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A relational account of communication on the basis of slips of the tongue

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> They are a good deal more than amusing (or embarrassing) errors of speech. The collection and analysis of such errors provides important clues to how speech is organized in the nervous system.
>
> Victoria A. Fromkin (1973: 110)

> Also, most current linguistics fails to consider various kinds of anomalous data which actually reveal very important information about the structure of the mental system which underlies our linguistic abilities, including slips of the tongue and unintentional puns.
>
> Sydney M. Lamb (1999: 9)

Abstract: The socio-cognitive approach to pragmatics [SCA] is based on two fundamental hypotheses: (1) speaker and hearer are equal participants in the communicative process, (2) communication is the result of the interplay of intention and attention, as this interplay is motivated by the individuals' private socio-cultural backgrounds. In this paper, I aim at showing that relational network theory (which has been mainly developed by the American neurolinguist Sydney M. Lamb) allow us to account not only for aspects corresponding to intention or attention, but also for "smooth communication" and "bumpy communication" (being the latter the dimension which includes unintended meanings). Four actual slips of the tongue will be relevant examples thanks to which it can be recognized how cooperation and intention are in a highly complex interaction together with the substantial elements of the individual traits: attention, private experience, egocentrism, and salience. Within this context, the relational account is epistemologically crucial. Firstly, it allows us to represent the neurocognitive structures that enable a person to produce or understand utterances. Secondly, it helps us to suggest that canonical pragmatics (like Speech Acts Theory, Gricean Pragmatics, Relevance Theory) cannot even consider actual and relevant phenomena like

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slips of the tongue, because they focus on cooperative intention and they neglect (or discard) egocentric attention.

Keywords: intention, slips of the tongue, cooperation, attention, egocentrism

1 Slips of the tongue as instances of egocentrism (and its interaction with cooperation)

Canonical pragmatic theories tend to consider communication as an idealistic, cooperation-based, context-dependent process in which speakers are supposed to carefully construct their utterances for the hearers taking into account all contextual factors. The theory of speech acts (Austin 1962; Searle 1969, Searle 1975, Searle 1979), the studies of politeness within the tradition initiated by Brown and Levinson (1978, 1987; Haugh 2015), the study of conversational implicatures (Grice 1975, Grice 1981, Grice 1989; Haugh 2015), Neo-Gricean Pragmatics (Atlas 2005; Horn 2000, Horn 2004, Horn 2005; Levinson 1983, Levinson 1987, Levinson 2000), and Relevance Theory (Sperber and Wilson 1995, Sperber and Wilson 2005; Wilson and Sperber 2002) count as representative and valuable instances of mainstream pragmatics.

Such canonical theories assume that there are some kind of universal rational norms or principles that regulate human communication. For example, Austin has proposed Felicity Conditions (which could finally apply to all utterances), Grice has offered the well-known Cooperative Principle, Brown and Levinson have talked about (some) universals in language use around the core notion of "face", Sperber and Wilson have developed the Principle of Relevance. Within this mainstream, it is strongly believed that hearers make a valuable effort in order to recognize the speaker's intentions. In this sense, Cognitive-Philosophical Pragmatics, a.k.a. Anglo-American pragmatics, has always assumed (implicitly or explicitly) that communication involves a process in which the speaker expresses his o her intention(s), and the hearer recognizes such intention(s). In other words, if the intentions attributed by hearers are basically the same as those transmitted by the speaker, then communication has been successful. In this sense, "Cognitive-Philosophical Pragmatics" is an accurate name because it can be used to make reference to the tradition initiated by Speech Act Theory and the Gricean approach (which belong originally to philosophy of language), and consolidated, among others, by Relevance Theory (one of whose main concerns is cognition).

Even so, the ubiquity of intention has been questioned by many authors (Arundale 2008; Danziger 2006; Davis 2007, Davis 2008; Duranti 2006; Green

2007, Green 2008; Jaszczolt 2005, Jaszczolt 2006; Keysar 2007; Levinson 2006a, Levinson 2006b; Németh 2008; Richland 2006). For example, Jeff Verschueren called for "a pragmatic return to meaning in its full complexity, allowing for interacting forces of language production and interpretation" (Verschueren 1999: 48), and Michael Haugh (2008: 102) suggested that, while there is substantial (if not overwhelming) evidence against the placement of Gricean intentions at the centre of theorizing in pragmatics, "there remains a need to account for the cognition that underlies interaction".

On the other hand, the socio-cognitive approach to pragmatics [SCA] aims at taking into account both the societal and individual factors, including cooperation and egocentrism, which are not considered antagonistic (Kecskés 2010: 50). Since it conceives that communication is not as smooth a process as mainstream theories depict, SCA is presented as an alternative to the canonical conception(s) of pragmatics. Thus, SCA pays particular attention to valuable and interesting linguistic phenomena that canonical pragmatic theories do not even consider simply because such phenomena are not part of the process of transmission and recognition of intentions.

However, SCA does deal with the aspects that have been traditionally considered by canonical pragmatics, such as intention, actual situational experience, cooperation, and relevance, and it also focuses on those other aspects that could not be explained by a theory that is exclusively or mainly intention-oriented, such as attention, private experience, egocentrism, and salience (Kecskés 2006, Kecskés 2008, Kecskés 2010; Kecskés and Fenghui Zhang 2009; Kecskés and Mey 2008).

Michael Rapaport (2003: 402) has suggested that, when we communicate, we almost always fail and yet we almost always nearly succeed. This permanent tension between failure and success is, in Rapaport's words, the paradox of communication. In this sense, canonical theories of pragmatics have widely accounted for the transmission and recognition of intentional meanings, but have not paid enough attention or have even ignored some constitutive phenomena of verbal communication, for example egocentrism. Since SCA comes to try to solve this problem, it needs concrete contributions and developments. This paper seeks to offer some help in that regard. Thus, it claims that relational network theory (Lamb 1999, Lamb 2004, Lamb 2005, Lamb 2006, Lamb 2013, Lamb 2016) accounts for both the cooperative and the egocentric traits that interact in communication.

Four actual slips of the tongue will be here considered as representative examples of such interaction. On their basis, we will not only be able to identify the complex interaction between the individual and the social traits, but also the great importance of the former ones (attention, private

experience, egocentrism, salience). The relational account will be epistemologically crucial, because the individual trait has been considered marginal (or directly discarded) by canonical pragmatics theories, especially by Cognitive-Philosophical Pragmatics. The relational account also provides figures that represent the neurocognitive structures thanks to which a person is able to understand and produce utterances. In addition, it explains how the cultural context participates in the configuration of such internal linguistic structures.

A slip of the tongue occurs when the speaker's utterance differs in some way from the presumably intended one (Fromkin 1971, Fromkin 1973, Fromkin 1980; Stemberger 1989). Contemporary psychology and linguistics have not been indifferent to the slips of the tongue, which have not only been interpreted as one of the reasons of linguistic mutability (Saussure 1949 [1916]; Sturtevant 1917; Jespersen 1922; MacKay 1970), but also as a means for accounting for the process of speech production (Freud 1924; Lashley 1951; Boomer and Laver 1968; MacKay 1970; Dell 1979; Dell and Reich 1977, Dell and Reich 1980a, Dell and Reich 1980b; Reich 1985; Lamb 1999). For example, in *Zur Psychopathologie des Alltagslebens* Freud (1924) hypothesizes that the mechanisms involved in the errors of speech could be signals of laws of speech production. In this same line, Victoria Fromkin (1971: 27) posits that they constitute anomalous utterances with a non-anomalous nature, and that its analysis has implications for a model of linguistic performance.

