Material implication and conversational implicature in Lvov-Warsaw School

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Abstract. The relation between indicative conditionals in natural language and material implication wasn't a major topic in the Lvov-Warsaw school. However, a major defense of the claim that the truth conditions of these two are the same has been developed by [1]. The first, major, goal of this paper is to present, assess, and improve his strategy. It turns out that it is quite similar to the approach developed by [3], so our second goal is to compare these two and to argue that the accuracy of Ajdukiewicz's explanation is less dependent on controversial properties of a systematic but convoluted general theory of cooperative communicative behavior. In Lvov-Warsaw school the relation between material implication and indicative conditionals was also discussed by [2] and [8], so the third part of our paper is devoted to their discussion and relating it to Ajdukiewicz's views.

Keywords. Material implication, counterfactuals, conversational implicature, natural language, assertibility, pragmatics, cancellability.

1. Ajdukiewicz's equivalence argument

Ajdukiewicz meant to establish that any conditional of the form:

$$\text{If } p, \text{ then } q$$

has the same truth conditions as the material implication

$$p \to q$$

(which is false just in case p is true and q false, and true otherwise). His argument has two main stages:

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STAGE 1 Showing that natural language disjunction – *not-p or q* – has the same truth conditions as its corresponding natural language conditional – *if p, then q*.

STAGE 2 Showing that this natural language disjunction has the same truth conditions as its corresponding classical disjunction – $p \vee q$.

If we mark having the same truth conditions by '$\Leftrightarrow$', the structure of the argument is this (we make no distinction between "either ... or ..." and "... or ..."):

$$[\text{If } p, \text{ then } q] \Leftrightarrow [\text{Either not-}p \text{ or } q] \text{ (by Stage 1)} \quad (1)$$

$$[\text{Either not-}p \text{ or } q] \Leftrightarrow [\neg p \vee q] \text{ (by Stage 2)} \quad (2)$$

$$[\neg p \vee q] \Leftrightarrow [p \rightarrow q] \text{ (by logic)} \quad (3)$$

$$[\text{If } p, \text{ then } q] \Leftrightarrow [p \rightarrow q] (\text{ by transitivity of } \Leftrightarrow) \quad (4)$$

Let's focus on STAGE 1 now (we'll get to STAGE 2 in section 3). Ajdukiewicz gives two separate arguments for two directions of the equivalence.

$\Leftarrow$:

w.t.s.:	[Either not-p or q] $\Rightarrow$ [If p, then q]
Step 1	(suppose) Either not-p or q.
Step 2	(from Step 1 by disjunctive syllogism) If it is not the case that not-p, then q.
Step 3	(from Step 2 by double negation elimination in the antecedent) If p, then q.

$\Rightarrow$:

w.t.s.:	[If p, then q] $\Rightarrow$ [Either not-p or q]
Step 1	(suppose for contraposition) It is not the case that [either not-p or q].
Step 2	(from Step 1 by De Morgan's law) Neither (not-p) nor q.
Step 3	(from Step 2, assuming conditionals with true antecedents and false consequents are false) It is not the case that [if p, then q].

2. Jackson's argument

Before we continue with the discussion of Ajdukiewicz's approach to conditionals, let's pause to observe that [4, 4-6], without reference to Ajdukiewicz (and, we take it, quite independently) formulated a very similar argument. He starts with the following principles:

Truth-functionality (TF)	It is correct to represent English 'not', 'or' and 'and' with $\neg, \vee, \wedge$.
Uncontested principle (UP)	For an indicative conditional to be false it is sufficient that its antecedent is true and the consequent false.
Passage principle(s) (PP)	The following reasoning patterns are valid: p or q. Therefore if not-p, then q. Not-(p and q). Therefore if p, then not-q.

To pass from the material conditional to the indicative conditional, Jackson relies on PP and gives two variants of the argument. The first variant is pretty much the same as in Ajdukiewicz's argument:

w.t.s.:	[Either not-p or q] $\Rightarrow$ [If p, then q]
Step 1	(suppose) Either not-p or q.
Step 2	(from Step 1 by first PP) If it is not the case that not-p, then q.
Step 3	(from Step 2 by double negation elimination) If p, then q.

The second variant is a bit different. First we notice that the material implication has the same truth conditions as not-(p and not-q). Then we argue:

w.t.s.:	Not (p and not-q) $\Rightarrow$ [If p, then q]
Step 1	(suppose) Not(p and not-q).
Step 2	(from Step 1 by second PP) If p, then not-(not-q).
Step 3	(from Step 2 by double negation elimination) If p, then q.

For the other direction, Jackson observes that the uncontested principle allows one to pass from $\neg(p \rightarrow q)$ to not-(if p, then q) and applies contraposition. This results in a move very similar to Ajdukiewicz's argument for $\Rightarrow$.

