person is dead.

The humorous effect is based on the fact that although the conclusion is *entailed* by the premises dr. Hackenbush is just deducing but not *inferring*. His set of beliefs *has* (4) as a consequence but (4) is not the conclusion that he should *draw*. MacFarlane (2020: 182-83) uses a very similar example. Once on a train he heard a young boy exclaim: "I have no pulse!" The boy may have also believed the conditional "If I have no pulse, I am dead." But he should obviously not apply *Modus Ponens* in order to come to believe "I am dead." He should reexamine his initial beliefs and interpret his initial observation as false. In a similar vein, dr. Hackenbush should dismiss the death of his patient as a serious doxastic option. According to Harman logic only tells you what a set of statements entails, it is not a theory of reasoning, a theory of "reasoned change in view." One often infers B from A because B provides the best explanation of A. In the case of dr. Hackenbush: From the alertness of this person I *infer* that the pulsimeter is not reliable as the best explanation of the evidence although I *deduce* the disjunction that the pulsimeter is not reliable or this person is dead.

An instructive way to map Harman's difference between deducing and reasoning is a contrast between consequence *having* and consequence *drawing*. Consequence-having occurs in logical space and consequence-drawing occurs in a reasoner's mind (Woods 2103a: 24):

Whether something is a consequence of a set of premises is wholly a matter of satisfying the requisite semantic conditions. Whether it is a consequence which it would be right (or necessary) to draw is partly a matter of semantics but also in large part tied to psychological factors.

Dr. Hackenbush is extracting the consequences but not drawing them. When a proposition Q is a consequence of something we believe, P (in the standard semantic sense, impossible for P to be true and Q false) this proposition is not always a candidate for drawing. Sometimes the right consequence to draw is that P is false (and thereby revise one's beliefs). According to Harman reasoning doesn't follow deductive principles (consequence having) and deductive reasoning (in the sense of deductive principles of consequence *drawing*) doesn't exist at all.

Smokrović disagrees with Harman, he argues that logic has a decisive *normative* role for reasoning. Reasoning can assume different forms that are guided by different goals. And each of these reasoning forms can be captured by a suitable logic: the normative standard for deductive reasoning is not (just) classical predicate logic. Deductive reasoning also includes reasoning in the conditions of uncertainty (modelled by probabilistic logic) and defeasible reasoning (modelled by default logic). This proposal immediately faces two questions: (1) What does *deductive* mean here? (2) Does this proposal offer an adequate reply to the Harman challenge?

3

First of all I am puzzled by the scope of *deductiveness*. The real-world reasoning is still described as deductive reasoning, to be evaluated by deductive logic according to the standards of logical validity. But deductive understood in “a weak and broad sense”, modelled by non-monotonic, probabilistic and default logic.

Smokrović rightly argues against a certain textbook picture of deductive logic as the norm of deductive reasoning. According to this view deductive logic equals classical predicate logic (CPL) combined with the soundness criterion of normativity. True premises and a valid form – the conclusion follows necessarily from the premises – is necessary and sufficient for the “goodness” of reasoning (argument). But this is a distorted picture of our everyday argumentative practice – we rarely infer with absolute certainty what follows necessarily from the available evidence. To quote from a recent book on deductive reasoning (Dutilh Novaes 2020: 19):

Indeed, in most practical real-life situations, the high degree of certainty afforded by deductive reasoning is not needed; in these situations, what we need to know is what is *likely* to follow from the available infor-

mation, given some background assumptions, such as that nothing abnormal is going on (the basic principle of some well-known non-monotonic logics [Stenning & van Lambalgen 2008] and default reasoning).

Dutilh Novaes is aware that human reasoning has a very strong component of defeasibility, *therefore* deductive logic is inadequate for modelling defeasible reasoning. She takes necessary truth preservation as a defining feature of deduction: the conclusion follows necessarily from the premises or is *entailed* by the premises, contrasted with inductive and abductive inferences, where the truth of the premises should make the conclusion more likely to be true (but it is still possibly false). Non-classical logical systems (probabilistic, default logics) that better suit defeasible real-life reasoning are standardly *not* classified as deductive logical systems. So, what could Smokrović (2018: 459) mean with: “Such logic is certainly deductive, although non-monotonic (initially assigned degree of probability to the conclusion may later be retracted in the face of new evidence) and not strictly truth-functional”?