Nevertheless, since it has overvalued the role of cooperative intention in verbal communication, canonical pragmatics cannot even consider such anomalous data, which actually reveal very important information about the structure of the cognitive system that underlies our linguistic abilities. This issue (how the slips of the tongue reveal the internal mental or linguistic structure) will be accounted for by means of relational networks. In addition, they will also serve as auxiliary hypotheses for SCA.

We will now expose four examples of Freudian slips of the tongue, that is, slips that are interpreted in terms of the prevalence of an unconscious, hidden or repressed thought or desire. It is relevant to emphasize here that such unconscious thought or desire is different from, or even incompatible with, the presumably intentional meaning.

During the Angelus, on March 2014, Pope Francis said *in questo cazzo* [in this shit/in this cock], instead of *in questo caso* [in this case]. The 77-year-old Argentinean Pontiff Jorge Bergoglio, who was speaking (in Italian) from the window of his apartment at the Vatican's Apostolic Palace, maintained his composure and corrected himself immediately:

(1) Se ognuno di noi non accumula ricchezze soltanto per se, ma le mette al servizio degli altri, in questo cazzo, in questo caso, la providenzia di Dio si rende visibile in quanto gesto de solidarietá.
[*If each of us does not accumulate wealth only for himself, but puts such wealth at the service of others, in this shit/in this cock, in this case, the providence of God becomes visible as a gesture of solidarity*].
(Pope Francis).
Source: https://www.youtube.com/watch?v=7YugBmiZWgA

It is common for Spanish speakers to randomly confuse the Italian sounds [s] and [ts], especially because in their mother tongue they can perceive the latter as an allophone that is characteristic of Italian speakers. But the use of the expression *cazzo* [catso] with negative connotations is very frequent in Argentina, where literally millions of Italian immigrants and Italian descendents have developed a powerful influence in cultural and social life. For example, during a speech on November 9 2012, the former president of Argentina, Cristina Fernández, said the following: "Es mentira que estás eligiendo, no estás eligiendo un catso" [*It is not true that you are choosing, you are not choosing anything*. Source: https://www.youtube.com/watch?v=F5Lv8yzsucM]. Since it is considered rude, the word *cazzo* was not reproduced in the official transcription. This example helps us to support the hypothesis that the Pope had strong phonological, lexical and conceptual representations associated to it. In fact, his slip up generated hundreds of comments on the media and the Internet. Since the Pope had been talking about the dangers of wealth, it can be interpreted that his strong anti-capitalist position might have caused him to say *cazzo* instead of *caso*, and that it was not a simple and accidental mispronunciation.

The second example corresponds to the former Prime Minister of the United Kingdom, Michael Cameron. In the House of Commons, in 2012, he was responding a question about tax cut for the wealthy: he presumably meant to say *for the poor*, but he said *for the rich*. Some detractors considered that this mistake was embarrassing and that it revealed the deepest and most unspeakable desires of a conservative leader.

(2) We are raising more money for the rich.
(Michael Cameron, Prime Minister of the UK, 2012).
Source: https://www.youtube.com/watch?v=GRV0qJkVYMI

On the Internet, there are dozens of varied and copious anthologies of real and apocryphal slips uttered by the former US President George W. Bush. On August

5, 2004, in Washington D.C., he was talking about the defense budget. In one passage of his speech he said the following:

(3) Our enemies are innovative and resourceful, and so are we. They never stop thinking about new ways to harm our country and our people, and neither do we.
(George W. Bush, President of the USA).
Source: https://www.youtube.com/watch?v=Sy05zj0X23M

If taken literally, the final words of the second statement in (3) state that Mr Bush was thinking about how to harm his own country and his own people. However, for obvious reasons, it does not seem that Mr Bush wanted to communicate this explicitly. But, it is precisely that (that Bush wanted to harm the US) what a good part of his audience interpreted. In other words, many of us do understand that Mr Bush transmitted unintentionally his bad intentions towards his country and his countrymen.

The fourth example corresponds to Argentinean politics. At a press conference, on February 13, 2013, the former minister of foreign affairs, Hector Timmerman, was defending the so-called "pact of mutual understanding" between his country and the Islamic Republic of Iran. This pact was being approved by the congress (although with time it was going to be declared unconstitutional and against the genuine interests of the country). During that conference, as on other occasions, Mr Timmerman was questioned that such pact with the Islamic Republic of Iran was disastrous because, among other things, it helped to cover up the presumable responsibility of Iranian officials and agents in the bloody attack against the Argentine Israelite Mutual Association of Buenos Aires (AMIA), in 1994. One of the main statements of the former minister on the accusation is reproduced in example (4).

(4) El encubrimiento existe gracias a las decisiones que tomó este gobierno.
[*The concealment exists thanks to the decisions made by this(my) government*]
(Héctor Timmerman, Minister of Foreign Affairs of Argentina, 2013).
Source: https://www.youtube.com/watch?v=FC_RvTwKjgU

Now, it is true and it is also relevant that, among many others, the following *linguistic* phenomena occur in utterances (1)-(4):

(a) It is **salient** that speakers evoke unintentional meanings. For instance, in (1), by saying *cazzo*, Pope Francis conveys some kind of association between wealth and bad.

(b) The evocation of unintentional meanings draws the **attention** of hearers (and even speakers). For example, in (1), the utterance of *cazzo* clearly draws the attention of the hearers and it draws the attention of the speaker himself, who immediately corrects his slip.
(c) The evocation of unintentional meanings depends to a great extent on the speaker's **private experience**, which is represented in his or her internal cognitive system. In example (1), the association between wealth and bad is characteristic of Francis and much of the Catholic tradition.
(d) The evocation of unintentional meanings reveals **egocentrism** in communication. In example (1), Francis activates conceptual information to produce his utterance, whereas the hearers activate their most salient conceptual information in order to understand such utterance.

It seems that the unintentional meanings evoked in utterances (1)-(4) cannot be characterized in terms of Gricean pragmatics. In effect, by definition, such meanings do not depend on the intention of the speaker, that is, they cannot be explained in terms of the Cooperative Principle and conversational maxims. In this sense, Sperber and Wilson (2005: 484) are correct when saying that a pragmatic theory should explain rather than idealize away the non-individually intended representations transmitted in an utterance. Nevertheless, the core hypotheses of relevance-oriented pragmatics are incompatible with such a profitable end. On the one hand, if the Communicative Principle of Relevance regulated verbal comprehension, there would not be "weak implicatures" (i. e. meanings which are evoked independently from the speaker's intention). On the other hand, if there were weak implicatures, then the Communicative Principle of Relevance could not regulate verbal comprehension. The reason for that is that, precisely according to such Principle, utterance comprehension is determined by the clear recognition of the speaker's communicative intention (which does not exist in "weak implicatures"!) (Gil 2011: 34). In conclusion, Relevance Theory is very important to account for crucial aspects of intentional communication, but it cannot help us to fully understand those meanings that are interpreted by the hearer independently from (and even against of) the speaker's intention.

