MEANING, MAXIMS OF COMMUNICATION AND LANGUAGE GAMES

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According to Dennett (1981) the function of intentional terminology is to explain and predict the behaviour of complex systems. A system is ‘intentional’ with respect to someone (perhaps the system itself) explaining its behaviour ‘by ascribing to the system the possession of certain information and supposing it to be directed by certain goals’. Actions of intentional systems are understood ‘on the basis of these ascriptions and suppositions’ (Dennett, 1981, p. 6). The problem addressed here is what enables the interpreter to make ascriptions of intentions and beliefs. (These will be sometimes referred to as propositional attitudes.) This problem is usually approached in one of three ways: specifying formally the functions which map propositional attitudes onto utterances; determining their possible psychological realisations (which may involve various strategies listeners in fact use when inferring speakers’ intentions and beliefs); and finally, constructing computer models which produce intentional interpretations of utterances (e.g. Johnson and Robertson, 1981; Schank and Lehnert, 1979). We postulate a system of rules which are akin to Grice’s ‘maxims of conversation’ and which assign intentions and beliefs to utterances in accordance with Grice’s definition of non-natural meaning (Grice, 1957, 1969).

It is also widely accepted in pragmatics that the meaning of signs is not exhausted by their semantic or logical descriptions but that the speakers’ intentions and beliefs matter. According to Grice (1957, 1969, 1982) if, for example, the sentence (1) ‘It is snowing’
is to mean ‘it is snowing’ on a particular occasion, the speaker must:

(i) intend the hearer to adopt the belief that it is snowing;
(ii) intend that the hearer recognizes the intention (ii) and
(iii) intend that the fulfilment of the intention (iii) will constitute, at least in part, the basis for the satisfaction of (ii)

The significance of the conditions (i)–(iii) becomes clearer if we imagine that the speaker has issued the utterance but some of them were either false (Leudar, 1981) or denied by the speaker. For example, if (i) is false and (ii) and (iii) true, the utterance (1) could be an indirect and strategic act of communication; if all (i) to (iii) are false, the utterance (1) could possibly count as an involuntary exclamation. Uttering (1) and denying (ii), as in (2), makes the utterance self-defeating (cf. Vanderveeken, 1980).

(2) *It is snowing and I don’t want you to believe it is snowing.


(3) *It is snowing and I don’t believe it is snowing.

In other words, issuing the utterance (1) as a direct, serious and sincere informative commits the speaker to intentions (i), (ii) and (iii) as well as to a belief (iv).

(iv) the speaker believes that it is snowing.

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The details of how non-natural meaning should be defined vary (Strawson, 1964; Grice, 1969; Schiffer, 1972; Vendler, 1972; Bennet, 1976; Vendler, 1980) and what can be ‘meant non-naturally’ has been a subject of controversy (Searle, 1969, 1983; Bach 1983) but the important point here is that mental terms are important in accounting for speaker-meaning. Meanings can be conveyed by means of recognition of intentions and the communicative significance of an utterance associated with different subsets of propositional attitudes (i)-(iv) varies. Understanding an utterance effectively requires its contextualisation relative to speakers’ goals and beliefs (cf. Goodman, 1966, pp. 362–369).

Grice (1967, 1975, 1978) also argued that the speakers and the hearers are guided in their conversations by the cooperative principle and its constitutive maxims: quality, quantity, manner and relevance; and that these partly constitute the background against which aspects of speaker meaning (e.g. implicature, implication, presupposition and reference) are computed (Gazdar, 1979; Wilson and Sperber, 1983; Smith, 1983). In general terms, maxims are pieces of background knowledge which express the manner in which we are expected to act in cooperative interactions. They are used, together with other background knowledge, to interpret and go beyond what is uttered.

The maxims of conversation put forward by Grice (1967) seem intuitively plausible for cooperative interactions. Several problems, however, arise. First, it is not clear whether the maxims of conversation are useful and appropriate in the analysis of non-cooperative interactions. It could be that in such communications, they are simply not in power and thus do not affect the interpretation of utterances (Sampson, 1982). The alternative is that some non-standard maxims govern non-cooperative interactions (May, 1981) and thus also the interpretations of actions which constitute them.