3. Ajdukiewicz on disjunction

Let's turn to Ajdukiewicz's Stage 2. The correspondence between classical disjunction and natural language 'or' isn't terribly problematic. Yet, Ajdukiewicz's way of handling it is quite interesting, because while dealing with it he is forced to make a distinction between truth and assertibility. Let's start with quoting Ajdukiewicz *in extenso*. First, Ajdukiewicz makes the audience agree that the truth conditions of the relevant sentences are the same:

> I take two pieces of chalk and hide them in my hands, so that the audience doesn't see in which hand I placed each piece: both in my right hand, both in my left hand, or one in my left hand and one in my

> right hand. Having done this I ask the audience: "am I holding chalk in my left or right hand?" and the response is unanimous and positive. I point out to the audience that there are three possibilities (chalk only in my left hand, chalk only in my right hand, chalk in both hands) and I ask whether no matter which of these is the case they still sustain their agreement with the disjunction: "[a piece of] chalk is in my right or left hand" and whether the only case in which they would consider the disjunction to be false would be if I didn't have chalk in any of my hands – and again, the response is positive. In this way I once again obtain agreement that disjunction in natural language is true if at least one of its arguments is true and false if none of them is. [1, 252]

Next, he points out that agreement doesn't have to go hand in hand with truth:

> Now I open my hands and show the audience that both pieces of chalk are, say, in my left hand. In this situation I ask again the same question: am I holding chalk in my left or right hand? This time, the audience is far from unanimosity, and the most popular opinion is that once it is known that chalk is in my left hand, one cannot give a positive response to the disjunctive question. Some would even say that in such a situation one can give neither a positive nor a negative response. This semantic experiment teaches us that we accept a disjunction as long as we know that one of the disjuncts is true, but we don't know which one. Once we find out which of the disjuncts is true, we no longer accept the disjunction. [1, 252]

Ajdukiewicz argues that our reluctance to accept the disjunction notwithstanding, it is still true. The disjunction is about pieces of chalks and hands, not about anyone's knowledge, and since the states of affairs involving these pieces of chalk and Ajdukiewicz's hands haven't changed, nor did the truth-value of the disjunction.

Indeed, he points out that suggesting otherwise and claiming that "p or q" really means "At least one of p and q is true and I don't know which" quickly leads to absurdity. For instance:

> For any natural number x, x is even, or x is odd.

is true, whereas:

> For any natural number x, at least one of "x is even" and "x is odd" is true, but I don't know which.

is plainly false, since it implies, among other things:

> at least one of "2 is even" and "2 is odd" is true, but I don't know which.

So, it seems, we refuse to assert the disjunction even though it is true, and more is required for a sentence to be assertible than its truth. What would be

the principles governing assertibility resulting in this disparity? Ajdukiewcz starts with a discussion of Quine's proposal.

4. Ajdukiewicz vs. Quine on assertibility

Ajdukiewicz doesn't think he is original and attributes the distinction between acceptability and truth to Quine.[1] He follows Quine in bringing up two examples:

EXAMPLE 1 Once we know France is in Europe, we don't utter "France is in Europe or the sea is sweet."

EXAMPLE 2 Once we know that every S is P (and that there are S), we don't say "at least some S are P."

Quine explains the examples by pointing out that in such contexts the longer sentences are less informative and that shorter and more informative sentences are usually more likely to be uttered for pragmatic reasons.

Yet, Ajdukiewicz is quite unhappy about the use of the notion of informativeness in this account – because he doesn't find this notion clear enough. He claims the only sensible explication of this notion as used by Quine is that p is more informative than q iff q follows logically from p but p doesn't follow from q.

While Ajdukiewicz finds this definition clear enough, on this account, he claims, it is false that if one wants to be as helpful and honest in a conversation as possible, one should always prefer the shorter and more informative claim. For instance, he insists, when we present a reasoning, we often utter statements weaker than the premises in the process, and this would be prohibited by the general principle suggested by Quine. Thus, we might say that Ajdukiewicz discards Quine's general principle by arguing that following it would prohibit us from uttering our arguments.

In the context of our discussion of Ajdukiewicz'a ideas it is worthwhile to clarify Quine's views on the relation between material implication and natural language conditional.