The very existence of unintentional meanings in verbal communication and the consequent importance of the individual traits (attention, private experience egocentrism, salience) will be accounted for in relational terms. We shall return to the account of examples (1)-(4) in Section 3, after considering what relational networks are.

2 The relational account of language structure and language use

> The recognition [...] that a totality does not consist of things but of relationships, and that not substance but only its internal and external relationships have scientific existence [...] may be new in linguistic science. The postulation of objects as something different from the terms of relationships is a superfluous axiom and consequently a metaphysical hypothesis from which linguistic science will have to be freed.
> Louis Hjelmslev (1961[1943]: 61).

There is an important but often overlooked tradition in linguistics according to which "language is a network of relationships". This tradition could be called "relational linguistics" and it is represented by great authors like Ferdinand de Saussure, Louis Hjelmslev, Michael Halliday, and Sydney Lamb. For example, Geoffrey Sampson has considered that "much more interesting than Hjelmslev's own work is the development it received at the hands of the American Sydney Lamb" (1980: 68). In fact, it could be said that Lamb aims at showing how and why the linguistic system is a network of relationships. If the relationships of linguistic units are fully analyzed, these "units" turn out not some kind of symbolic objects at all, but just nodes, i. e. points of interconnection of relationships. We may conclude that the linguistic system (unlike its external manifestations) is not in itself a symbol system after all, but a network of relationships, a purely connectional system, where all of the information is precisely in its connectivity.

Since the information is in the connectivity, there is no such thing as a separate memory module, a place where things would be placed and from which they would later be retrieved. Rather, memory is the connections themselves and is therefore widely distributed. According to Lamb (1999: 53–65, 2005: 159–160, 2013: 138–139), the linguistic system can be graphed with lines and nodes and nothing else, forming a network of relationships. It is very important to notice that labels will be necessary for readability, but they are not part of the structure. In fact, the linguistic information resides entirely in the connectivity of the network. For the processing of information we have two kinds of operation available: (1) the movement of activation through the network and (2) changes in the lines and nodes, including the recruitment of new lines and nodes. Lines and various node types can be interpreted as the elementary components of the network. Any point at which lines meet is a node, and we can stipulate as a rule of relational network modeling that at each such point the type of node must be identified.

In Lamb's relational networks there is a clear representation of the connections among phonological, lexico-grammatical, and conceptual information. Such connectivity serves to illustrate that the linguistic system is, as Saussure and Halliday have explained, a three-level system in which meaning (concept/signified) is coded into wording (form), and then wording is coded into expression (signifier/sound-image). In this section some relational networks show how meanings and phonology are connected by lexicogrammatical information, and it will be also justified how such networks are supported by linguistic and neurological evidence.

2.1 Relational networks and the linguistic evidence in their favor

It is not an exaggeration to suggest that the relational conception of language is compatible with copious empirical evidence (Lamb 1999: 186–203, Lamb 2005: 159–164, Lamb 2006: 201–203, Lamb 2013: 155–156, Lamb 2016: 3–4). A first acceptable analysis of such linguistic evidence demonstrates that there are many relationships of different types among nodes, for example, those for meanings, lexemes and phonemes. For example, a lexeme that could be given symbolic representation, like *cat*, is connected on one side to phonological information and on the other to meaning. Figure 1 is a first schematic representation of such relationships as connections in the network.

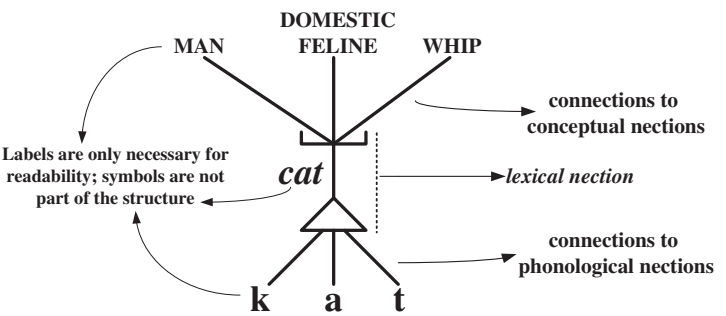

Figure 1: Conceptual, lexical, and phonological information around the lexical node for *cat*.

The triangle represents a downward ordered "and": Downward activation from the lexical node for *cat* goes to the nodes for the node for /k/, and later to /a/, **and** later to /t/. Upward activation from /k/, and later from /a/, and later from

/t/ goes to *cat*. On the other hand, the upward oriented brackets are instances of the upward ordered "or" node: Upward activation from the lexical nection for *cat* goes to different concepts simultaneously, whereas downward activation from the concept DOMESTIC FELINE, *or* the concept MAN, *or* the concept WHIP, goes to the lexical nection for *cat*.

Relational networks exhibit patterns of organization of lines and nodes with hierarchical structure, and recurring modular structures can be recognized. A basic module (which has a central line connecting to two nodes, of which one provides multiple downward connections, the other multiple connections upwards) may be called a "nection" (Lamb 1999: 72–73).

When relationships are represented simply as connections in a network, there is no need for the symbol *cat*, which is not part of the network. In fact, the symbols *cat*, CAT, /k/, etc. are just labels that make the network diagram easier to read. They just identify locations in the network.

Figure 2 accounts for the fact that two of the nections at the phonological level allowing the activation of the sequence *kat* (/a/ and /t/) are the same that are needed for the activation of the sequence *bat*. It also represents information at the level of meaning, with labels in capital letters. The different kinds of nodes in Figure 2 represent syntagmatic and paradigmatic relationships: AND vs. OR relationships, respectively. These nodes correspond to "compact" or "abstract" notation in relational networks. They differ from one another not only in AND vs. OR relationships, but also in two other dimensions of contrast: UPWARD vs. DOWNWARD orientation, and ORDERED vs. UNORDERED activation (Lamb 1999: 67).

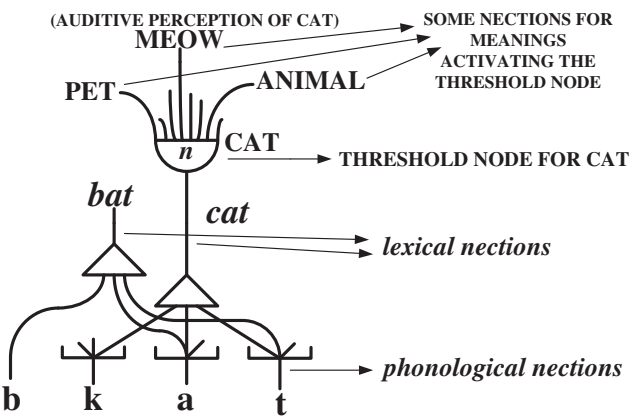

Figure 2: A network of relationships around the lexical nection for *cat*.

As it has been said, triangles represent AND relationships, whereas brackets are used to represent OR relationships. The upward unordered "OR" represents that activation from the nection for /k/ goes to the lexical nection for *cat* **and** [sic] to other lexical nodes, like *cow, cab, kid*, etc. (which are not represented here). Downward activation from the nection for *cat* or [sic] other lexical nection goes to /k/.