I conjecture that he equates the domain of *deductive* with the domain of *formal*, an attitude well expressed by Burgess (2009: 2)

Logic, whether classical or extra- or anti-classical, is concerned with form. (On this traditional view of the subject, the phrase “formal logic” is pleonasm and “informal logic” oxymoron.) An argument is *logically valid*, its conclusion is a *logical consequence* of its premises, its premises *logically imply* its conclusions—three ways of saying the same thing—if and only if the argument is an instance of a logically valid form of argument.

Smokrović speaks about different kinds of validity grounded in different logics, but still validity remains a matter of *form*; one proposition is a consequence of others only if there is a valid pattern which the propositions together match. Non-classical logical systems are then formal deductive systems, where I will understand formal as formal₂ according to Barth and Krabbe (1982, 18). A system S is formal₂ when: (i) the (syntax of the) language to which S belongs is precisely formulated (the language is “formalized”); (ii) the validity concept in S is defined in terms of the forms of the sentences involved – it is a function of the definitions of the meanings of the logical constants concerned, and of the form of these sentences.

I propose to interpret “deductive in a weak and broad sense” in a very general and purely formal₂ sense, say: “a deduction is any sequence of statements each of which is derived from some initial set of statements (the

premises) or from a prior statement in the sequence.¹²⁵ The syntax of the language to which a statement belongs is precisely formulated or formalized. I think that the opposite of deductive in this sense is best understood as *informal* as in *informal* logic.

How successful is deductive in this broad sense as a *realistic* theory of deductive reasoning? I will address this question by discussing one of the earlier attempts to reformulate deductive logic as a *realistic* theory of deductive reasoning, the project of *relevance* logics. I think that the moral also applies to modern attempts to model real-life reasoning in formal systems, such as formal logics of dialogues and games, dynamic epistemic logic, defeasible logic, systems of default logic, auto-epistemic logic ... “FS*” for short.

4

Smokrović often stresses the fact that real-life reasoning in natural language is dynamic and non-monotonic (classical logic is monotonic and necessary truth preserving). An early model of a *deductive* (formal₂) system that lacks the property of monotonicity was relevance logics (‘relevant logics’ in Britain and Australasia). These systems were initially developed as attempts to avoid the paradoxes of material and strict implication:

... the claim that ‘ $q \ \& \ \sim q$ ’ entails ‘ p ’, in general, signals a breakdown in our intuitions not different in kind, though different perhaps in severity, from the kind of breakdown whose result is outright inconsistency, and similarly for the other paradoxes of implication, material or strict (Meyer 1971: 812).

But the ambitions were much higher, the aim of the project was to capture a true and correct formal counterpart of the *intuitive* notion of entailment. They often promoted a more encompassing “Aquarian” agenda of making and living in a better “world of reason.” What looked like purely technical logical results, one of the many specimen in the newly established zoo of non-classical logics, was promoted with the zeal of avantgarde manifestos against the tyranny of standard logic (Quine was a favourite target). According to Mares (2004: 3):

I suggest that what is wrong is that the standard notion of validity is too weak to provide a vertebrate distinction between good and bad arguments. It allows too many non-sequiturs to be classified as good arguments.

¹²⁵ Baker, Alan, “Non-Deductive Methods in Mathematics”, The Stanford Encyclopedia of Philosophy (Summer 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2020/entries/mathematics-nondeductive/>, accessed October 4th, 2021.

Relevant logic was developed in part to avoid the so-called paradoxes of material and strict implication. The original sin, the paradigm “fallacy of relevance” is a classically valid inference that a contradiction entails everything and its twin, that a tautology is entailed by everything. In each case it is logically impossible for the premises to be true and conclusion false:

$$\begin{aligned} \textit{Ex falso quodlibet} \text{ (EFQ)} & (p \ \& \ \sim p) \supset q \\ \textit{Verum ex quodlibet} \text{ (VEQ)} & q \supset (p \vee \sim p) \end{aligned}$$

The objectionable thing about these paradoxes is that the antecedent and the consequent appear to be irrelevant to each other. There needs to be more of a connection between the content of the antecedent and the consequent in an implication if we are to say that the former implies the latter. Notice the close connection between “entailment” as characterizing the relationship between the premises and the conclusion in a valid argument and “implication.” Usually the connection is established via the deduction theorem (if a formula B can be derived from a set of formulas Γ together with a single formula A , then the implication $A \rightarrow B$ can be derived from Γ). For more orthodox tastes the connection defended by the relevantists is almost “incestuous.” Anderson and Belnap (1975: 473) retort provocatively : “the principle aim of this piece is to convince the reader that it is philosophically respectable to ‘confuse’ implication or entailment with the conditional, and indeed philosophically suspect to harp on the dangers of such a ‘confusion.’ (The suspicion is that such harpists are plucking a metaphysical tune on merely grammatical strings.)”