In *Methods of Logic*, [6] discusses briefly whether material implication conforms to the ordinary indicative conditional 'if-then'. He first states that restricting our attention to simple indicative conditionals is justified:

> the material conditional '$p \to q$' is put forward not as an analysis of general conditionals such as (1) ['If anything is a vertebrate, it has a heart'], nor as an analysis of contrafactual conditionals such as (4) ['If Eisenhower had run, Truman would have lost.'], but, at most, as an analysis of the ordinary singular conditional in the indicative mood... [6, 15]

[1] He does so without giving any references, but Quine's discussion of these issues can be found in [7] and [6].

arguing that (1) *must be viewed as affirming a bundle of individual conditionals* which in this context means that it shall be analyzed in terms of first-order logic with quantifiers instead of propositional calculus only, and that...

> ... any adequate analysis of the contrafactual conditional must go beyond mere truth values and consider causal connections, or kindred relationships, between matters spoken of in the antecedent of the conditional and matters spoken of in the consequent... [6, 14]

Quine observes that in natural language some counterfactuals with false antecedents and false consequents may be true while other counterfactuals with false antecedents and false consequents can be false. From this, he concludes that the semantics of counterfactuals is definitely not truth functional, whatever the adequate analysis of their meaning is.

After settling that the material implication may be an analysis only of indicative conditionals, he claims that analyzing conditionals as material implications may be unnatural when there is no relevance between the antecedent and the consequent:

> Even as an analysis of such conditionals, the version '$p \rightarrow q$' is sometimes felt to be unnatural, for it directs us to construe a conditional as true no matter how irrelevant its antecedent may be to its consequent, so long as it is not the case that the antecedent is true and the consequent false. [6, 15]

Quine argues that if we have a conditional in which the compounds are irrelevant to each other, it is equally strange to consider it true and to consider it false, irrespective of the truth values of the antecedent the and consequent. He claims that the strangeness of conditionals such as'*If France is in Australia then the sea is sweet*' stems from the fact that linguistic practice usually allows for forming conditionals (of the form 'if p, then q') out of compounds (p and q) which have unknown truth values:

> ... for it is not usual in practice to form conditionals out of component statements whose truth or falsity is already known unconditionally... In practice, one who affirms 'If p then q' is ordinarily uncertain as to the truth or falsehood individually of 'p' and of'q' but has some reason merely for disbelieving the combination 'p and not q' as a whole. [6, 15]

Thus, the question of the nature of the reason to disbelieve 'p and not q' rises. Quine replies, as mentioned above, that the reason is to be provided by some kind of relevance between the compounds of the conditional. However, he claims that this relevance does not have an influence on the *meaning* of the conditional, but rather that *useful applications* of a conditional in linguistic practice are dependent on it:

> Only those conditionals are worth affirming which follow from some manner of relevance between antecedent and consequent – some law, perhaps, connecting the matters which these two component statements describe. But such connection underlies the useful application of the conditional without needing to participate in its meaning. Such connection underlies the useful application of the conditional even though the meaning of the conditional be understood precisely as '$\neg(p \wedge q)$'. [6, 16]

In *Mathematical Logic*, [7] presents essentially the same view, adding a remark on the particular role of the truth table for material implication in assessing conditionals in ordinary practice:

> What the truth table adds, in thus deciding the cases beyond the range of ordinary usage, is essentially theoretical; no supplementary practical use of 'if-then' is thereby prescribed. In practice, even in the light of the truth table, one would naturally not bother to affirm a conditional if he were in position to affirm the consequent outright or to deny the antecedent – any more than one bothers to affirm an alternation when he knows which component is true. [7, 17]

Hence, according to Quine, there is a difference between the meaning (semantics) of an expression and its useful applications (pragmatics) – the meaning of a conditional is exhausted by the truth tables of material implication, whereas practical useful application of a conditional demands there to be some kind of (e.g. causal) connection or relevance between the matters expressed in the compounds of a given conditional. And, most importantly, the rule is not to assert a conditional if we are already certain of the truth values of its compounds. Consequently, the general rule of reasoning that Quine suggests and the one he takes as an explanation of the strangeness of conditional with mutually irrelevant compounds is that in practice communicating agents choose to assert statements that are as short and as strong as possible. So, when we know the truth values of 'p' and of 'q, it is useless to use the conditional '*if* p *then* q" in our reasoning:

> Why affirm a long statement like 'If France is in Europe then the sea is salt.' or 'If France is in Australia then the sea is salt.' when we are in position to affirm the shorter and stronger statement 'The sea is salt'? And why affirm a long statement like 'If France is in Australia then the sea is salt.' or 'If France is in Australia then the sea is sweet.' when we are in position to affirm the shorter and stronger statement 'France is not in Australia'? [6, 15]

Instead of following Quine, Ajdukiewicz, having found Quine's general principle too strong, and lacking a more successful general principle, settles tentatively with acknowledging the following phenomenon:

DISJUNCTION One normally doesn't utter a disjunction if one knows which of the disjuncts is true.

and goes on to find a more plausible explanation for DISJUNCTION.