In Figure 2, the semicircle represents a threshold node at the level of meaning, i. e. nodes of an intermediate type between OR and AND nodes. The threshold node representing meanings can be activated by some (but not all) of its input lines in accordance with a threshold of activation. Lamb (1999: 152) explains that this threshold node is logically more basic than the "and" and the "or" in that they can be derived from it, as special cases. The "and" is a special case of the threshold node for which the threshold is equal to the number of lines on the plural side, and the "or" is a threshold node with a threshold of 1. The threshold node can be drawn with a number *n* inside indicating the threshold, i. e. the number of incoming lines that have to be activated in order to activate such a threshold. In fact, it may be unnecessary (or even impossible) to specify an exact number. Consider for example a relatively simple conceptual nection like the one for the concept CAT. It must be connected to many other nections, corresponding to nections for concepts (like ANIMAL or PET) as well as to nections corresponding to visual, auditory and somato-sensorial information (like MEOW). It is not likely that it can be found exactly which and how many nections for meanings have been activated in order to recognize or to activate such concept.

Figure 3 represents some information at the level of meanings that has not been represented before. For example, the upward unordered node for *bat* helps us to account for the relationship of polysemy, which involves ambiguity (often resolved by context). In this case, the lexical nection for *bat* is connected upwards to the nections for FLYING MOUSE and STICK. Figure 3 also represents the upward unordered "AND" node, the inverted triangle whose lines come from the same point. In this case upward activation from the nection for *kitty* goes (simultaneously) to the nections for CAT and FAMILIAR REGISTER. On the other hand, downward activation from CAT and FAMILIAR REGISTER goes (simultaneously) to *kitty*. Roughly speaking, the nection for *cat* or *bat* do not have any meaning "inside". Lexical nections are simply connected to certain conceptual nections. Consequently, relational networks help us to explain how "words" are used to evoke, communicate, or understand certain meanings.

In Figure 3 we can also find an example of the downward ordered "OR": Downward activation from the nection for CAT goes to *cat* AND *kitty*, and upward activation from *cat* OR *kitty* goes to CAT. But this type of disjunction involves

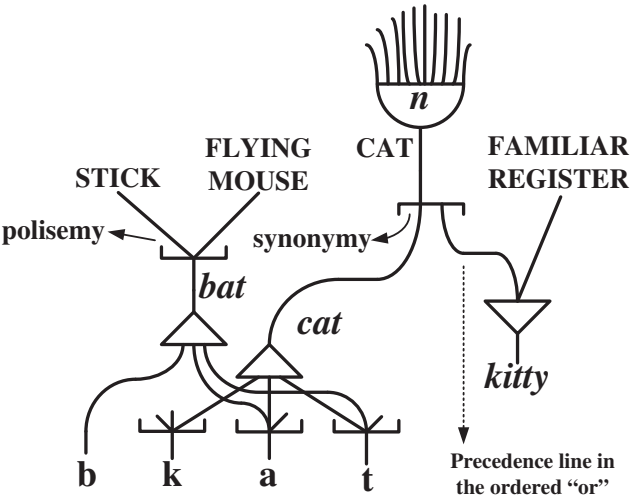

Figure 3: Polysemy and synonymy in relational networks.

precedence ordering; the line shown off to the right side of the 'or' node in Figure 3 takes precedence over the other line: if it can be taken, it is. The other line is the default line; in this case, it is the one connected with the nection for the lexeme *cat*. By means of the downward ordered 'or' node it is shown that during linguistic production downward activation goes to the nection for *kitty* if some other information has also been activated, namely the specification of the type of register: *kitty* is the marked option. On the other hand, if there is no information about informal register that has been activated, then downward activation goes to the nection for *cat*. This example also allows us to represent the relationship of synonymy, which involves one meaning, in this case the nection for CAT, connected downwards to two (or more) lexical nodes: those for *cat* and *kitty*.

Now Figure 4 represents the connections that travel upwards to meaning and downwards to phonology, including downward unordered "and" nodes for phonological features.

In downward unordered "AND" node, downward activation from (for example) the node for /b/, goes simultaneously (i. e. without an ordered sequence) to the nodes for Labial, Stop, and Voiced. Upward activation from Labial, Stop, and Voiced goes simultaneously to /b/.

Relational networks like Figure 4 provide realistic means of explaining speaking and understanding in terms of the activation across the network pathways. Regarding the hearer, activation goes from expression to meanings. For the

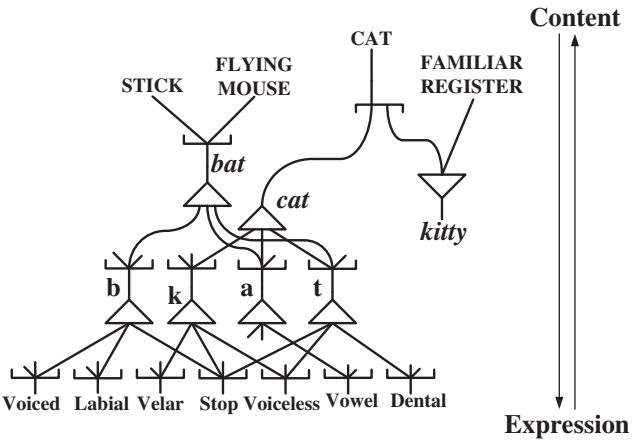

Figure 4: Meanings, lexical information, and phonological information.

speaker, activation starts with meanings and then follows pathways to expression (although the actual process is much more complex). In recognition, activation first travels along connections from the cochlea to the brain stem (including the thalamus, which functions largely as a mechanism to control the timing of receipt of information in the cortex), and from the brain stem to the primary auditory cortex. It continues to the nections for the auditory features, and these nections will pass activation on up to nections corresponding to phonemes and syllables. There are no symbolic objects here, and thus no buffer is needed, nor any workspace. Each nection is its own processor: when it receives enough activation it passes activation on to higher-level nections to which it is connected. In summary, network connectivity is displayed both upwards (from expression to meaning) and downwards (from meaning to expression).

Predictably, relational networks account for intentional meanings. We may consider a relevant and interesting example of deliberate ambiguity. The name of the fans of the national soccer team of Iceland is *tólfan*. That word, in Icelandic, means TWELVE, and it evokes the role of the fans as another important player ("the player number 12": there are 11 players in a soccer team). In addition, there is an intended pun based on the words *tól* ("tool") and fan, which may suggest that the fans also work for their team or that the fans are a valuable resource ("like a tool"). Figure 5 depicts the linguistic structure that represents the lexical and conceptual information needed to produce and to understand the pun based on the Icelandic word *tólfan*.

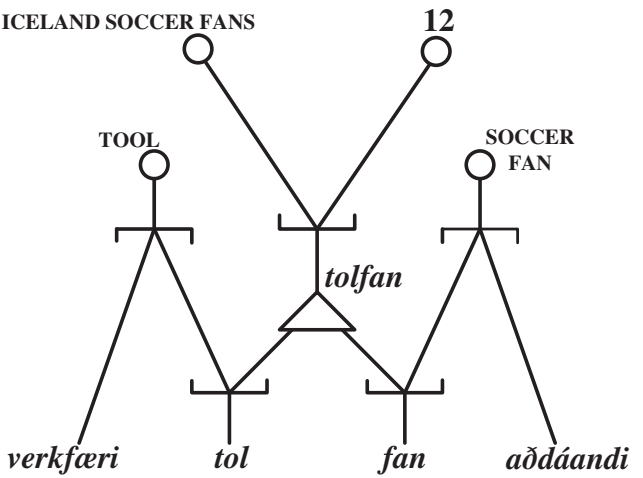

Figure 5: The intentional pun based on *tólfan*.