Second, the set of maxims proposed for cooperative interactions can either be redundant (Wilson and Sperber, 1981) or incomplete. A methodological problem involved is that the maxims of conversation can be studied either in terms of their origins or of their effects on the meaning inferred from utterances. Past research has mainly focused on the effects on inference, rather than the former aspect. On this consideration only, the (Gricean) set of maxims can be shown to be redundant (see Wilson and Sperber, 1981). This redundancy, however, is not a sufficient reason for ‘pruning’ the set of maxims. Quite simply, the speakers do not presuppose the validity of maxims in order to derive, for example, implicatures. Rather, the content and the validity of some of the maxims are determined and imposed on speakers and hearers by the social organisation of interactions. This is presumably the point made by Wittgenstein (Wittgenstein, 1953, 1958; Hunter, 1968) when he said that language is a form of life. Indeed, there is no a priori reason to assume that each inference made in conversation is arrived at uniquely by all the hearers on various occasions. The system of rules, which enables the hearers to infer the speakers’ communicative intentions, may well be redundant in this sense. Of course not all the maxims need to stem from the organisation of interactions. Wilson and Sperber (1983), for example, claim that relevance is a reflection of the principle of economy, characteristic of information processing in general. There is an important empirical problem indicated here. Some maxims may be relaxed in some communications (and with some speakers, whom we know to ignore them habitually), but others may always remain in power. If Sperber and Wilson are correct, the relevance considerations are invariant and fixed characteristics of comprehension and the contextual implications stemming from relevance are always initially drawn by the hearers, only to be possibly cancelled in the context of some ‘language games’. The potential contextual implications of the maxims not in power would, however, not be drawn at all
and thus the process of cancellation would be side-stepped. Empirical evidence on this point is, however, lacking. The term 'language game', which we have just used, lacks a clear definition, perhaps following Wittgenstein’s assertion that to attempt a general definition is misguided. We shall nevertheless discuss whether it is possible to define and distinguish ‘language games’ in terms of which maxims are valid, not in power or consistently violated by the speakers.

In summary, the present paper investigates the link between some tacit rules guiding communications and non-natural meaning. We do not attempt to formalise ‘maxims of conversation’, but rather postulate ‘maxims of communication’ which are similar to Grice’s maxims in that they are a function of the organisation of cooperative interactions and their validity is likely to be presupposed in those interactions by speakers and listeners. The two types of maxims, however, differ in content.

The system
Defining the maxims of communication

We assume that hearers interpret utterances in terms of speakers’ intentions and beliefs. There is a variety of means which allow such interpretations to take place. Maxims of communication are here defined as rules which relate utterances, beliefs and intentions and thus allow attributions of propositional attitudes. Maxims of communication are elements of background knowledge, brought to bear on utterances when these are interpreted. More specifically, they reflect our assumptions about what it is to cooperate in communications, and are interpretable in terms of adjectives, such as ‘sincere’, ‘insincere’, ‘open’, ‘direct’, ‘devious’, which signify whether a maxim is true or violated. The effect of the postulated communicative maxims is that a speaker, who issues an utterance in a language game which presupposes the validity of some or all of them, will be taken by his or her audience to have certain intentions and hold certain beliefs (cf. Schutz, 1975). The speaker cannot deny these without opting out of the language game. In other words, we formulate the maxims of communication so that they would enable the hearer to attribute ‘standard’ intentions and beliefs to the speaker on the basis of (a) her assumptions about the kind of interaction taking place and (b) the speaker’s actions, intentions or beliefs. The speaker is committed to the ‘standard’ intentions and beliefs and their absence, not their presence, needs to be signalled or justified.

Four kinds of communicative maxims are defined:
(i) consonance rules, whose main point is that the content and propositional attitudes conventionally indicated by an utterance coincide with what the speaker is actually saying (note the system applies both to directives and informatives);
(ii) sincerity rules, which, as it turns out, formalize Grice’s maxim of quality;
(iii) communality rules, which distinguish communications that strive to establish shared beliefs from those in which differences between the interactants’ belief systems are established and highlighted; and finally
(iv) externalisation rules, which refer to making public one’s beliefs and intentions.

Formally expressed maxims of communication are given in Fig. 1. We start by postulating more maxims than necessary but eventually identify the minimum necessary sets which produce ‘non-natural meaning’.

It is important to distinguish between the maxims which the hearer assumes to hold, and those which are actually in power or violated. The hearer may be assuming a certain maxim (e.g. sincerity) to hold and thus attribute to the speaker (who is lying) certain beliefs
**CONSONANCE and LITERALNESS**

Consonance 1 (CON1): \(\text{utter}(S, U)\&\text{cont}(U, \text{that}(P))\rightarrow \text{bel}(S, P)\)

Consonance 2 (CON2): \(\text{utter}(S, U)\&\text{cont}(U, \text{do}(H, X))\rightarrow \text{int}(S, \text{do}(H, X))\)

Literalness 1 (LIT1): \(\text{utter}(S, U)\&\text{cont}(U, \text{that}(P))\rightarrow \text{int}(S, \text{bel}(H, P))\)

Literalness 2 (LIT2): \(\text{utter}(S, U)\&\text{cont}(U, \text{that}(P))\rightarrow \text{int}(S, \text{bel}(H, \text{bel}(S, P)))\)

**COMMUNALITY**

Communality 1 (COM1): \(\text{bel}(S, P)\rightarrow \text{int}(S, \text{bel}(H, P))\)

Communality 2 (COM2): \(\text{int}(S, \text{do}(H, X))\rightarrow \text{int}(S, \text{int}(H, \text{do}(H, X)))\)

**SINCERITY**

Sincerity 1 (SIN1): \(\text{int}(S, \text{bel}(H, P))\rightarrow \text{bel}(S, P)\)

Sincerity 2 (SIN2): \(\text{int}(S, \text{bel}(H, \text{bel}(S, P)))\rightarrow \text{bel}(S, P)\)