5. Expressing vs. stating

At this point, to provide a more general account of why such a principle should hold, Ajdukiewicz makes a distinction between what a sentence *states* (what has to be the case for it to be true) and what it *expresses*:

> To say that an utterance W of a person O expresses, given the linguistic habits, his state S, is the same as saying that W uttered by O is for the audience (who know of those [linguistic] habits) a sign of O's being in state S, or that uttering W by O allows the audience familiar with those habits to figure out that O is in state S. [1, 255]

On this approach, by uttering something, speakers not only state the fact required for the truth of the statement, but also express their states, associated with particular types of utterances by linguistic habits of a given linguistic community. While the statement might be *true* or *false* in virtue of whether what it states obtains, it is *proper* or *improper* in virtue of whether the utterer is in the state expressed by the statement.

Another important aspect of the distinction is that while to come to believe what is stated, one has to believe the statement to be true, while to come to believe what is expressed, one doesn't have to accept the statement itself. It is enough to understand it and to know the relevant linguistic habits.

Now we have reached Ajdukiewicz's general principle:

AJDUKIEWICZ One is unwilling to accept improper claims, even if they are true.

Ajdukiewicz doesn't say anything about this issue, but notice that Ajdukiewicz's criticism of Quine's solution doesn't apply to his own approach. After all, there are many cases of deductions which can be presented properly, because the inference steps do not express anything that contradicts what the premises express.

6. Ajdukiewicz on the diagnostics of improper use

One way of diagnosing our reasons to not assert a particular utterance p suggested by Ajdukiewicz is to ask ourselves: are we willing to accept $\neg p$?[2] If we refuse to assert p because we think it's false, our answer should be positive:

[2]For the purposes of this paper we follow Ajdukiewicz in taking acts of acceptance to be public, and so we ignore the distinction between accepting and asserting.

> Whether the refusal to accept a certain sentence is motivated by the unwillingness to accept something false, or the unwillingness to use an expression improperly, can be recognized, among other facts, by the fact, that in the first case the refusal is accompanied by the readiness to accept the negation [of the sentence], while in the second case such a readiness is missing. [1, 256]

Now, this seems a bit too hasty. After all, if I have no information about some p (say "aliens exist"), I will refuse to accept it, and I will refuse to accept $\neg p$. By Ajdukiewicz's criterion, this would mean that my refusal to accept p is not motivated by the unwillingness to accept something false. But this doesn't sound right – the main reason why I don't accept sentences about whose truth values I have no information is because as far as I know they might be false, and I wouldn't want to accept a false sentence.

In all fairness, however, when I refuse to assert "aliens exist", it's not only because I don't want to accept a (potentially) false statement, but also because this would suggest to the audience that I do think that I know that aliens exist, and that would be false. But this holds for any sentence which we don't know to be true, including those sentences that we know to be false. So, for instance, I'm unwilling to assert "2+2=5", and one reason for this is that this would express the claim that I know that 2+2=5, which is false. But at the same time, I am willing to assert "$2 + 2 \neq 5$", and so, by Ajdukiewicz's criterion, I am refusing to accept "2+2=5" for truth-related reasons, and not just because it would be simply improper to assert it.

So, we submit, Ajdukiewicz's account of this diagnostics should be revised. First of all, refusing to assert a sentence because it would be improper (= because it would express something false) doesn't exclude refusing to assert it because it's false. If we believe that a sentence is false, we should also believe that asserting it would be improper, because the assertion would express our knowledge that it is true (and we don't have that knowledge).

Second, as our example with aliens shows, refusing to assert a sentence because it would be improper (= because it would express something false) doesn't exclude refusing to assert it because we wouldn't want to accept something false, even if we don't know the sentence to be false.

Third, the distinction should be rather between sentences that we believe to be false and refuse to accept, and sentences that we don't believe to be false and refuse to accept. To this distinction Ajdukiewicz's diagnostic criterion correctly applies: if I believe something to be false, I will assert its negation, and if I don't believe it to be false, I won't.

The problem is, however, that now the criterion fails to divide sentences where Ajdukiewicz would like it to. After all, if I refuse to accept a disjunction while refusing to accept its negation, all I know is that I don't believe it to be false. Whether it is further the case that I only refuse to accept it because I believe it is

true, but it would be improper to assert it, or whether I also think I have no good reasons to think it's true is a separate issue that needs to be separately discussed.

There is a charitable and instructive way of reading Ajdukiewicz's remarks about the diagnostic method, though. Consider the example with pieces of chalk. The audience agreed to "p or q". Upon discovering that p is true and q is false, they cease to assert this disjunction. Now, if they thought the fact that p is true and q is false made the disjunction false, they would not only refrain from asserting it, but also were ready to assert its negation. Hence, it seems, Ajdukiewicz is still right that this shift doesn't have much to do with truth conditions of disjunctions.