In conclusion, against the hypothesis that our linguistic system stores symbols, a more realistic alternative is to assume that the internal linguistic structure does not have symbolic representations of phonemes, morphemes, or lexemes, but the means for producing such forms in oral or written texts. This relational hypothesis is also attractive from a neurological point of view because it is compatible with neurological evidence. In fact, neuroscience research has shown that the cerebral cortex *is* a network and that learning develops as strengthening of connections. The basic processes involved in text comprehension operate directly in the network "as patterns of activation traveling the pathways formed by its lines and nodes" (Lamb 2005: 157). Linguistic information is not stored as symbolic objects of any kind, but *it is in* the connections.

It should be noted that relational models based on Lamb's work are also suitable for a complete and adequate description of linguistic phenomena at the levels of phonology, morphology or syntax. For example, by means of the relational account of the Spanish Noun Phrase it is illustrated *how* certain meanings determine certain options at the lexicogrammatical level (Gil 2016). Thanks to relational networks we can also represent how phonological perception (in Wernicke's area) and phonological production (in Broca's area) are connected (Lamb 1999), and how the lexicogrammatical system is the linguistic level that connects meanings with phonology (Gil 2014).

2.2 Neurological evidence in favor of the relational hypothesis

A realistic theory of language should go beyond the analysis of the products of verbal behavior (i.e. texts), and should account for the linguistic system in plausible neurological terms. With a view to doing that, a realistic linguistic theory will have to satisfy the following three requirements (Lamb 1999: 293–294):

(i) *Operational plausibility*: a realistic linguistic theory has to provide a plausible account of how the linguistic system can be put into operation in real time to produce and understand speech.
(ii) *Developmental plausibility*: a realistic linguistic theory needs to be amenable to a plausible account of how the linguistic system can be learned by children.
(iii) *Neurological plausibility*: a realistic linguistic theory has to be compatible with what is known about the brain from neurosciences

For example, the process of learning is explained in terms of two neurocognitive processes: (*i*) recruitment of nections, and (*ii*) establishment (and eventual strengthening) of connections. For example, we may consider the learning of *ball* as a new word. A little child may know the concept of BALL because of his or her experience with balls. Such conceptual knowledge is represented by a little network that comprises hundreds (maybe thousands) of nodes and that includes also a visual sub-network for the visual features, somatosensory connections for what a ball feels like to the hands or the feet, auditive connections for the recognition of a ball when it rebounds, etc., all of them coordinated by a central nection that is given the label ^{C}BALL. During the learning process, the child needs to create the connections that are going to enable a phonological form to activate the ^{C}BALL nection, and, complementarily, the child also needs to create the connections that are going to enable him or her to say "ball" when thinking about a ball, perhaps because such child sees a ball and, consequently, the conceptual nection for BALL receives activation from the visual system. Then, the new lexical nection will be associated to the phonological and conceptual representations, and, because of that, it will allow the child to get from phonological to conceptual information, and vice versa. In terms of the relational learning hypothesis, this process is based on recruitment of a latent nection in an adequate location, i. e. in a place that has latent connections that reach the two nections which have to be connected: One of them is a nection in the phonological area and the other one is a conceptual nection.

The first part of the recruitment of the lexical nection, which is represented in the middle of Figure 6, is the strengthening of the two incoming connections that are currently receiving activation from the conceptual and the phonological nections, because the child is hearing the word whereas the concept node is also

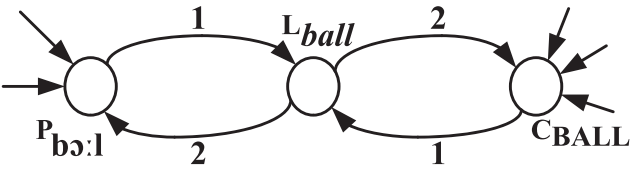

Figure 6: Learning to associate a phonological representation with a concept.

active. These are the lines that are labeled with "1" in Figure 6. On the basis of such strengthening, the new lexical nection has become dedicated to connecting the phonological representation of /bɔ:l/ with the concept BALL.

The lines labeled "2" will also be active and they will carry activation from the newly recruited lexical nection back to the phonological and conceptual nections. As a consequence, these connections are also strengthened, and, from now on, activation will travel either from the phonological representation to the concept, or from the concept to the phonological representation. The process of learning a concept consists in a node that will integrate information from perceptual and other conceptual locations.

The lines and nodes of Figures 1–5 belong to "compact" notation (Lamb 1999: 78). It must be emphasized here that such lines and nodes are bidirectional, i. e. they can carry activation in either direction. At a given moment, the bidirectional lines can be active or inactive in either of its two directions. However, the bidirectional lines of abstract relational networks can also be analyzed as pairs of lines of opposite direction. Consequently, every line of compact notation is an abbreviation for a pair of oppositely directed lines of narrow notation, where each line is a one-way line and, if it is active at a given moment, the activity is moving in only one direction.

Thus, we need two relational networks in narrow notation in order to account for (more precisely and delicately) the information represented in one compact relational network. One of such narrow relational networks represents downward activation, whereas the other one represents upward activation. For example, Figures 7 and 8 account for (again, more precisely and delicately) the information represented in the compact relational network of Figure 4. As it can be seen, the one-way nodes of narrow networks are of two different types:

(1) The **branching node** is represented by a solid black circle: Activation branches out from the singular side to the plural side.
(2) The **junction** is represented by a larger hollow circle: Activation comes to the node from one or more lines on the plural side and may continue on the singular side.

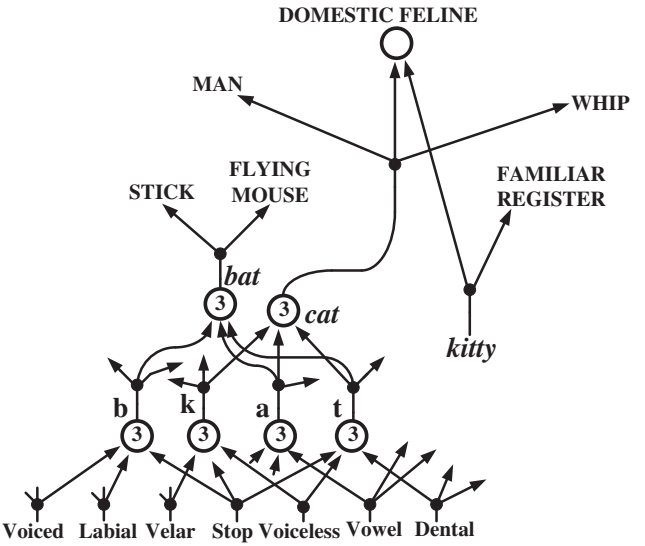

Figure 7: Meanings, lexical information, and phonological information, upward oriented.

