

SENTENTIAL EVIDENTIAL ADVERBS AND AUTHORIAL STANCE IN A CORPUS OF ENGLISH COMPUTING ARTICLES¹

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ABSTRACT. *This article considers evidentials as stancetaking markers. For this, I have selected a corpus of scientific computing articles from where evidential adverbs placed initially are analysed using corpus tools. The adverbs found in the corpus under survey are clearly, intuitively, obviously and experimentally. These findings suggest that, in this type of research articles, there is a preference to use adverbs in the field of clarity and obviousness. Many of these adverbs to show authorial stance are said to communicate the author's commitment towards the information given, and so these are categorised as epistemic adverbs. I will argue that this epistemic meaning is but a pragmatic effect rather than a primary function of these adverbs, and so they should be firstly categorised in the domain of evidentiality.*

KEYWORDS. *Evidentiality, epistemic modality, stance, adverbs, computing research articles.*

RESUMEN. *En este trabajo, se analizan los marcadores evidenciales para determinar si estos expresan o no el punto de vista de los autores. El corpus de trabajo consiste en artículos de investigación informáticos en los que se ha analizado los adverbios evidenciales clearly, intuitively, obviously y experimentally en posición inicial. El análisis de los datos revela que, en este tipo de artículos de investigación, se usa de manera generalizada adverbios relacionados con los campos léxicos 'claridad' y 'obviedad'. Muchos de estos adverbios de punto de vista suelen categorizarse como adverbios epistémicos que sugieren el compromiso del autor con la información aportada. Una de las conclusiones de este trabajo es precisamente que la manifestación del compromiso del autor, así como los diferentes grados de verdad implicados en estos adverbios, solo son posibles efectos secundarios del uso evidencial de los mismos.*

PALABRAS CLAVE. *Evidencialidad, modalidad epistémica, stance, adverbios, artículos de investigación informáticos.*

1. INTRODUCTION

This paper focuses on the concept of evidentiality in relation to *stance*, i.e. authorial standpoint, in English computing scientific discourse. For this purpose, I will analyse a

corpus of scientific papers in the field of computing to identify single sentential adverbs in initial position that may carry evidential meaning. The adverbs found to fulfil my selection criteria in the corpus amount to four: *clearly*, *intuitively*, *obviously* and *experimentally*. I will also discuss some related features such as epistemic modality, which is closely connected to evidentiality. Whereas for some scholars evidentiality represents a subdomain of epistemic modality, there are others who consider evidentiality as an independent category. Epistemic modality seems to be strongly connected to the idea of *truth* and the authors' responsibility regarding their statements (Traugott 1989; Sweetser 1990; Stukker Sanders and Verhagen 2009), as in *I may possibly buy one of those* with *may* and *possibly* as indicators of the author's degree of certainty towards the proposition. Evidentiality is seen as the coding of the authors' source of knowledge, and this may sometimes imply certainty as to the proposition manifested, as in *I have heard she moved to America*, where the matrix *I have heard* may indicate both the source of the proposition and/or some degree of certainty concerning its truthfulness.

In this context, Dendale and Tasmowski (2001) argue that the relation between these two concepts is divided into disjunction, inclusion, and intersection. In the strictest sense, evidentiality conveys no more than evidence about the source of information, i.e. disjunction. Cornillie (2009) follows this disjunctive line, and he argues that the mode of knowing should not be associated with the degree of authors' commitment towards their texts. For Palmer (2001), evidentiality is a subcategory of epistemic modality, i.e. inclusion. Finally, scholars such as Chafe (1986), van der Auwera and Plungian (1998), Mushin (2001), and Carretero (2004) follow the intersective approach, which implies an overlap between inferential evidentiality and epistemic necessity, as in *Someone is knocking. That must be Sally*. In this case, *must* shows how the speaker obtains information through his own mental processes. The speaker's previous knowledge about Sally and his expectations enable him to deduce information from his own logical reasoning (*inferential evidentiality*) while evaluating that the chances of the proposition are high enough to expect an actualisation of the event (*epistemic necessity*).