7. Generalization, weakening, Moore's paradox

One remark is in place here. Ajdukiewicz suggests that by uttering a disjunction we express the fact that we know it to be true (and, that we don't know which disjunct is true). And in general, one might think that when uttering any sentence meant to state a fact, in standard contexts we express that we know that the sentence is true.

Both the suggestion about disjunction, and its generalization seem a bit hasty, though. For Ajdukiewicz would like any assertion which expresses a condition which is not satisfied to be improper. But there seems to be nothing improper to assert a true disjunction I *think* I know to be true which I don't really know to be true (and of which I *think* I don't know which disjunct is true), Gettier-like cases abound. And so, we submit, it would be sensible, and it would not damage Ajdukiewicz's approach to conditionals, to weaken the claim to saying that when one, in a standard context, asserts a disjunction (or any sentence meant to state a fact), one expresses the fact that one *believes* (not: *knows*) that disjunction (sentence) to be true. In what follows, we'll keep this remark in mind, but we'll still formulate arguments mostly in terms of knowledge, assuming that unless stated otherwise, considerations still apply after replacing knowledge with belief.

On the other hand, this easy generalization (and, at the same time, weakening) of Ajdukiewicz's suggestions bears directly on what, we think, Ajdukiewicz would say about Moore's paradox, where one says things like "p, but I don't believe that p". Namely, Ajdukiewicz would point out that by asserting a conjunction one expresses one's belief in both conjuncts, and so one expresses one's belief in p, and one's belief in not believing that p. Observe further that assuming introspection, this leads to straightforward contradiction in expressed judgments. The idea is that the expressed content is $Bp \wedge B\neg Bp$. The first conjunct, by introspection yields BBp, and so the whole thing together entails that the belief set is inconsistent.

8. Apparent connection between disjuncts

To use AJDUKIEWCZ to explain DISJUNCTION, Ajdukiewicz observes that a disjunction, apart from *stating* that at least one of the disjuncts is true, *expresses*

the fact that the speaker knows that at least one of the disjuncts is true, and that the speaker is ignorant as to which of them it is. For this reason, he suggests, once we know which disjunct is true, we refuse to utter a disjunction.

Ajdukiewcz asks: how can we know that a disjunction of the form "p or q" is true? Well, one option is that we know p, or we know q. In such a case, asserting "p or q" would be improper. Another option is that we're ready to assert q if we find out that p is false: that is, we're ready to infer q from $\neg p$.

So, on this view, in the context of proper assertion, expresses speaker's readiness to assert q if they find out that p is false: to infer q from $\neg p$. Where does this readiness comes from, though? Isn't it supported by some connection between the disjuncts, which is not only expressed, but also stated by a disjunction? Ajdukiewicz disagrees.

What sort of connection would that be? One option would be that it would be psychological: on this approach, the connection is that a disjunction makes one willing or ready to infer one disjunct from the negation of the other one. Ajdukiewicz observes that this notion would relativize truth-conditions of a disjunction to the speaker, and since he finds the idea of a disjunction being true for one person but false for another unpalatable, he rejects this account.

Another idea would be that the connection consists in making the inference under discussion legitimate. But in what sense? If all that is meant here is that if one of the disjuncts is false, the other one is true, then Ajdukiewicz agrees — but this is exactly what a disjunction states, and what is captured by the standard truth table for classical disjunction.

On a stronger interpretation, the claim is that the negation of one disjunct logically entails the other disjunct. But this, Ajdukiewicz observes, doesn't seem to hold for natural language disjunctions. He uses the following example: *I will die on a day with an even date, or on a day with an odd date*. This, he holds, is clearly true.[3] Yet, without additional premises that he will die some day and that each day has either an odd date or an even date, the negation of one of the disjuncts doesn't logically entail the other disjunct.

Could the second proposal be fixed to avoid Ajdukiewcz's criticism by saying that the negation of one of the disjuncts should entail the other disjunct with some additional premises? Not easily, for reasons similar to those for which the cotenability approach to conditionals is unsuccessful. For one would have to specify which additional premises can be used. If any true premises can be used, no interesting connection between disjuncts is required, it is just enough that one of them really is false. Once p is false, $\neg p$ is true, and p *or* q with $\neg p$ (a true sentence after all) logically entails q. One might be tempted to avoid this by saying that only those extra premises can be used to infer q from p *or* q and $\neg p$ which are connected with q, but this would make the account circular.