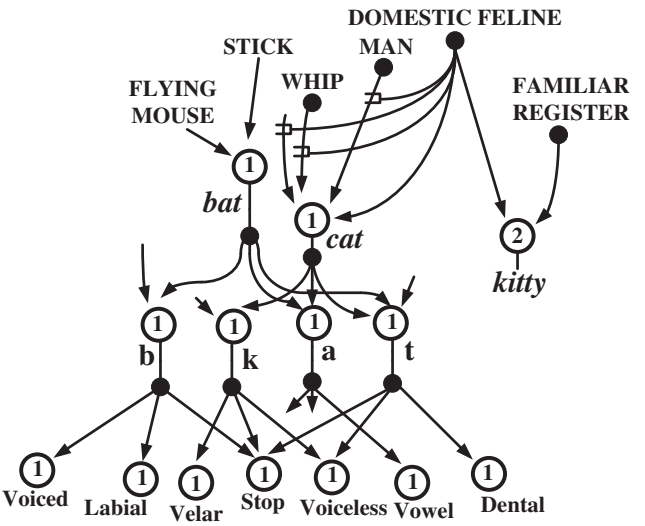

Figure 8: Meanings, lexical information, and phonological information, downward oriented.

The difference between the "and" and "or" nodes of the compact notation is represented, in narrow networks, by means of a difference in threshold: The number written inside the junction node indicates the number of incoming lines

which must be active in order to satisfy the threshold. When such threshold is satisfied, the node will send activation onward along its output line. For the "and" junction the threshold is equal to the number of incoming lines; for the "or" junction it is one, since activation on *any* of the incoming lines is enough to satisfy the node.

Among many other things, narrow relational networks must show how choice operates. It seems that we need here some kind of inhibitory connection to block the alternative lines. For example, we can propose the existence of a blocking element that blocks any activation which might be traveling along the line to which it is connected. Figure 8 shows that there may be also blocking lines departing from branching nodes. Such blocking lines connect the blocking element (which is represented by a small bracket) to the activation lines of potential competitors. For example, Figure 8 shows concretely that, since the concept DOMESTIC FELINE has received more activation it activates the blocking element that inhibits the activation lines of other conceptual nodes, such as WHIP and MAN.

There is a good amount of neurological evidence for relational networks. However, there is no direct experimental evidence for some of their features for the following reasons: (a) Brain images are too rough for the study of microscopic levels; (b) the experiments with living brain tissue of animals are not done with humans for obvious ethical reasons; (c) the experiments with living brain tissue of animals deal with visual, auditory, and somatosensory perception of cats and monkeys (Hubel and Wiesel 1962, Hubel and Wiesel 1968, Hubel and Wiesel 1977; Mountcastle 1997, Mountcastle 1998), and these animals do not perform linguistic processing.

On the other hand, there is a good amount of relevant *indirect* evidence for the neurological plausibility of the relational hypothesis. For example, Hubel and Wiesel (1962, 1968, 1977) discovered that visual perception in cats and monkeys works in the ways that would be predicted by the relational network model, and the nodes of visual network are implemented as cortical columns. "The nodes are organized in a hierarchical network in which each successive layer integrates features from the next lower layer and sends activation to higher layers" (Lamb 2005: 168).

These requirements deal with research in perceptual neuroscience, mainly the research carried out by Vernon Mountcastle and many other colleagues (Hubel and Wiesel 1962, Hubel and Wiesel 1968, Hubel and Wiesel 1977; Mountcastle 1957, Mountcastle 1997, Mountcastle 1998, Mountcastle 2005; Mountcastle et al. 1975; Martin 2015). Mountcastle, who characterized the columnar organization of the cerebral cortex, explains that the basic unit of the mature neocortex is the cortical minicolumn, a narrow

chain of neurons that extends vertically across cellular layers II-VI. Each minicolumn contains about 80–100 neurons and all the major phenotypes of cortical neural cells. Mountcastle's general hypothesis is that the minicolumn is the smallest processing unit of the neocortex, and he also claims that "every cellular study of the auditory cortex in cat and monkey has provided direct evidence for its columnar organization" (1998: 181). For example, a nerve-regeneration experiment in the monkey provides evidence for columnar organization of the somatic sensory cortex. In one experiment a recording microelectrode was passed nearly parallel to the pial surface of the cortex of the postcentral somatic sensory cortex, through a region of neurons with the same modality properties. Neurons in adjacent minicolumns are related to adjoining and overlapping peripheral receptive fields, and the transitions between minicolumns pass unnoticed. Results obtained in the same animal in a similar experiment after section and resuture of the contralateral medial nerve showed a misdirection of the regenerating bundle of nerve fibre, innervating then the glabrous skin of the hand. Sudden displacements of receptive fields, which occur at intervals of 50–60 μm, reveal the minicolumns and their transverse size (Kaas et al. 1981, cited by Mountcastle 1997: 708, Mountcastle 1998: 173)

Since speech perception is a higher-level perception process, it is permissible to suggest the following extrapolation: Each nection of the linguistic system of an individual can be implemented as a cortical column. Within the linguistic system, every nection/cortical column has a highly specific function. For example, there may be a nection/cortical column corresponding to a single lexeme like *cat*.

Now, we see that the relational network model requires (*before* considering its neurological plausibility) the following types of connectivity among its nodes, and the following types of properties for its connections (Lamb 2005: 170):

1. Connections can have varying strengths.
2. Connections are strengthened through successful use (the learning process).
3. Connections of given strength carry varying degrees of activation.
4. Nodes have varying thresholds of activation.
5. The threshold of a node can vary over time (part of the learning process).
6. Connections are of two types: excitatory and inhibitory.
7. Excitatory connections are bidirectional, feed-forward and feed-backward.
8. Excitatory connections can be either local or distant.
9. Inhibitory connections are local only.
10. Inhibitory connections can connect either to a node or a line, the blocking element attaches to a line.

11. In early stages (pre-learning) most connections are very weak (latent).
12. A node (at least some nodes) must contain an internal wait (delay) element, needed for sequencing, for example of the part of a syllable or of the constituents of a construction.

The examination of neurological evidence shows that minicolumns and their interconnections have every one of these properties. For example, the internal delay element (Number 12 in the above list) is implemented by means of axon fibers which branch off from the axons of pyramidal cells within a column and connect vertically to other cells in the same column.

> [F]rom layer VI they project upwards and from upper layers downward. This circulating activation among the pyramidal cells of a column keeps activation alive until it is turned off by inhibitory neurons with axons extending vertically within the same column. Such inhibitory cells are called double basket cells (Lamb 2005: 170).

There are also relevant considerations about the number of minicolumns that an individual would need in order to represent linguistic information. For example, when estimating the huge number of minicolumns in Wernicke's area (which is responsible of phonological recognition), Lamb (2005: 172) suggests that there could be approximately 2,800,000 minicolumns in that area. This number could allow an individual to represent all the information needed precisely for phonological recognition.

On the basis of previous remarks, we can provide an argument for the neurological plausibility of relational networks:

(i) Linguistic nections and connections represent linguistic information.
(ii) Linguistic nections of relational networks are implemented as cortical minicolumns.
(iii) Linguistic connections of relational networks are implemented as neural fibers.
(iv) Minicolumns and fibers integrate real cortical connections.
(v) Therefore, relational networks represent linguistic information in the brain.

Of course, this argument is very general. Strictly speaking, it is not the nections of "compact notation" (Lamb 1999: 78) that have been described, but the nections of "narrow notation" (Lamb 1999: 81) that are more adequately implemented as cortical minicolumns. And it is often bundles of minicolumns. Also, narrow notation comes in degrees of narrowness, and we have to go to very narrow levels to approximate what is there in the columnar structures.