These approaches to evidentiality can be exemplified with the instance *I have observed that our students failed to meet the essay deadlines this term*. Following the inclusive approach, the use of the matrix *I have observed that* shows the likelihood of the proposition to be true. An intersective analysis implies the reading of *I have observed that* in a continuum where this matrix have both an evidential and epistemic reading. Thus, it indicates source of knowledge and an evaluation of the truth of the proposition. From a disjunctive approach, this matrix only suggests the source of information. I follow this disjunctive approach in this paper, and I will show that epistemic readings of evidentials are a pragmatic effect rather than a primary function of these devices.

The study of stance demonstrates that scientific texts are not depersonalised, as has often been argued. In a recent paper on historical expression of stance, Gray et al. (2011: 221) have claimed that

Recent scholarship has demonstrated that stance is an important aspect of formal written prose. This scholarship has emphasized the role of stance in creating and maintaining relationships between the writer and his or her audience as well as reflecting the value system of writers and their discourse communities.

Stancetaking devices, such as *perhaps*, *I hope...*, *unfortunately*, and *should*, are generally (inter)subjective, and so a negotiation of meaning is held between interactants. In the case of stance adverbs, these position speakers with respect to the propositional content, but they also establish a dialogue in which certainty, truth, and responsibility are evaluated (Downing 2002: 256-257). Evidentials may be also (inter)subjective. This subjective nature of some evidentials qualifies both the proposition and the speaker. The use and evaluation of evidentials is a highly social activity. In this sense, Babel (2009: 492) states the following:

The tacit assumption that identifying information sources is a transparent, straightforward process is an assumption that is firmly rooted in our own culture and ideologies... speakers take advantage of the flexibility involved in identifying sources of information as they calibrate the relationship among themselves, their interlocutors, and the information they wish to communicate.

This study diverges from others, such as Haumann (2007)², in that the adverbs under scrutiny are primarily classified as evidentials with possible epistemic nuances as a pragmatic effect. This is explained following the disjunctive method described in section 2, below. I endorse Conrad and Biber (2000) classification of adverbials in the identification and categorisation of these forms in my corpus. The paper is structured as follows: Section two reviews the literature concerning evidentiality and epistemic modality. Similarly, a succinct description of adverbs in connection with stance is offered. Section three explains the corpus and the methodology used in this study. The following section presents the analysis of results and the discussion. Finally, the conclusions are given.

2. EVIDENTIALITY AND ADVERBS

In this section, I will first describe the current trends in the study of evidentiality and the relationship of evidentiality and epistemic modality since there seems to be a lack of scholarly consensus as to whether evidentiality represents a category in itself or it is subsumed under the domain of epistemic modality. Subsequently, I deal with adverbs and more particularly with those adverbs categorised as evidentials in earlier literature. In this context, the value of these particles as point-of-view markers is explained.

2.1. *Evidentiality and its place within the modal system*

Evidentiality is defined as the expression of the author's source or mode of information. It represents a very complicated issue in linguistics because, as has just been pointed out, scholars agree on neither its linguistic nature and status nor how

evidentials should be approached at from a methodological standpoint. Whereas many Amerindian languages have been typologically classified as evidential languages because evidentiality is marked by a set of conventionalised grammatical forms, many European languages, among which English is a clear example, are not classified as an evidential language. The reason for this lies in the fact that, for some, evidentiality is a purely grammatical phenomenon while, for others, it can be both grammatical and lexical.³

In terms of the issue of how evidentiality should be approached, there are two main streams, the difference between them being based on a semantic-pragmatic distinction. Some scholars consider evidentiality as a subdomain of epistemic modality, while some others think that evidentiality represents an independent category. Halfway between these two lines of thought, a third emerges that calls for the independent status of both evidential and epistemic categories although this does not mean that a particular form may not render both readings providing a suitable context for interpretation is given. These three approaches are identified as inclusion, disjunction and intersection, in this order (Dendale and Tasmowski 2001).

In the following subsection, I will explain each of them in some more detail. I first concentrate on the views integrating evidentiality in the realm of epistemic modality, namely the inclusive and the intersective approaches, and then I describe the disjunctive model. Finally, I offer my own view of the state of affairs, and my understanding of the relationship between these two concepts. This will be my framework for the analysis of the evidential adverbs *clearly*, *obviously*, *intuitively* and *experimentally* in section 4, below.