Let's observe, however, that Ajdukiewicz's criticism isn't lethal. He lists three interpretations of what it would mean for there to be a connection between the

[3]In fact, he died on April 12 1963, and so the first disjunct is true.

relevant sentences, excludes two of those options, and shows that the third one is exactly the one he proposes. What is missing is an argument to the effect that this is a complete list of sensible interpretations. But, absent other interpretations that would avoid criticism, this should be good enough.

9. Ajdukiewicz's diagnostics and Grice's cancellability

Now that we have presented Ajdukiewicz's defense of the material implication account of indicative conditionals, let's compare it to a much better known defense of the same claim, due to Grice. While analyzing the problem of material implication in his *Logic and Conversation* [3, 3–143], P. Grice considers the so-called Indirectness Condition (IC) associated with the conditional. According to IC, there should be non-truth-functional grounds for accepting $p \to q$ as the meaning of 'if p then q'. That is, if a subject asserts 'if p then q', they are conventionally committed both to the proposition $p \to q$ and to IC, which amounts to claiming some causal (or other, but still non-truth-functional) link between p and q.

Grice's analysis of conditionals lies in the scope of his theory of maxims of conversation and of conversational implicature. The main idea is that rational communicative interaction is governed by certain principles and maxims, which despite their prescriptive phrasing actually *describe* how agents behave in order to achieve effective communication in conversation. The most general rule is **the cooperative principle** (CP) which says:

> Make your contribution as is required, when it is required, by the conversation in which you are engaged.

According to Grice, the descriptive content of CP consists in the fact that speakers (generally) observe the cooperative principle, and listeners (generally) assume that speakers are observing it. Fulfilling CP consists then in obeying the so-called maxims of conversation. This means that the requirements of CP are explicated by the following rules:

Maxim of Quality: Contribute only what you know to be true. Do not say false things. Do not say things for which you lack evidence.

Maxim of Quantity: Make your contribution as informative as is required. Do not say more than is required.

Maxim of Relevance: Make your contribution relevant.

Maxim of Manner: Avoid obscurity, avoid ambiguity, be brief and be orderly.

Grice claims that certain utterances during a conversation convey meanings that are not explicitly expressed nor logically implied (entailed) in what is said, but nevertheless can, in some sense, be inferred for pragmatic reasons. Such meanings (or pragmatic inferences) are called *conversational implicatures*:

> I am now in a position to characterize the notion of conversational implicature. A man who, by (in, when) saying (or making as if to say) that p has implicated that q, may be said to have

> conversationally implicated that q, provided that (1) he is to be presumed to be observing the conversational maxims, or at least the cooperative principle; (2) the supposition that he is aware that, or thinks that, q is required in order to make his saying or making as if to say p (or doing so in those terms) consistent with this presumption; and (3) the speaker thinks (and would expect the hearer to think that the speaker thinks) that it is within the competence of the hearer to work out, or grasp intuitively, that the supposition mentioned in (2) is required. [3, 30–31].

The idea is that a conversational implicature is a pragmatic inference that the listener has to make if she is about to maintain that the speaker is cooperative. More precisely, following [5, 113] we might say that the speaker S's saying that p **conversationally implicates** q if:

1. S is presumed to be observing the maxims, or at least (in the case of floutings) the cooperative principle (cooperative presumption).
2. In order to maintain this assumption it must be supposed that S thinks that q (determinacy).
3. S thinks that both S and the addressee H mutually know that H can work out that to preserve the assumption in 1., q is in fact required (mutual knowledge).

One of the most important features of conversational implicatures[4] is cancelability and Grice even claims that conversational implicatures differ from semantic implicatures exactly in being cancelable. This means that they can be consistently dismissed by the speaker or in light of the context. For instance, the speaker might consistently add to the conversation some content that entails the negation of an already introduced implicature – assume that the speaker said 'Some of the students passed the test.' This implicates that not all of the students passed the test. The implicature might be canceled then by uttering: 'Indeed, all of the students passed the test.' Another example is when the speaker adds to the conversation some content that indicates that she is not committed to the implicature or its negation, as in 'Some, maybe all, of the students passed the test.'

Grice also makes one distinction that will be relevant to our concerns. He claims that there is a difference between *particularized* and *generalized* conversational implicatures:

> I have so far considered only cases of what I might call particularized conversational implicature — that is to say, cases in which an implicature is carried by saying that p on a particular occasion in virtue of special features of the context, cases in which there is no room for the idea that an implicature of this sort is NORMALLY carried by saying that p. But there are cases of generalized conversational implicature. Sometimes one can say that the use of a certain form of words in an utterance would normally (in the

[4] Among others, such as: calculability, non-conventionality, non-detachability, indeterminacy or re-inforcerability. An interested Reader can consult e.g. Levinson [5]

> ABSENCE of special circumstances) carry such-and-such an implicature or type of implicature. Noncontroversial examples are perhaps hard to find, since it is all too easy to treat a generalized conversational implicature as if it were a conventional implicature. [3, 37]

A generalized conversational implicature is one which does not depend on particular features of the context, but is instead typically associated with the proposition expressed. Not surprisingly, a particularized conversational implicature is one which depends on particular features of the context.