Regarding neural fibers, the situation is far more complex because it is not only necessary to talk about this relationship in terms of narrow notation, but also to consider that for a connection of narrow notation we have, in general, many neural fibers. The main factor is that a column is connected to other columns by means of many fibers, not just one. Nevertheless, compact relational networks help us at least to consider the possibility of satisfying the requirement of neurological plausibility.

It seems that there is a good amount and variety of linguistic and neurological evidence that supports the hypothesis according to which the linguistic system is a network of relationships. According to the relational approach, language is a biological and a cultural system at the same time. Every relevant piece of information coming from culture will be represented as a concept, or a set of concepts, within the linguistic system of an individual, which is a biological system because *it is* in the brain. For example, a relatively simple process like eating is connected to sub-procedures and super-procedures, whose structures depend mainly on the knowledge of the cultural context. In conclusion, relational linguistics seems to begin to account for the complex nature of language, a network of relationships that is built in the brain thanks to the information coming from the context of culture.

3 A relational account of slips of the tongue

The very existence of unintentional meanings in verbal communication and the correlative importance of the individual traits considered by SCA (attention, private experience egocentrism, salience) will be now accounted for in relational terms.

In example (1), the Pope involuntarily says *cazzo* [*shit*], but hearers (and even himself) recognize that what he meant was *caso* [*example, case*]. This *lapsus linguae* can be explained, as it has already been suggested, by virtue of the conceptual association between WEALTH and BAD. The activation of these concepts is what makes the speaker activate the corresponding lexical node for *cazzo*. This fact (which can be understood in terms of attention, private experience, egocentricity and salience) combines with phonology, because the activation of *cazzo* and the activation of *caso* differ only in one single phoneme. In this sense, the example is very interesting because it shows, like many other lapses, that during the very complex process of utterance production, phonology begins to activate along with conceptual planning, even before the activation of lexical nodes.

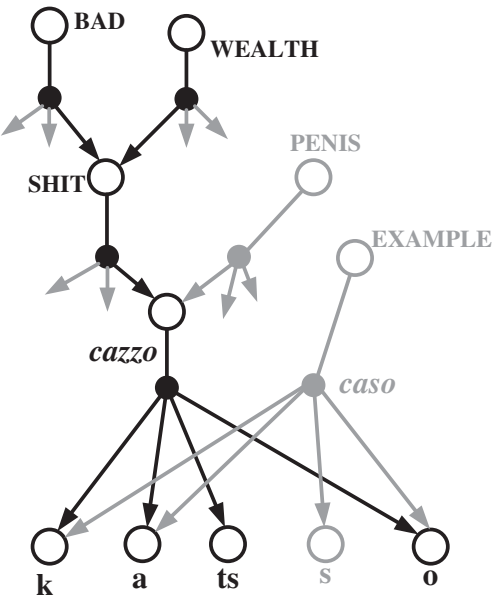

Figure 9: The slip of *cazzo* (Pope Francis).

Figure 9, in narrow notation, represents the linguistic structure that makes such process possible. The black color corresponds to the nodes and connections that receive more activation, whereas the gray color corresponds to the nodes and connections that receive less activation at the precise moment in which the Pope says *cazzo*, instead of *caso*.

In front of the House of Commons, in 2012, the then British Prime Minister said that his government was raising money *for the rich* (and not *for the poor*). Of course, in example (2), and in all other cases, we can never be completely sure of the reason that motivated the slip of the tongue. But what we do know is that such reason can be found in the vast and complex level of meanings. Here, it can be suggested that the activation of the concept MONEY and the lexical node with which is connected to it favored the consequent activation of RICH instead of the activation of POOR. This process is represented in narrow notation, in Figure 10. Again, the black color corresponds to the nodes and connections that receive more activation, whereas the gray color corresponds to the nodes and connections that receive less activation. (This convention, with black and gray, will be maintained in Figures 11 and 12).

Some hearers could infer that this lapsus revealed the deepest and most unspeakable desires of Mr Cameron, who, as a conservative leader, would prefer to govern in the benefit of the rich. This hypothesis has not been included in

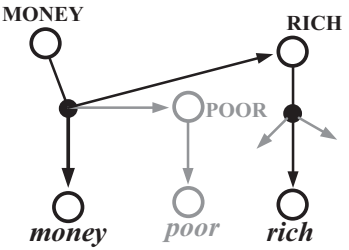

Figure 10: The slip of *rich* (David Cameron).

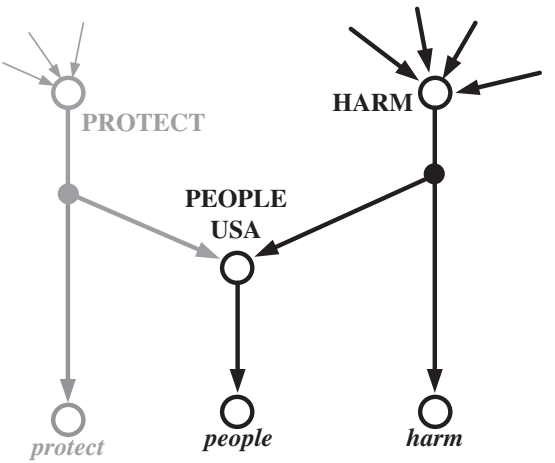

Figure 11: The slip of the tongue based on *harm our people* (George W. Bush).

Figure 10, but it could be represented by means of more nodes and connections, in black, at the conceptual level.

Example (3) is one of the most famous slips of the tongue uttered by Mr Bush:

(3) [Our enemies] never stop thinking about new ways to harm our country and our people, and neither do we (G. W. Bush).

Figure 11 accounts for both the unintended meanings evoked by the slip of the tongue and the presumably intended meaning evoked by the utterance as a whole:

a. *Unintended meaning, strongly communicated*: The conceptual node for HARM in its connection to PEOPLE USA received much more activation than the conceptual node for PROTECT. Consequently, the lexical node for *harm* received much more activation. This information is represented in black color in Figure 11.

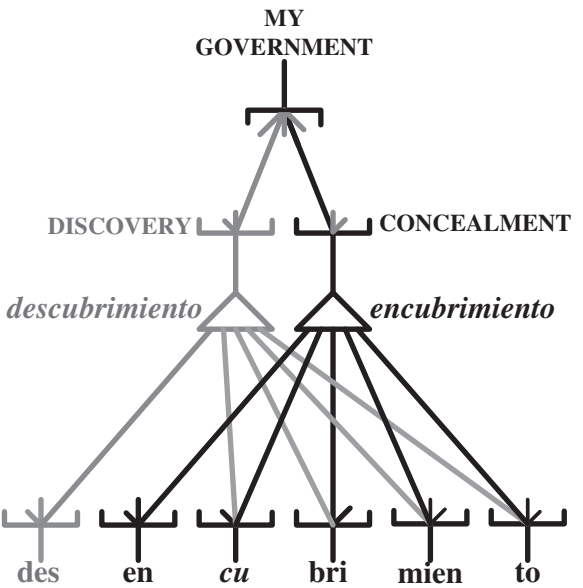

Figure 12: The slip of the tongue based on *encubrimiento* [*concealment*].

b. *(Presumably) intended meaning, not communicated, but probably inferred by hearers*: The conceptual node for PROTECT should have received enough activation in order to activate the lexical node for *protect*, but it received less activation than the node for HARM. In other words, Mr Bush may have had the intention to make mutually manifest (5). This information is represented in gray in Figure 11

(5) We never stop thinking of new ways to protect our country and our people.