Relevance logicians have attempted to construct logics that reject theses and arguments that commit “fallacies of relevance”. The problem with EFQ and VEQ is that some of the premises of the inferences appear to have nothing to do with the conclusion. Intuitively, we require some kind of topic overlap between the premises and the conclusion, they should not have an entirely different subject matter. We also expect the premises to really *do* some “work” in establishing the conclusion of the inference. The relevantists propose two conditions as a formal capture of relevance between antecedent and consequent or premises and conclusion. First, the premises and the conclusion have to share some nonlogical content (a propositional variable)—this variable-sharing is a necessary condition for relevance. Secondly, they propose modifications of rules of inference for natural-deduction systems, all of the premises in an argument must really be *used* in the derivation of the conclusion—this condition is both necessary and sufficient.

Andersen and Belnap developed the logical system *E* as the system of entailment (relevant strict implication) and also formulated the nowadays standard logic *R* of relevant implication. Details are not important for our purposes, both systems are non-monotonic, since the premises really have to be *used* in a given derivation, one *cannot* move from:

- (1) $A \vdash A$
to
(2) $A, B \vdash A$

In the case of (2) *B* is doing no work. Still, *reflexivity* of the consequence relation expressed by (1) is declared to be unproblematic. Both systems incorporate the *The Law of Identity*: “ $A \rightarrow A$.” According to Andersen and Belnap (1975: 8):

We take the law of identity to be a truth about entailment; it represents the archetypal form of inference, the trivial foundation of all reasoning, in spite of those who would call it “merely a case of stuttering.”

Yet “ A , therefore A ” really looks like a poor candidate for “real” inference – the authors quote Strawson (1952: 15):

... a man who repeats himself does not reason. But it is inconsistent to assert and deny the same thing. So a logician will say that a statement has to itself the relationship [entailment] he is interested in.

And they offer a reply (Andersen and Belnap 1975: 8):

Strawson has got the cart before the horse: the reason that A and $\sim A$ are inconsistent is precisely because A follows from itself, rather than conversely.

In a system *E* formula: “ $(A \rightarrow A)_{[\text{horse}]} \rightarrow \sim(A \ \& \ \sim A)_{[\text{cart}]}$ ” is a thesis but not vice versa (“ $\sim(A \ \& \ \sim A) \rightarrow (A \rightarrow A)$ ”) supposedly defended by Strawson. But let us have a look at what Strawson has to say about the cases of “follows from” (Strawson 1952: 14):

What is common to all the cases I refer to is the claim, signaled by the linking expressions, that it would be inconsistent to assert what precedes those expressions and to deny what follows them. The logician interests himself in cases in which this relationship holds between statements, irrespective of whether or not the transition from one statement to another so related to it is a transition which we should dignify by the name ‘step in reasoning’; irrespective even of whether it is something we should acknowledge as a transition.

A real “step reasoning” looks very similar to the core motivation for relevant logic, but immediately the differences appear (Strawson 1952: 14):

This explains why ‘study of the principles of valid deductive reasoning’ is too narrow a description of logic. A man who repeats himself does not reason. But it is inconsistent to assert and deny the same thing. So a logician will say that a statement has to itself the relationship he is interested in.

One could interpret Strawson as saying that “A, therefore A” does not correspond to *real* reasoning (merely repeating). Andersen and Belnap object that this inference does not *really* follow via EFQ from “A & ~A” according to their reformulation of “follows from.” But they still accept “A, therefore A” as the trivial foundation of all reasoning. It is no longer based on the notion of classical consequence (impossible for the premise to be true and conclusion false), but we have an exact topic overlap between the premise and the conclusion and the premise (repeated as a conclusion) is really *used* in the derivation of the conclusion. Nevertheless, we should ask with Strawson, does such relevance really deliver the “goods” promised? For in instance, “I argue that relevant logic is useful. It provides us with a theory of inference” (Mares: 2004, viii)?