For instance, imagine a following conversation:

A: Will Sally be at the meeting?
B: Her car broke down.

In this situation, it is implicated by B that Sally will not be at the meeting, but the implicature is particularized, as there is nothing in the content of the expressed proposition that would suggest such an inference. Consider, however, another example:

Mary has 3 children.

When such a sentence is uttered in a conversation, it is implicated that Mary has no more than 3 children and the implicature is generalized – we can associate it with the proposition expressed, irrespective of the context.

Grice defends the view that the meaning of a conditional on any particular occasion of utterance is simply equivalent to the meaning of material implication. He claims that IC is a generalized conversational implicature. Just as all generalized conversational implicatures, it can be cancelled without contradiction, either by circumstances in the context or by explicit denials. Grice considers two examples of assertions of conditionals which carry no implicature of IC. These are the following:

If I have a red king, I also have a black king

uttered during a card game, and

If Mr Jones has black pieces, Mrs Jones has too

uttered during the run of a particular logical puzzle where the participants are about to guess the identity of the characters in the game and are provided with a piece of information, such as the one given in the conditional above. Grice claims that the total contents of the utterances above is just $p \to q$.

One of the maxims of Girce's pragmatics is the one of Quantity – it dictates to make, in a given context, the most informative statements of interest as possible. Grice calls the pragmatic virtue of this maxim 'conversational helpfulness'. Its point is to make natural language communication as efficient as possible. This resembles Quine's suggestion that we should utter stronger rather than weaker claims However, as Grice puts it:

> An infringement of the first maxim of Quantity, given the assumption that the principle of conversational helpfulness is being observed, is most naturally explained by the supposition of a clash with the second maxim of Quality ("Have adequate evidence for what you say"), so it is natural to assume that the speaker regards himself as having evidence only for the less informative statement ... [3, 33]

The above amounts to the claim that any utterance of 'if p then q' will, unless prevented by context, give rise to the implicature that the speaker does not have definite information about the truth values of p and q. According to Grice, some utterances of 'if p then q' might implicate a stronger condition than the one provided by the truth-tables of $p \to q$. However, instead of being a part of the meaning, what is implicated then is founded on the Cooperative Principle and the maxims of conversational implicature. Conditionals, then, play, apart from their semantics (given by the truth-table for $\to$), also roles of pragmatic nature: they enable people to ponder the consequences of certain choices durign a conversation. In the light of Gricean theory one might say that it would simply be irrational to use a conditional in certain contexts, for instance when there is no doubt about the truth of the antecedent.

Interestingly, the very same analysis also applies, according to Grice, to disjunctions: a natural-language disjunction of the form 'p or q' shares the logical meaning of '$p \vee q$', but in addition carries a generalized implicature that they are not both true. If the speaker was in a position to offer the more informative form 'p and q', then it would be conversationally more helpful to do so.

Prima facie, both Grice and Ajdukiewicz achieve seemingly equivalent results – the former's conversational implicature and the latter's expression of a mental state are quite similar to each other. It needs however to be noted that Grice, as Quine, has a general principle from which the Maxim of Quantity follows, whereas Ajdukiewicz gets to his result in a different manner. He first acknowledged a simple linguistic phenomenon (DISJUNCTION – see above) and found a relatively uniform yet simple explanation for it. Without assuming generalities of logical (as Quine) or of pragmatic (as Grice) sort, he simply associated effective utterances (i.e. the ones that, during a conversation, successfully deliver the content intended by the speaker) of a given expression with the possession of a certain epistemic state. In contrast with Grice's theory, the accuracy of his explanation does not depend on strongly controversial properties of a systematic but convoluted general theory of cooperative behaviour. Secondly, the nature of the criterion needs to be taken into account – for Grice it seems to be purely pragmatic, conversational and practical; for Ajdukiewicz – it is, in a sense, doxastic – it pertains to expressing the agent's knowledge or belief.

However, it actually might be questioned if Ajdukiewicz's account allows for expressing the content of the mental states only. As he puts it himself, conditionals express certain type of a lack of knowledge of the agent who makes the assertion

(that she does not know that the antecedent is true and she does not know that the consequent is false). Moreover, conditionals express that the agent is ready to infer the consequent from the antecedent. As for the former condition, it is rather clearly doxastic or epistemic. But as for the latter, one might ask: what does it exactly mean to express a disposition to make a certain type of inference? It is not completely clear whether one should understand it as expressing a mental state or rather just a disposition to be in a certain type of mental state a disposition to perform a particular type of behaviour.