2.1.1. The relationship between evidentiality and epistemic modality

Epistemic modality has been defined as “an evaluation of the chances that a certain hypothetical state of affairs under consideration (or some aspect of it) will occur, is occurring or has occurred in a possible world” (Nuyts 2001: 21), and so it seems to be strongly connected to the idea of truth and the authors’ responsibility concerning their statements (Traugott 1989; Sweetser 1990; Stukker Sanders and Verhagen 2009). Traditionally, the study of the concepts of evidentiality and epistemic modality has overlapped, as in Chafe (1986), although there is certainly a distinction between them: “Evidentiality is concerned with indicating the information source the speaker is relying on to make a claim. This places this category next to epistemic modality without, however, merging them into one” (Diewald, Kresic and Smirnova 2009: 190).

Cornillie (2009) proposes a disjunctive model, in which epistemic modality and evidentiality are seen as distinct categories. However, these domains are not mutually exclusive, so one expression may lend itself to evidential as well as epistemic readings. Cornillie argues that confusion concerning the overlapping of these domains is due to the frequent association of the mode of knowing and the degree of the speaker’s commitment concerning the proposition. In his view, modes of knowing do not really imply any degree of authorial certainty, evaluation, commitment or likelihood of the proposition to be true. Modes of knowing can be direct or indirect, depending on how

the speaker has obtained the information, which could be: visually, non-visually, through their own inferences or from other people’s inferencing processes. His definition of evidentiality reflects this trend of thought, and thus evidentiality “refers to the reasoning processes that lead to a proposition” (2009: 47), whereas epistemic modality “evaluates the likelihood that this proposition is true” (2009: 47).

In my view, this terminological maze is due to the confusion that arises from what it is strictly speaking the function of an evidential and its pragmatic effects, and from what is strictly speaking the function of an epistemic device and its pragmatics. When these aspects are not taken into account, then indeterminacy creeps in. Since the very nature of an evidential is to indicate the author’s source of knowledge, or the author’s mode of knowledge, an immediate pragmatic conclusion might be the attestation of truthfulness concerning the proposition. However, values of this kind are not the function of evidentials, as I show in Fig. 1, below, which represents hearer-centered interpretation. In this case, the speaker (or writer) expresses how she has gained information, and this view is also shared by Listener A. Nonetheless, given an appropriate context, further cognitive enrichment takes place and so the modulated declarative is pragmatically interpreted in terms of epistemic modality (Listener B). In this case, the pragmatic effect on the hearer is that of probability, and in turn of uncertainty. Factuality is not in any way guaranteed in any of these interpretations of the modal *must*.

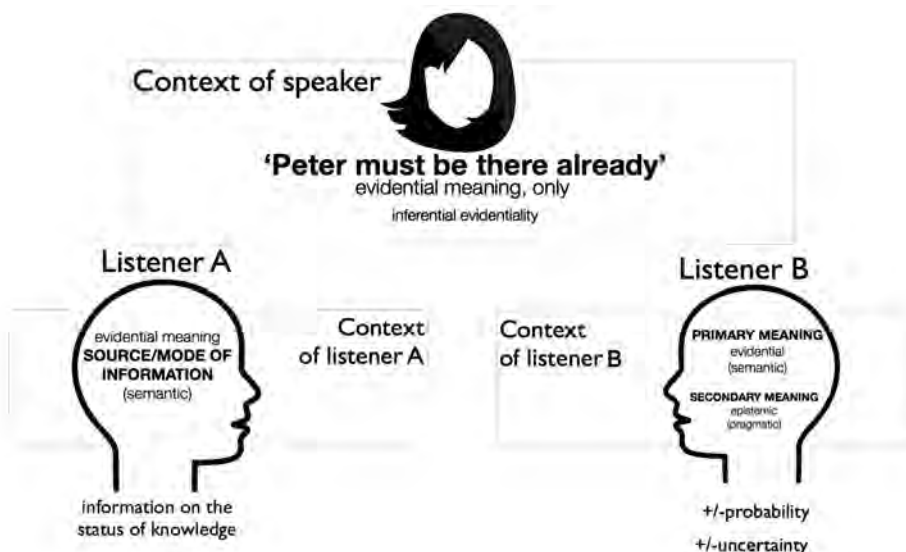


Figure 1. *The modal meanings of must* (images from openclipart.org, cc).