It will be useful to understand relevant entailment “ $A \rightarrow B$ ” as “If A then B for that *reason*” (Burgess 2009: 114). And let us further assume that this locution encapsulates “a correct description of the basis of inference” (Read, 1988: 2). There are then at least two ways of understanding “for that *reason*” as an inference claim. In the first sense B is deducible in virtue of A, it follows logically from A in a deductive, rule-governed system. Such a derivation is an inference in a technical, or perhaps *thin* sense, an abstract codification of an inference conforming to a certain collection of syntactic rules. *The Law of Identity* is relevantly impeccable in this sense: A is deducible from A for *that* reason, derivable from A using A only. But there is also a different, more substantial, *thick* notion of inference as an episode of reasoning, inference understood in an epistemically serious way. According to Adler “reasoning is a transition in thought, where some beliefs (or thoughts) provide the ground or reason for coming to another” (Adler and Rips, 2008: 1). To infer B from A is then to take up, to accept, B as a result of reflecting on A (Rumfitt 2015: 35). *The Law of Identity* is *not* an inference in this sense: A is not grounded in A, there is no rational transition from A as a premise to A as a conclusion.

We thus have two notions of inference, inference in the derivational sense (“d-inference”) and inference in the reason-giving sense (“r-inference”). Corresponding to these two notions are then two notions of rele-

vance: *derivational* relevance (in this sense A is relevant for A). And, secondly, *reasoned* relevance – in this sense A is not relevant for A : we do not accept A (conclusion) as a result of reflecting on A as the premise in the argument “ A , therefore A ”. The premise is not giving the right kind of reason for the conclusion. According to Strawson “ A , therefore A ” is not an inference at all. Woods (2004: 34) writes in the same spirit: “For “ p , so p ” is always a fallacious inference (not to be confused with the correct and unexceptional entailment, “ p entails p ”).” And the same is true (for Woods) of EFQ: a failure for inference, not for entailment.

The logic of relevance offers an improved interpretation of consequence having (eliminates EFQ etc.) as a model of real inference. But this is still *d*-inference only. Contemporary formal systems championed by Smokrović follow the lead: they aim to improve consequence having in the derivational sense in their attempts to adequately map the real-life reasoning. Harman thought that all such projects were doomed to failure. He identified argument with proof that is governed by the (deductive) rules of implication and contrasted this with reasoned change in view which is governed by rules of revision which he called “rules of inference”. He was *equally* dismissive of what he called AI logics as improved systems of implication (nowadays listed as non-monotonic, dynamic, (auto)epistemic, etc.):

But, although this terminology emphasizes the noncumulative character of reasoned revision, it is also potentially misleading in calling the ordinary sort of proof or argument “monotonic reasoning,” because proof or argument is not of the same category as reasoned revision (Harman 1986: 4).

Even dynamic or epistemic logics cannot model human reasoning:

It may be a mistake to expect principles of reasoning to take the form of a logic. In short, distinguishing reasoning from argument can make one suspicious of certain arguments for inductive logic, practical syllogisms, a logic of entailment, and so on. It is unclear how work on such “logics” might contribute to the study of reasoned revision (Harman 1986: 6).

Reasoning escapes the structure of logical implication, even non-monotonic (etc.) logics do not really model how human agents infer. It is easy to see why Harman is complaining: all logical systems remain the systems of consequence-having, they are not norms of real-life consequence-drawing. But I think that it is impossible to map (any kind of) consequence-having as real-life consequence-drawing, that aim was unrealistic from the very beginning. Even an enriched logical toolbox cannot solve the Harman

problem. Smokrović proposes a default logic incorporating the closed-world assumption (CWA), which is a variant of default logic. In closed world reasoning, it is assumed that any information that would weaken or cancel the premisses' connection to the conclusion is already contained in the premisses:

$$(p \ \& \ \sim ab) \rightarrow q$$

This is to be read as “If p and nothing abnormal is the case, then q ” (Smokrović 2018: 467). Take the case of the young boy on a train: “I have no pulse! If I have no pulse, I am dead. So, I am dead.” In this case the problem is not the abnormality of his deductions but the abnormality of his *reasoning* (were he to conclude that he is dead via *modus ponens*). The boy should infer that the antecedent is false – something *abnormal* is the case. But what conclusion, exactly, should the boy *draw*? Probably there was something wrong with the instrument, perhaps with his measuring technique, or even his ability to reliably detect the results. What consequence is the best thing to *draw* from the data and how to modify one's beliefs is not really or not just a question of logic but a broader question of epistemic rationality or even practical rationality in general.