Sincerity 3 (SIN3): \(\text{int}(S, \text{bel}(H, \text{int}(S, \text{do}(H, X))))\rightarrow \text{int}(S, \text{do}(H, X))\)

**EXTERNALIZATION**

Disclosure (DIS): \(\text{bel}(S, P)\rightarrow \text{int}(S, \text{bel}(H, \text{bel}(S, P)))\)

Openness (OPEN): \(\text{int}(S, X)\rightarrow \text{int}(S, \text{bel}(H, \text{int}(S, X)))\)

\(S\) stands for speaker; \(H\) stands for hearer; \(U\) stands for utterance; \(P\) stands for its conventional content and \(X\) stands for an action. Utter, cont, bel and int stand for ‘utters’, ‘contents’, ‘believes’ and ‘intends’, respectively.

Thus \(\text{bel}(S, P)\), for example, means ‘speaker believes \(p\)’.

Fig. 1. Maxims of communication.

and intentions which in fact are not present. Thus, in order to account for acts of communications such as lying, it is necessary to specify the validity of maxims both from the point of view of the hearer and the speaker. Of course, normally the two specifications will coincide.

There are at least four criteria which maxims of communication should satisfy:

(a) the set of maxims must assign to utterances the appropriate and meaningful propositional attitudes;

(b) maxims of communication should be meaningful and their violations should be interpretable in terms such as ‘sincere’, ‘insincere’, ‘devious’ and ‘direct’;

(c) it should be possible to distinguish types of communication according to which maxims are in power, violated or suspended; and

(d) for each pair of maxims there should be at least one type of communication in which one of the maxims is in force but the other is not.

**I. Consonance and literalness maxims**

These rules map utterances onto beliefs or intentions and are formally expressed in Fig. 1.

In English, they can be roughly paraphrased:

Speakers say what they:

(a) believe (CON1);

(b) intend their hearers to believe (LIT1);

(c) intend their hearers to believe they (the speakers) believe (LIT2); and finally

(d) intend the hearers to do (CON2);

Thus CON1 specifies a direct correspondence between the conventional content of utterances and speakers’ beliefs: the speaker believes what she states.\(^3\) Rules with the same ‘flavour’ have been put forward previously. Grice (1982) suggested that there is a ‘correspondence between particular communication devices or utterances on the one hand
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and psychological states on the other' (see also Hintikka, 1962). Joshi (1982), postulated
the following rule for man–machine interface: ‘If S says Q then it must be that S believes Q,
and it should not be possible for U(ser) from what S(peaker) said to infer some other fact which S knows to be false’. Finally, Lakoff (1975) introduced a meaning postulate sincere (x, state (x, y, p,)) → believe (x, p) to account for Moore’s paradox; according to him if this postulate is in power, (1) cannot be sincerely issued. Of course, Lakoff does not define sincerity, but the definition implicit in his postulate prescribes a particular relationship between a speaker’s statements and beliefs. Breaking Lakoff’s postulate in itself, however, does not warrant an attribution of insincerity to a speaker (consider sarcasm or irony, for example) and neither do violations of consonance maxims. We define sincerity below differently, in terms of the relationship between hearer’s beliefs and her communicative intentions. Lakoff’s proposal was also criticised by Gazdar (1979) on different grounds.

On the assumption that CON1 is in force, saying something commits the speaker to a consonant belief: so saying ‘It is raining’ commits the speaker to believing it (5, 6).

(5) *John says ‘It is raining’ but believes that it is raining.
(6) John says ‘It is raining’ but believes that it is sunny.

‘But’ is used in English to signal that the conjunction of clauses is in some way unexpected but only apparently contradictory (cf. Grice, 1961; Kempson, 1975). The sentence (5) is odd because there is no apparent contradiction: in fact saying ‘It is raining’ implies (on consonance, CON1) that the speaker believes that it is raining. The sentence (6), on the other hand, is well-formed; ‘but’ signals that the consonance implication is cancelled. We shall use the ‘but’ test below to exemplify the other maxims.

CON1 is violated when the speaker states something which she does not believe, as happens in lying but also in sarcasm, exaggeration, metaphorical speech and irony. Lies are parasitic on presupposed truthfulness. If a lie is to be successful, the deliberate violation of consonance by the speaker must be covert and not apparent to the hearer (cf. Lewis, 1969, p. 174, and see below). In sarcasm and irony, on the other hand, the violations of consonance are usually signalled by non-verbal cues. In indirect informatives the rule may or may not be true.

The rule CON2 specifies that if S issues a directive for H to do something, she actually intends that H does it (7, 8).

(7) *Peter says to John ‘Open the door’ but wants him to open the door.
(8) Peter says to John ‘Open the door’ but wants him to keep it shut.

The maxim is violated in, for example, sarcasm (9) and in politeness (10).

(9) ‘Go and jump in a lake’
(10) ‘Stay as long as you like’ (said to an unwelcome guest).