Our last example also makes reference to the dark intentions that some politicians may have. As noted before, at that time, the Argentinean government was being accused of having protected the perpetrators of the terrorist attack against the Jewish mutual association of Buenos Aires. When asked about the matter, the then Minister of Foreign Affairs responded as follows:

(4) El encubrimiento existe gracias a las decisiones que tomó este gobierno. [*The concealment exists thanks to the decisions made by this (my) government*] (Héctor Timmerman).

Figure 12, in compact (abstract) notation, shows that in the minister's neurocognitive system the association between MY GOVERNMENT and CONCEALMENT was stronger than the association between MY GOVERNMENT and DISCOVERY. Therefore, the conceptual node for CONCEALMENT sent strong activation to the lexical node for *encubrimiento* [concealment] and he ended up saying that instead of *descubrimiento* [discovery]. As in Figure 9, it is also revealed here that phonological nodes are already active during conceptual planning because, in Spanish, the words corresponding for CONCEALMENT and DISCOVERY differ only in one single syllable.

4 Conclusions

A general theory of communication and cognition should account not only for intentional communication, but also for anomalous statements that evoke unintentional meanings, for example the Freudian slips of the tongue that are manifest in examples (1)-(4). Canonical pragmatics has made highly valuable contributions to understanding "smooth" communication, which is based on cooperative intention. For its part, SCA faces the challenge of becoming a theory that can account for the complex nature of all human communication, including "bumpy communication", which is based on egocentric attention. Within this context, relational networks can count as a fundamental methodological contribution, because they can represent traits corresponding to the two planes that interact in communication. Table 1 summarizes how these traits are present in every phase of the communicative process (albeit to different extent, depending on every case). A systematic analysis of their relationships may help us to understand the complex nature of human communication:

- The societal trait corresponds to intentional communication, which has a cooperative nature. This is the plane of smooth communication, i.e. the plane of **cooperative intention** (column 1, Table 1).
- The individual trait corresponds to egocentric communication, which has an attentional nature. This is the plane of bumpy communication, i.e. the plane of **egocentric attention** (column 2, Table 1).

By means of relational networks, fundamental aspects of bumpy communication (based on egocentric attention) have been analyzed and explained. However, some issues of smooth communication (based on cooperative intention) have also been characterized, for example in the case of intentional ambiguity represented in Figure 5 (about the Icelandic football fans). In

Table 1: Dimensions of communication.

Cooperative intention (Smooth communication)	Egocentric attention (Bumpy communication)
Intention: The reason or a goal behind individual utterances and conversation (Searle 1983).	**Attention:** Cognitive resources available to interlocutors that make communication a conscious action (Kecskés 2010: 61).
Actual situational experience: The shared cognitive environment in which it is manifest which people share it. Sperber and Wilson talk about a "mutual cognitive environment" (1995: 41) that enables the hearer to identify the speaker's communicative intention.	**Private experience:** The unique and unrepeatable individual's cognitive system, which organizes what has been learnt and determines both linguistic production and linguistic understanding.
Cooperation: The rational principle by virtue of which hearers aim at recognizing the speaker's communicative intention. On its basis, it is assumed that speaker's contributions are cooperative, i. e. with the necessary amount of information, reliable (sincere), relevant, and perspicuous (Grice 1975).	**Egocentrism:** It means that interlocutors activate and bring up the most salient information to the needed attentional level in the construction (by the speaker) and comprehension (by the hearer) of the communication (Kecskés 2010: 62).
Relevance: It means that every utterance, as an ostensive act, conveys the guarantee that it is the most relevant thing that the speaker could have said, that is, that the result of its processing will be sufficiently valuable to justify the effort to process it (Sperber and Wilson 1995).	**Salience:** It is a semiotic notion that refers to the relative importance that speakers and hearers give to signs they consider prominent. (Kecskés 2010: 65).

addition, the lines and nodes in gray color represent the intentional meanings that are being weakly activated. Now, Table 2 presents a summary of the interaction of the two planes. Of course, egocentric attention has greater salience in examples (1)-(4).

In summary, SCA is an approach that allows us to start considering communication in all its complexity. The well-known contributions of canonical pragmatics will still be fundamental in order to understand the cooperative-intentional plane of communication.

The relational explanation of the slips of the tongue is compatible with SCA because it shows how what the speaker says relies "on prior conversational

Table 2: Intentional and unintended meanings in examples (1)-(5).

Example	Smooth communication: Cooperative intention	Bumpy communication: Egocentric attention
(1) In questo cazzo, in questo caso [in this shit/cock, in this case]… (Pope Francis)	The Pope intended to communicate an example by means of the expression *in questo caso*.	The Pope communicated that he considers that wealth is bad.
(2) We are raising money for the rich (D. Cameron)	The PM intended to communicate that his government was raising money for the *poor*.	The PM communicated that his government was raising money for the *rich*.
(3) [Our enemies] never stop thinking about new ways to harm our country and our people, and neither do we (G. W. Bush)	Bush intended to communicate that he was thinking how to protect the USA and the people.	Bush communicated that he was thinking how to harm the USA and the people.
(4) El encubrimiento existe gracias a las decisiones que tomó este gobierno. [The concealment exists thanks to the decisions made by this (my) government] (H. Timmerman)	The minister intended to communicate that his government had tried to discover who were the perpetrators of the terrorist attack.	The minister communicated that his government had tried to conceal who were the perpetrators of the terrorist attack.

experience, as reflected in lexical choices in production" (Kecskés 2008: 385, Kecskés 2010: 57), and how it also relies on the speaker's cognitive system.

Conversely, how the hearer understands utterances in actual contexts is determined by his/her prior conversational experience with the lexical items used in the speaker's utterances, and also by the structure of his/her cognitive system.

Thus smooth communication (based on cooperative intention) depends mainly on the match between the interlocutor's prior experiences and cognitive systems. However, bumpy communication (based on egocentric attention) does not depend on such correspondence. In fact, "cooperation, relevance, and reliance on possible mutual knowledge come into play only after the speaker's ego is satisfied and the hearer's egocentric, most salient interpretation is processed" (Kecskés 2010: 57).

In other words, when we communicate, we are committed to the transmission and recognition of intentions. This is smooth communication (based on cooperative intention), and it has been extensively and deeply explained by Cognitive-philosophical Pragmatics. But when we communicate we are also

involved in a process of transmission and identification of unintentional linguistic information that is cognitively relevant for both speakers and hearers. SCA begins to account for them, and relational networks can collaborate greatly for that challenging goal.

In any case, communication is a much more complex process than the transmission and recognition of intentions that canonical pragmatics has characterized. Cooperative intention and egocentric attention are not antagonistic, but constitutive and necessary phenomena of communication and cognition. In other words, cooperation and egocentrism affect communication simultaneously, and they are always present in varying degrees. Of course, this simultaneity does not imply that there are two different types of communication.

As Sydney Lamb says, perfect communication occurs only when the cognitive system of the speaker is identical to the cognitive system of the hearer; that is, never. We can add that communication fails completely when the two systems are absolutely different; that is, never...

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Bionote

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