Well, the boy should not draw the “I am dead” conclusion because such a conclusion is *not* to be accepted as a result of reflecting on the premises. The verdict should be that the premises are unacceptable. And here is my worry: can any kind of *formal* logic (or deduction in the weak and broad sense) model *r*-inference? Even a reformed formal logic maps derivational inference only, this is clear from the fact that the principle of *reflexivity* is a necessary feature of *any* respectable *formal* consequence relation, non-monotonic (FS* systems) included. Informally, a sentence is a consequence of any set of sentences of which it itself is a member (Woods, 2013a: 228). This structural principle of consequence immediately yields the problematic *Law of Identity* (A is a consequence of A), which is not a principle of real-life reasoning.

To summarize the historical lesson: Strawson is “degrading” entailment (explained in classical terms) – classical logic does not capture real reasoning, but, we could say, derivational consequence-having only. Andersen and Belnap are trying to confer dignity back to entailment: only if the conclusion “really”, i. e. relevantly, follows from the premises (or the consequent from the antecedent) do we have a case of entailment. The non-classical systems further improved the notion of consequence, but the *worry* remains: formal logic (FS* systems) does not, as such, constitute a theory of *r*-inference; it supplies a theory of derivational inference only.

5

Reasoned-inference *should* guide us in our rational consequence-drawing, but there are different formal and informal methods of reasoning involved as the principles of belief-modification (Bayesian updating, inference to the best explanation, etc.). Smokrović (2018: 468) is right to stress the *normative* role of logic: "... for any form and goal of deductive reasoning there is an adequate normative system that can direct this reasoning toward the "rational" achievement of the goal." I think that the "directedness" introduced by the goals of reasoning is a right way to go as a reply to the Harman challenge (to bridge the gap between consequence *having* and consequence *drawing*) and the proper way to capture real-life reasoning. But I am doubtful whether any branch of formal logic is likely to capture inferential links in the reason-giving sense. Smokrović (2018: 458) is aware "that reasoning performed in natural language is not syntactically or extensionally valid but at best intentional" and he thinks that FS* systems and in particular a default logic with CWA offer an adequate model of real-life reasoning.

Let me mention some hesitations which are not decisive (I am not an expert on CWA systems). First of all, consider the core schema: "If p and nothing abnormal is the case, then q ." According to Woods (2013a: 285) the problem is to determine whether the assumption of normality is ever actually available to the reasoning agent, to beings like us, the world is never closed. If so, what are the conditions under which we are justified to invoke the closed world-assumption? This is hardly a matter of a *formal* system or deduction in a weak and broad sense.

And secondly, Smokrović (2018: 456) states: "I'm embracing the view that norms can be applicable to those who apprehend them." This seems plausible: a form reasoning is normatively justified if it can be connected with a type of validity that the thinker can apprehend or recognize as valid, where "validity" is to be understood in the weak and broad sense. The contemporary *formal* proposal is to improve consequence-having as a model of real-life logic. The project is implemented by *enhancing* the formal power and reach of logic, by developing a "heavy equipment" logic (cf. Woods 2013b). Just have a look at the *Appendix* of the paper on the logic of human reasoning: "Kleene 3-valued procedural semantics for logic programs in non-monotonic reasoning, based on models for definite programs, as fixed points of a three-valued consequence operator" (Varga, A., Stenning, K., and Martignon 2015). The formal way to make logic right for real-life reasoning seems to be by *complexifying* the logic's mathematical structure. But is such a structure really apprehensible for an everyday thinker? And

this is my second worry: when you insist on mathematically precise formulation and implementation of reasoning you risk the loss of apprehension required by the requirement of normativity.

Of course, the structure of apprehension is more complicated, Smokrović quotes approvingly MacFarlane (2004: 22):

My own view is that apprehension should not be intellectualized to the extent that it requires a completely explicit understanding of what an inference schema is, the kind one would get from an encyclopedia article on the subject. It is something more basic than that. But it is important that apprehension be something for which one can take responsibility and give or receive criticism.