Grice (1969) also suggested that when S issues a directive for H to do X, S intends for H not just to do X but also to intend to do X. A corresponding communicative maxim would be utter (S, U)&cont(U,do(H,X)) → int(S,int(H,do(H,X))). We will show below that the intention int(S,int(H,do(H,X))) is in fact produced from the product of CON2a by communality (COM2) and the communicative maxim CON2b is not strictly necessary. While according to the criteria (a)–(d) this is not a sufficient reason for rejecting the maxim, we shall not consider it further.

The literalness maxims map the content of utterances and speakers’ intentions. They establish as direct such correspondence: LIT1 commits S to wanting H to adopt a belief
corresponding to the content of the utterance issued (cf. Bach and Harnish, 1979; Sperber and Wilson, 1986) and LIT2 specifies that issuing an utterance commits the speakers to wanting the hearer to believe that the speaker believes the content of the utterance. LIT1 is contradicted when S asserts that \( p \) but does not expect or intend \( H \) to adopt the belief that \( p \). Perhaps the best examples of this are declarations of position in scientific and ideological disputes and the assertions made in political campaigns, such as (11) and (12) in which LIT2 but not LIT1 are in force.

(11) This government will be the end of this country (said by a paid-up member of Labour Party to a paid-up Tory).

(12) And yet it still moves! (Galileo Galilei).

In these utterances, speakers disclosed beliefs without expecting or intending that they would be adopted by their audiences at the time. In other words, LIT1 is violated when \( S \) issues an utterance \( U \) with content that \( (P) \), but either (a) has no intention to affect \( H \)'s beliefs in any way (e.g. involuntary exclamations) or (b) simply puts his or her belief that \( P \) is true 'on record'. LIT2 is violated in acts of communication, such as sarcasm, irony and 'soundings', in which the intended effect of an utterance differs patently from its conventional content. Note that neither LIT1 nor LIT2 are violated if \( S \) lies to \( H \) or is misleading her, and indeed both should be assumed valid by \( H \) if a lie is to be successful.

II. Communality maxims

There are two maxims, again given formally in Fig. 1. In English they say:

(a) 'Speakers intend their hearers to believe what they (the speakers) believe'; and
(b) 'Speakers intend their hearers to intend to do what they (the speakers) intend the hearers to do'.

Both communality maxims express preference for consensus, for inducing in others the beliefs and intentions that one holds oneself rather than those one does not (cf. e.g. Brown and Levinson, 1978; Carlson, 1983). The first communality rule is violated if (a) \( S \) attempts to induce in \( H \) a belief which she does not hold, as in lies and misleading; but also (b) in secretiveness, when \( S \) is in the role of speaker, takes something to be true but does not wish \( H \) to do so, as in (13);

(13) Children are playing and Billy knocks over a vase.

Mother hears the noise, comes in and asks Billy:

"Who broke that vase?"

Billy: no reply

and finally (c) when \( S \) simply does not care whether \( H \) holds the same beliefs or not (9, 10) as may happen in blazing arguments. The inverse of COM1—\( S \) believes that \( p \) and intends \( H \) not to believe that \( p \) is the case—may be valid in some interactions, in which the speaker's goal is to differentiate himself or herself from the hearer, rather than to establish consensus.

Note that the rule COM2 cannot be formulated (briefly) \( \text{int}(S,X) \rightarrow \text{int}(S,\text{int}(H,X)) \), as might be expected by analogy with COM1, for the following reasons. Such as formulation would apply to beliefs (e.g. let \( X = \text{bel}(H,P) \)), and thus attribute to \( S \) the intention that \( H \) should intend to believe \( p \), \( \text{int}(H,\text{bel}(H,P)) \), which would be a rather odd state of affairs to aspire to.

What is the distinction between interactions in which COM2 is violated and those in which it is abided by? One possible violation is that \( S \) intends that \( H \) does \( X \) unintentionally.
One can, for example, induce another to make space on a park bench by edging towards them (instead of asking them to move). COM2 is also violated when $S$ 'tricks' $H$ into doing something. $S$ may, for example intend the hearer to upset some third party (who is, say, poor but proud) even though the hearer would not do this intentionally. $S$ may, however, fulfill her intention by suggesting to $H$ that he offers the third party a small loan. In doing this, $H$ upsets the third party, but does this unintentionally, and $S$'s goal has been fulfilled.

There is another set of interactions in which COM2 could have been violated, the manner of violation being quite different from that in the previous two cases. $S$ may force $H$ to do something which $H$ would not do, were it not for $S$'s intervention. A good example is orders. Suppose a policeman is ordered to arrest his son; obviously, the policeman cannot do this unintentionally, but doing so may be against his desires. The distinction here is between inducing actions by means of authority rather than by getting one's audience to accept particular goals (and actions to these goals) as their own. The problem is how widely we interpret the term 'intend': does intending something entail desiring it? It is clear, however, that the predicate 'intend' should have the same meaning throughout the system. If we take the term 'intend' to entail preference to alter the world (including others' beliefs), then actions in which we force our audiences to do something against their preference violate COM2.

III. Sincerity maxims

These maxims are again given formally in Fig. 1. Their English paraphrases are as follows.