10. Gołąb on indicative conditionals

Material implication as an interpretation of natural language indicative conditionals was also discussed in Lvov-Warsaw school by [2] and [8]. The former proposed a difficulty to the interpretation and the latter is a reply. Gołąb complains that when he teaches introductory logic, the claim that a conditional whose antecedent is false and consequent true is true usually startles the audience, because they have strong intuitions there are false conditionals which satisfy these conditions. Gołąb's example is:

If today is Monday, tomorrow is Wednesday.

The sentence, uttered on Tuesday, should be true, if the material reading is adequate, but people usually don't have this intuition.

Another problem brought up by Gołąb is with contraposition – he credits prof. Harassek from Lublin with the following counterexample:

$$\frac{\text{If I'm hungry, I won't swallow a needle.}}{\text{If I swallow a needle, I won't be hungry.}}$$

11. Słupecki's reply to Gołąb

As for contraposition, Słupecki suggests that the conditionals formulated in the counterexample don't express what is really being claimed. The actual and correct premise of the reasoning should be *Even if I'm hungry, I won't swallow a needle.* But if that's the case, the problem doesn't arise, Słupecki claims, because contraposition doesn't work for *even ... if* conditionals. He claims that for such conditionals there is no rule analogous to the principle of contraposition.

Słupecki's response to Gołąb's first worry is somewhat dismissive. He insists that the sentences in question are true, but it's simply that people wouldn't normally utter them due to some unspoken principles of parsimony, which prevent them from stating useless sentences not worth of interest:

> I suppose that the source of these intuitions is a kind of unformulated and not fully recognized principle of economy which we also follow when we classify the following sentence as nonsense:
>
> $$2 + 2 = 4 \text{ and } 2 + 2 = 4 \text{ and } 2 + 2 = 4$$

> – although in logical terms (logically) it is completely correct (sound) – or when we are not willing to accept (assert) compound sentences, the components of which are not materially (factually, objectively) linked or when such a link is bizarre (fanciful, odd, singular). Perhaps we would not be always inclined to count such sentences as false, but rather as superfluous, inexpedient or not worth of serious attention.

Słupecki also suggests a certain teaching trick that is meant to facilitate the digestion of the truth conditions of material implication. The trick consists in asking the students to describe a state of affairs in which a given conditional would be false. For instance

If it rains, John is not having a walk

The trick is to ask when this sentence would become false. The expected (obvious) answer should be, and usually is: if and only if it rains and John **is** having a walk. Then, it should be an easy way from this point for the students to see that if the above is not the case, the entire conditional must be true.

The problem with the trick is that it doesn't seem to overcome the difficulties that give rise to the questions concerning the semantics of conditionals. It is not too surprising that such heuristics works for sentences in which the antecedent and the consequent are causally related. It is, however, doubtful whether this teaching method would work for problematic examples such as *if today is Monday, tomorrow is Wednesday* or *if it is raining and not raining, then the Moon is made of green cheese.*

12. Ajdukiewicz's solution and Gołąb's problem

Obviously, Ajdukiewicz's approach was not available at the time of Gołąb's and Słupecki's discussion, but we can ask whether the solution he proposed successfully handles the case Gołąb brought up (Ajdukiewicz doesn't seem to be aware of Gołąb's and Słupecki's papers on the topic).

A natural thing to say about the conditional *if today is Monday, tomorrow is Wednesday* from Ajdukiewicz's perspective is that when we utter it on Tuesday, we know that the consequent is true, and yet the conditional expresses the claim that we don't have such knowledge.

But what if this reason for the utterance being improper is removed? Suppose it is Tuesday, but neither the speaker nor the audience know what day of the week it is (nor do they have any beliefs about it). The implication in question expresses that the speaker doesn't know which of the disjuncts is true, which is the case. Isn't this a problem for Ajdukiewicz's account? Not really – for there is another reason why an utterance of this conditional in such situation would be improper, stemming from the discussion in section 8.

How would the speaker come to know the conditional? Well, one way is by knowing either in the consequent, or in the negation of the antecedent (this is, by the way, quite a useless way of knowing a conditional, because a conditional

known this way cannot be properly uttered). But the speaker doesn't know what day of the week it is, so this way of knowing it is not an option. Another would be, perhaps, to know of a reason why today's being Monday would allow the speaker to infer that tomorrow is Wednesday. But there can't be such a reason, and so the speaker can't also come to know the conditional in this manner. Thus, the speaker is never in position to know the conditional, and consequently, never in position to utter it properly, for the expressed claim that the speaker knows the conditional to be true would always be false.

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