The understanding of the *Appendix* on 3-valued procedural semantics is apparently not required to follow the requisite norm in your reasoning. Still, one apprehends an inference as an instance of inference schema if one is responsible in the sense that one intends to infer according to this scheme (Smokrović 2018: 466). If (full?) apprehension of an inference schema is required I remain doubtful about the normative legitimacy of heavy-equipment models of human reasoning.

These are sketchy remarks, they are not decisive, but they all point into a certain direction, beyond the walls of formality. Hartry Field, whose writings are quoted approvingly by Smokrović points into the same direction. According to Field an adequate normative system is not a system based on the rules of necessary truth preservation. He proposes to redefine validity, not as (necessarily) preserving truth in general but as (necessarily) doing so “when it matters” (Field 2009: 266). And a rule “preserves truth when it matters” if it preserves truth when applied to premisses that can be established or are rationally believable. This characterization will (presumably?) exclude *The law of Identity* as a degenerate instance of truth preservation since the premise (equivalent to the conclusion) will no longer count as acceptable. Field’s *formal* criterion (acceptable premisses and rules which preserve truth when it matters) comes surprisingly close to *cogency*, the basic normative notion of *informal* logic, cf. Govier (2018: 287-88): “If the premisses of an argument are rationally acceptable and are ordered so as to provide rational support for the conclusion, the argument is cogent.”

6

Roughly at the same time as relevance logic the *Informal Logic Initiative* emerged when many philosophers and logicians turned their attention to the analysis, evaluation and improvement of real life argument. Clas-

sic formal logic turned out to be an inappropriate educational tool for the analysis of real arguments. According to Scriven (1980: 147) it should be removed to the monsters part of the “academic zoo”:

It’s not good for children to see too much of the monsters part of the zoo; ... They grow up into poor little perverts who ... mutter things like “ p is true if and only if p ,” then smile beatifically. Or they go around chanting “A false proposition implies any proposition; yes it does, yes it does ...”

ILI was motivated by the dissatisfaction with ‘the soundness doctrine’ or the normativity of classical logic. Classically valid form (necessary truth preservation) plus true premises is neither necessary nor sufficient as a criterion of a good argument. There are good arguments that are not sound (usually classified as *inductive*) and there are sound arguments that are not good arguments: any circular argument with a true premise. Johnson and Blair (1977) identified standards for the evaluation of an argument based on the leading question: what standard is violated in this or that traditional fallacy? They proposed a so called “RSA” criterion of *cogency*: in a good argument acceptable (A), individually relevant (R) and jointly sufficient (S) premises rational support the conclusion. In contrast to classical soundness, requiring valid arguments with true premises, the RSA criterion emerged as the central normative notion in the approaches that remain closer to the practice of argumentation.

It is clear that “A, therefore A” is a bad argument and no one would take it seriously. Sometimes the verdict is that it does not meet the RSA criteria, since its premise would not count as *acceptable* (Blair, 2012: 88). This is in line with a classical objection to *petitio*: a statement (premise) is made that presupposes or depends upon the point at issue (conclusion) and such a premise is judged to be unacceptable. But I find the Strawsonian objection more principled: “A, therefore A” is a failure of inference. This diagnose is based on the thick, reasoned conception of inference (A is not a reason to accept A). The relevance of premises and their sufficiency pertain to the adequacy of the inferential link: the reasons offered must be probatively relevant to the conclusion and they have to be sufficient for accepting it. The relevance criterion requires that the proposition P actually plays a supporting role for C , the premise P counts in favor of the truth of C . In *The Law of Identity* the premise is then not relevant, it offers no support or no grounds for the conclusion. Something of epistemic value (knowledge, justification, conviction ...) fails to be transmitted from premises to conclusion. An inference proper is “directed,” so to speak, there is a certain initial epistemic asymmetry between premises and conclusion. McKeon

(2015: 319) for instance proposes a very thick conception of inference: “if I infer q from p , then my belief that p explains, at least in part, why I believe q .” I would claim, perhaps more cautiously, that a proposition which entails itself is not relevant to establishing itself, so *The Law of Identity* fails as an inference.