(a) 'Speakers believe what they intend their hearers to believe' (SIN1).
(b) 'Speakers believe what they intend their hearers to believe that they (the speakers) believe' (SIN2).
(c) 'Speakers intend their hearers to do what they intend them to believe they want them to do' (SIN3)

Sincerity rules rephrase and expand on Grice's maxim of quality. The rule SIN1 (which is a converse of communality COM1) can be exemplified by application of the 'but test', as in (14) and (15).

(14) *John wants Paul to believe that Mary had too much to drink, but he believes that she had too much to drink.
(15) John wants Paul to believe that Mary had too much to drink, but he believes that she did not.

The rule SIN2 applies to declarations of beliefs—its validity excludes false declarations of beliefs (cf. 16, 17).

(16) *John wants Harry to think that he believes that inflation is bad but believes that inflation is bad.
(17) John wants Harry to think that he believes that inflation is bad, but believes that inflation does not matter.

SIN3 applies to declarations of one's intentions that one's audience should act in some way—it simply excludes those occasions on which the speaker would want the hearer to act in some way, without this being actually the case. This may actually happen in some strategic interactions, such as getting a perverse and stubborn child to behave in a certain way by telling it to do the opposite. The rule is also sometimes violated for reasons of politeness.

The maxims SIN2 and SIN3 (but not SIN1) can be seen as instances of a more general rule $\text{int}(S,\text{bel}(H,P) \rightarrow P$. This generalised maxim is more likely to be held valid if $P$
is instantiated by a predicate denoting the speaker's propositional attitude, rather than a proposition about the 'world'. In the latter case, in addition to truthfulness, the 'design characteristics' of the speaker (i.e. his or her efficiency, intelligence or experience) will be considered by the hearer (cf. Dennett, 1983). It may, however, also be the case that the hearers usually assume that the speakers' expressed beliefs are actually true: 'There is no point in ascribing beliefs to a system unless the beliefs ascribed are in general appropriate to the environment and the system responds appropriately to the beliefs' (Dennett, 1981, p. 17).

The two aspects of sincerity defined above are clearly related to Grice's (1969) maxim of quality.

IV. Externalization maxims

We postulate two of these maxims (Fig. 1), which can be paraphrased in English as follows.

(a) 'If the speaker believes something, then she intends the hearer to believe that this is so' (DIS).

(b) 'If the speaker intends something, then she intends the hearer to believe that this is so' (OPEN)

These rules predict that if the speaker has a belief or an intention she will want to share it with the hearer (cf. 18, 19).

(18) John believes that inflation is bad but he wants Bill to believe that he believes that inflation is irrelevant.

(19) *John believes that inflation is bad, but he wants Bill to believe that he believes that inflation is bad.

Thus openness produces the intention (iii) in Grice's definition of non-natural meaning and establishes communications as open. Openness and disclosure can be subsumed under a more general externalisation rule \( Fa(S,P) \rightarrow int(S, bel(H, Fa(S,P))) \), where Fa refers to a propositional attitude. In our model, however, the two rules are defined separately, because they are in fact valid in different subsets of interactions and communicative acts. In general the externalisation rules are contradicted in interactions during which, for some reason, the speaker prefers to keep relevant beliefs or intentions private rather than making them public. This may happen when one either prevaricates, communicates covertly, or makes insinuations and indirect remarks. They are also violated in lying and misleading, in the sense that the speaker's true beliefs or intentions are not made public.

It should be noted that these rules, and also communality, need to be constrained in their application by relevance to current interactions, or else the speaker would 'bare' all of her belief system, which is clearly absurd.

The productive properties of the system

In this section we shall be concerned with the properties of the system of maxims. These maxims were formulated to produce descriptions of declaratives and directives consistent with Grice's (1957) definition of non-natural meaning. The complete system in fact does this but it also produces other intentions and beliefs. We give some examples of the system's productions for four selected databases (Fig. 2). Each of them describes a hypothetical interaction in which the speaker has either a single or a multiple audience and issues either a declarative or a directive. The audiences assume that all the maxims are in power.
Database a:
aud(mary,john).
utter(mary,u).
cont(u,that([the,book,is,on,the,table])).

Product:
beliefs:
B1a: bel(mary,[the,book,is,on,the,table]).
B2a: bel(mary,bel(mary,[the,book,is,on,the,table])).
B3a: bel(mary,int(mary,bel(john,[the,book,is,on,the,table])).
B4a: bel(mary,int(mary,bel(john,bel(mary,[the,book,is,on,the,table])))).

intentions:
I1a: int(mary,bel(john,[the,book,is,on,the,table])).
I2a: int(mary,bel(john,bel(mary,[the,book,is,on,the,table])).
I3a: int(mary,bel(john,I1)).
I4a: int(mary,bel(john,I2)).

Database b:
 aud(mary,john).
utter(mary,u).
cont(u,do(john,[get,the,book])).