Cogency as a central term of logical assessment covers different forms of reasoning (deductive, inductive and also a third type of connection between premises and conclusion, sometimes conceptualized as *conductive*). It incorporates broader epistemic norms, but the appraisal of arguments as based on the structure of reasoned-inferences is perhaps really closer to epistemic appraisal than to formal-logical evaluations. This was already the lesson from the Harman challenge. Informal logic includes directedness of reasoning guided by goals (emphasized by Smokrović) but also a dialectical dimension of reasoning. A defining feature of informal logic is its emphasis on arguments, not as abstract objects (ordered pairs premises - conclusion) but as arguments in *use*, arguments in the sense of argumentation as an interactive social process. Smokrović rightly observes that “reasoning can assume different forms that are guided by different goals.” He mentions goals such as proving the theorem, showing that an accused is guilty beyond any reasonable doubt, or coming to the conclusion about the whereabouts of a certain bus (Smokrović 2018: 457). He does *not* mention, however, the clearest case of goal-directedness: a piece of reasoning embedded in an *argument*. A type of discourse in which the arguer expresses a point of view (the conclusion) and offers one or more reasons (the premise(s)) in support of the conclusion. The premises are advanced as reasons in support of the conclusion. Arguments in this sense defy d-inferences and also introduce another, dialectical and pragmatic dimension, not easily captured by formal tools. Even Dutilh Novaes (2020), who takes necessary truth-preservation as a defining feature of deduction, explains the sources of deduction in dialectical exchanges and practices of debating which then evolved into deductive argumentative practices (cf. also Smokrović 2017).

Finally, consider again the argument we started with:

1. We should accept *logicism*, the claim that there is some connection between logical validity and the evaluation and criticism of reasoning.
2. But real-world reasoning in natural language is often probabilistic, context-dependent and content-sensitive.
3. Therefore, the appropriate way to model human reasoning are deductive, although not classical logical systems (probabilistic, defeasible, non-monotonic ...).

Normativity is a hot topic of theoretical discussions and (1) was famously questioned by Harman. I think that something like: “If *B* ‘really’ follows from *A*, then, if we accept *A*, we should accept *B* as a result of reflecting on *A* (as grounded in *A*)” should be a guiding principle in this area. Is this still *logicism*? Perhaps logicism in the weak and broad sense which includes *cogency*:

(1)* We should accept the view that there is some connection between logical assessment in the broad sense and the evaluation and criticism of reasoning.

I have also raised some considerations against the formal conception of deductiveness operative in (3), so I would suggest instead: “we therefore have to model human reasoning with formal but also non-formal approaches.”

I understand the lesson from relevant logic to be that the project of incorporating relevance into the logical notion of validity in a formal way (d-inference) fails. We do get a better model of consequence-having (implication, entailment) but this is not enough to map the real-life reasoning based on reasoned-inferences. Even Andersen and Belnap realized that the project of relevance was too ambitious. Later they go more low-profile, they argue that relevance logic is preferable to classical logic for extracting information from a database that might contain inconsistent information (MacFarlane 2020: 187). I suspect that the moral generalizes to contemporary non-classical formal systems. I might be wrong however, prediction is very difficult, especially about the future, allegedly said Niels Bohr. It is safe to say that the logic for AI systems, dynamic logic, auto-epistemic logic, etc. will further improve the notion of consequence having and may even approximate real-life reasoning. Perhaps advanced formal systems which include goal-directedness might constitute a viable theory of inference.

But in general I have doubts about the attempt to make logic right for *argument* by complexifying logic’s mathematical structure. Admittedly, as a normative notion cogency turns out to be a loose evaluative concept. Smokrović stresses that we are engaged in various forms of reasoning, accomplishing different goals, we economize with our cognitive resources, “computational efficiency is an opportunity cost of expressive power” (Smokrović 2018: 457). But the same is true of logicians in their meta-logical theorizing about normative systems of reasoning. The rebellion of a new generation of logicians against the cliches and worn out admonitions of classical logic, in particular its treatment of implication and logical consequence was described as logic of “the Age of Aquarius” (Meyer 1971: 808). Astrologers apparently do not agree on when the Aquarian age will start or even if it has already started. Most published materials on the sub-

ject state that the Age of Aquarius arrived in the 20th century (29 claims), with the 24th century in second place with 12 claimants.¹²⁶ Well, from the perspective of the 21st century it looks that logic in the Age of Aquarius is and will continue to be pluralistic, including more *casual*, less precise and more fluid but consequently more flexible and more “real-life” approaches of informal logic.

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¹²⁶ https://en.wikipedia.org/wiki/Age_of_Aquarius, accessed October 4th, 2021.

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