Product:
intentions:
I1b: int(mary,do(john,[get,the,book]))
I2b: int(mary,int(john,do(john,[get,the,book]))).
I3b: int(mary,bel(john,I1b)).
I4b: int(mary,bel(john,I2b)).
I5b: int(mary,bel(john,B1b)).
I6b: int(mary,bel(john,B2b)).

beliefs:
B1b: bel(mary,I1b).
B2b: bel(mary,I2b).
B3b: bel(mary,B1b).
B4b: bel(mary,B2b).

Database c:
 aud(mary,john).
aud(mary,pete).
utter(mary,u).
cont(u,that([the,book,is,on,the,table])).

Product:
beliefs:
B1c: bel(mary,int(mary,bel(pete,I1a))).
B2c: bel(mary,int(mary,bel(pete,I2a))).

intentions:
I1a, I2a, ... as for the Database a
I1c: int(mary,bel(pete,I1a)).
I2c: int(mary,bel(pete,I2a)).
I3c: int(mary,bel(pete,I1c)).
I4c: int(mary,bel(pete,I2c)).

Fig. 2. Continued overleaf
Continued from previous page

Database d:
aud(mary,pete).
aunder(mary,john).
utter(mary,u).
cont(u,do(john,[get,the,book])).

Product:
intentions:
11b, 12b, . . . as in the Database b
11d: int(mary,bel(pete,int(mary,do(john,[get,the,book])))).
12d: int(mary,bel(pete,int(mary,int(john,do(john,[get,the,book]))))).
13d: int(mary,bel(pete,1ld)).
14d: int(mary,bel(pete,12d)).

beliefs:
B1b, B2b, . . . as in the Database b
B1d: bel(mary,int(mary,do,(john,[get,the,book]))).
B1d2: bel(mary,int(mary,int(john,do(john,[get,the,book]))))).

Fig. 2. Productions of the system.

Database a
This database specifies that Mary has a single audience, John, to whom she says ‘The book is on the table’. The product of the system is expressed formally in Fig. 2. In everyday English, Mary asserts that the book is on the table; this is evidenced by her utterance, her belief that the book is on the table (Bia), her intention that John should adopt this belief ((11a) and its reflexes 13a, 14a, etc.). In addition, however Mary declares her belief that the book is on the table (the beliefs B1a, B2a and intentions 12a, 14a, etc.). In other words, asserting that something is the case is accompanied by declaring one’s belief to that effect.

The second surprising result is that issuing the utterance against the background of maxims of communication commits Mary to believing what she believes or intends (B2a, B3a, . . .). These beliefs about propositional attitudes (which we shall refer to below as ‘reflexive beliefs’) are produced from the intentions to inform one’s audience about one’s second order intentions on application of the sincerity maxim SIN1. For example, if applied to ‘Mary wants John to believe that she believes that it is snowing’, SIN1 would produce ‘Mary believes that Mary believes that it is snowing’. Believing in one’s own beliefs and intentions is one aspect of organisation of belief systems which follows from the speaker’s involvement in interactions governed by maxims of communication. Thus the intra-subjective rule bel(S,X) → bel(S,bel(S,X)) (cf. Hintikka, 1962) can be expressed as a thesis of maxims of communication’. 

Database b
The difference between interactions (a) and (b) is that in the former Mary issues a declarative while in the latter a directive ‘Get the book’. According to the system, in saying ‘Get the book’, Mary indicates both that she wants John to get the book (intentions 11b, 13b, 15b, . . .) but also that she wants him to want to get the book (12b, 14b, 16b, . . .) (cf. Grice, 1969). As in the case of informatives, the system commits Mary to believing what she believes and intends, and these reflexive beliefs are produced in the manner described previously. She is, however, also committed to declaring these (reflexive) beliefs
to her audience, if the disclosure rule DIS is allowed to apply to them. We shall return to this point later in the paper.

To summarise so far: maxims of communication produce the meaning-nn for declaratives and directives as they were designed to. More surprisingly, the system also produces

(a) reflexive beliefs (such as S believes what S believes or intends); and
(b) the intentions to declare these reflexive beliefs.

An interesting possibility is that the consequences (a) and (b) are necessarily produced by any set of rules generating meaning-nn. We shall consider this possibility below, but first we outline what the system produces for speaking to the multiple audiences.

Database c

In this hypothetical interaction, Mary has a multiple audience, John and Peter. Mary again says ‘The book is on the table’. As expected from the results for database a, the system produces the intentions and beliefs which specify that Mary informs each of them that the book is on the table, and that she declares her belief to this effect. In addition, however, Mary is committed to ‘communicating’ to Pete her communicative intentions with respect to John. In other words, Mary has the right propositional attitudes for communicating-nn to Pete that she is communicating-nn to John that . . . , and so on. The relevant intentions (11c, 12c, . . . ) are derived from Mary’s reflexive beliefs (B3a, B4a, . . . ) on application of the communality maxim COM1. The converse, of course, also obtains and Mary is committed to propositional attitudes consistent with telling John what she is telling Pete. (For the sake of brevity, the relevant intentions and beliefs are omitted from Fig. 2.) Considering the kernel of the Gricean conception of meaning—it is conveyed by means of intention recognition—any actual declaration by Mary that she has these intentions is redundant. In a sense, the system of maxims commits the speaker to creating mutuality of beliefs in situations in which his or her audience is multiple. The result is the same with directives issued in the presence of multiple audiences.

Database d

In the final hypothetical interaction Mary issues a directive, ‘John, get the book!’ before a multiple audience, John and Pete, The system produces intentions and beliefs already given for the database b and Mary can be taken to say (a) that she wants John to get the book and (b) that she wants him to want to get it. In addition, however, the system attributes to Mary the propositional attitudes consistent with informing Pete that (a) and (b) are the case. In other words, Mary is committed to informing Pete what she is requesting of John. (In fact, according to the system, Mary also informs John that she is informing Pete that she wants John to get, and to want to get, the book, and so on, ad infinitum.)

Properties of maxim subsets

The system of maxims of communication given above maps an utterance onto an infinite set of beliefs and intentions, including all the necessary definienda for non-natural meaning. The fact that the set is infinite is not a problem if the system is used to verify whether an utterance meant nn as the goal for verifications and there is no need to infer beyond them. There are, however, some additional difficulties.

The first one is that there are too many maxims and the system is redundant. What happens if some of the maxims are not in power? It can be shown that there are four distinct,
minimal sets of maxims which produce all the propositional attitudes discussed above. These sets are:

1. CON1, CON2, LIT1, COM2, SIN1, DIS, OPEN.
2. CON1, CON2, COM1, COM2, SIN1, DIS, OPEN.
3. CON2, LIT1, COM2, SIN1, DIS, OPEN.
4. CON2, LIT2, SIN2, COM1, COM2, SIN1, DIS, OPEN.

Note that the maxim SIN3 is not necessary whereas the maxims OPEN, DIS and SIN1 are necessary. It appears that set (3) is the smallest one sufficient to produce all the intentions and beliefs we have considered above. It is an empirical question which of these sets is in power in a particular cooperative interaction but the deletion of a maxim from the four sets will have different consequences.

The complete system (and the maxim subsets 1–4) commits the speaker to intending to induce in audiences beliefs about her reflexive beliefs and this is implausible. ‘Switching off’ the maxim DIS is relevant in this respect. The effects of doing this, however, depend on which other maxims remain in power. For the following sets of maxims:

5. CON1, CON2, LIT2, COM1, COM2, SIN1, OPEN.
6. CON2, LIT1, LIT2, COM2, SIN1, OPEN.
7. CON2, LIT2, COM1, COM2, SIN1, SIN2, OPEN.

the intentions to induce in an audience beliefs about reflexive beliefs are not produced. These subsets of maxims, however, do produce (a) the Gricean non-natural meaning definiens for an utterance, including an infinite number of intentions:

i1: int(S, bel(H,P)).
i2: int(S, bel(H,i1)).
i3: int(S, bel(H,i2)).

General discussion

We started on the assumption that understanding involves determining the speaker’s beliefs and intentions and set out to specify the rules which might guide their attribution in some interactions. There is clearly a relationship between Grice’s (1957) concept of non-natural meaning and maxims characteristic of cooperative interactions. The latter can be formulated so that they produce the former. We in fact postulated four types of maxims of communication: consonance and literalness, communality, sincerity, and externalisation. We have shown that these provide one inferential mechanism by means of which intentions and beliefs can be assigned to utterances, enabling the speakers to use the utterances to mean-nt. We have also indicated that the maxims of communication are in power only in some interactions. In essence, we have treated maxims as optional elements of (mutually held) background knowledge, activated in some interactions and reflecting their social organisation. From this viewpoint, beliefs and intentions are contextual entailments of maxims of communication (cf. Wilson and Sperber, 1983). Of course, we are not assuming that the maxims we put forward are the only means by which intentions and beliefs can be inferred. That is, we do not assume that if a maxim of communication is not in power, the propositional attitudes it would otherwise produce are necessarily taken to be absent. A habitual liar can be seen to say something which is true, but this conclusion will not be reached through maxims of communication.

Our reformulation of Grice’s conception of non-natural meaning suggests that his original definition had certain tacit consequences relevant to (a) the organisation of belief systems and (b) the problem of mutual knowledge. First, we have observed that the production
of definienda of Grice's meaning necessarily committed the speaker to believing her beliefs and intentions. This result suggests that it is not always necessary to postulate intra-subjective principles, such as, for example, that believing something implies believing that belief. A more cautious claim would be that some of these principles originate in the organisation of and involvement in cooperative social interactions. The second result worth noting is that the maxims of communication establish some aspects of mutual knowledge which arise in communicating with multiple audiences and no extra rules to establish these features of inter-subjectivity are required (cf. Clark and Marshall, 1981).

We have suggested above that maxims of communication may allow us to clarify the concept of 'language game'. What we propose is that these maxims are features which simultaneously (a) partly define and differentiate types of interaction; and (b) provide premises on the basis of which intentions and beliefs can be inferred or attributed by hearers to speakers. A similar proposal has been made by Levinson (1979). According to him, standard cooperative interaction can be defined as that in which all the maxims of conversation are in force and it can treated as the unmarked, paradigm case of interaction. Other interactions can be treated as marked and their deviations from the standard may be characterised according to which maxims are definitely false or not in force. This is illustrated by comparing, for example, the following communications: advertising and telling 'tall stories'; instructing somebody how to fix a bicycle puncture; making a political speech; and being a defendant in front of a jury. Suspensions of maxims in some interactions affect which inferential strategies are available to listeners (see Levinson, 1979, 1983). As such strategies usually involve an active search for relevant information (which may include requests for information, challenging one's audience etc.), the sequential properties of interactions may also be affected. Thus we propose that different types of interactions be referred to as 'language games' and partly defined in terms of which maxims of communication are in power, relaxed or consistently violated. The maxims provide the means for inferring the speakers' intentions and beliefs and the strategy which makes use of them consists simply of attributing to the speaker the standard intentions and beliefs produced by maxims of communication 'in power' in the current language game. Since, however, not all maxims are valid in all language games, this basic strategy is not always available. It is clear, however, that, as postulated, the maxims of communication do not fully define language games. In lectures and tutorials all the maxims of communication are presumably in power, and yet the two differ in, for example, the organisation of turn-taking and allowability of interruptions. Thus language games must also differ in other aspects appropriate to different levels of description. We have not investigated the relationship of these features of interaction to maxims of communication.

It also seems that there is a need for some mechanism which would allow the speakers to act flexibly. One is able to make a joke on an otherwise solemn occasion and have it taken for a joke. The problem is that, given a language game characterised by a set of maxims of communication in power, the hearers will attribute certain standard intentions and beliefs to the speakers. A speaker needs to be able to signal the violations of maxims to cancel or avoid these attributions. There is in fact some empirical evidence that the violations of the maxims in cooperative interactions need to be licensed (Mura, 1983). The signals which suspend their validity include prosodic cues (as in sarcasm); quantifiers, as in (20); terms indicating propositional attitudes (as in (21); verbs of communication (as in (22)); and interjections such as 'well' as in (23) (Lakoff, 1973; Brockway, 1981, Owen, 1981, Hoey, 1979).
Possibly it is raining.
I believe the inflation will rise.
He suggested that it will rain tomorrow.
Well, the inflation will rise.

We suggest that in communications, validity of maxims with respect to an utterance is suspended by means of these signals. The process is one of tuning the background against which utterances are interpreted, and complements the presupposed robustness of Grice's maxims of conversation.

Finally, it is important to take into account the fact that most communications occur between participants who know each other reasonably well. Not all speakers necessarily abide by all the maxims prescribed by each language game. It seems plausible that hearers take this into account and adjust their assumptions about which maxims should be used in interpreting the communications of different speakers of different occasions.

NOTES

1 We shall use terms 'mean-nn' and 'communicate-nn'. These terms imply that an utterance is interpreted by being associated with the speaker's beliefs and intentions and all the definienda of Grice's meaning-nn (i)–(iii) are true. It should be noted, however, that throughout the paper we do not take the condition (ii) into account.
2 The system of maxims of communication has been in fact implemented in a PROLOG program (Clocksin and Mellish, 1981). In the present article, we keep the formalisms to a necessary minimum, and in the text re-phrase the maxims in English. When, however, we refer to the productions of the system we refer to the products of the formalised, logically expressed system.
3 There is an obvious problem of what the maxims of communication 'work on'. Do they apply to propositional content of utterances, to their presupposition(s) or even also to their contextual implications? Obviously, the application of maxims of communication presupposes extensive semantic pre-processing. For the purposes of this paper we shall assume that the input into the system of maxim is utterance meaning, as defined by, for example, Gazdar, 1981. Thus the predicates cont \((U, \text{that}(P))\) and cont\((U,\text{do}(H,X))\) do not refer to propositional content of an utterance.
4 We are not saying that suspension or violation of consonance maxims is a sufficient condition for the occurrence of irony or sarcasm. These manners of speaking are thus not explained solely by reference to the maxims. It is, however, the case that their suspension in, say, irony needs to be signalled, usually by intonation of an utterance.
5 Soundings (Labov, 1972) are ritual exchanges of insults. The speaker asserts something quite outrageous about the kin of the hearer but it must be obvious that the assertion is false and that the hearer does not actually believe what he/she asserted.
6 It is necessary to distinguish between the 'static' and 'dynamic' properties of communicative acts. Disagreeing, for example, may highlight the difference between the speaker’s and the hearer’s beliefs system, but its ultimate aim may be to reach a consensus. On other occasions this aim may be absent.
7 A maxim can be a thesis of two or more other maxims. This simply means that if the latter maxims are valid, the former must also be valid. In this sense, LIT1 is a thesis of either COM1 and COM1, or of LIT2, SIN2 and COM1; LIT2 is a thesis of COM1 and DIS; and finally COM1 is a thesis of either LIT1 and SIN1, or of LIT2 and SIN2.

Acknowledgement—This research was supported by SHHD grant K/MRS/50/C330 while the 1st author was a Research Fellow at Psychology Department, University of St. Andrews, Fife, Scotland.

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