Having clarified these points, in my analysis of adverbs in scientific computing articles, I shall maintain evidentiality and epistemic modality as two distinct concepts,

since this will benefit my interpretation of the authors' stance towards their texts to a significant extent. The use of these strategies may be indexical of the authors' position and intention in discourse (Marín Arrese 2009). In other words, adverbs like *clearly* may signal only source of information knowledge, or it also show the commitment of the author towards the proposition.

2.2. Evidential adverbs and stance

Adverbials may be used to explicitly show the authors' stance towards their texts. Stance is a very difficult concept to study and apply, since it covers a wide range of meanings, as it is in itself a meaning rather than a form, as pointed out by Hunston (2007: 27-28):

The phenomenon of stance is a meaning, a type of meaning, or several types of meaning, rather than a form [...] it is always acknowledged that identifying stance entails more than simply locating those forms, and that interpreting the role of stance in discourse entails a deeper understanding of the discourse as a whole that can be obtained from looking at the immediate co-text of an individual lexical item.

Biber et al. (1999: 996) define stance in relation to the expression of the speakers' and writers' "personal feelings, attitudes, value judgements, or assessments". In this vein, *stance* as a concept has traditionally been an umbrella term to refer to *evaluation* (Hunston 1994; Hunston and Thompson 2000), *evidentiality* (Chafe 1986), *affect* (Ochs 1989), *hedge* (Hyland 1998), among others. The term *hedge* is itself another umbrella term referring to "the means by which the writers can present a proposition as an opinion rather than a fact: items are only hedges in their epistemic sense, and only then when they mark uncertainty" (Hyland 1998: 5). In this context, a stance adverbial might also be a hedge to frame a given proposition when used to convey probability or possibility concerning that proposition.

Conrad and Biber (2000) represent an earlier study on adverbials in a multi-register corpus. In this study, Conrad and Biber (2000: 58ff) characterise adverbials according to three parameters: semantic class, grammatical realisation, and placement in the clause, and these are further divided into subcategories, as shown in the Table below (examples taken from the same source). Evidential adverbials are here categorised as a case of epistemic stance.

TABLE 1. *Adverbials, after Conrad and Biber (2000).*

Semantic class (meaning)	epistemic stance	Well <i>perhaps</i> he is a little bit weird.
	attitudinal stance	<i>Unfortunately</i> , IPC as proposed is applicable to only a relatively small number of pollutants.
	style stance	<i>Honestly</i> , I've got a headache.

Grammatical realisation (form)	single adverb	A message <i>actually</i> belongs to...
	adverb phrase	I assume you're right Lynda, but <i>quite frankly</i> I don't know.
	noun phrase	The enthusiastic housekeeper will <i>no doubt</i> be pleased to hear that...
	prepositional phrase	I'll tell you <i>for a fact</i> that Steven won't go for Ollie tonight...
	finite subordinate clause	She, she's in hospital here <i>I think</i> .
	non-finite subordinate clause	We feel that if we did not pursue this second transplant it would be like, <i>to put it bluntly</i> , pulling the plug on her.
Placement in the clause	initial	<i>Actually</i> I can't blame her.
	pre-verbal	I'll <i>actually</i> said thank you for that.
	post-verbal	I'm <i>actually</i> cold.
	final	They look good <i>actually</i> .

In this paper I describe the use of single stance adverbials showing evidential meaning in a corpus of scientific computing papers. I will specifically concentrate on sentential adverbs affecting the meaning of the complete proposition placed at the beginning of the sentence. Except for one case, all the adverbs are visually indicated by means of a comma, which also acts as an intonation cue. According to Dixon (2005: 385), this *appositional intonation* or *comma intonation* is used to indicate deviation from standard prototypical position of the adverb in the sentence.

3. CORPUS AND METHOD

The data analysed have been excerpted from the *Corpus of Specialized Research Papers in English*. This corpus is part of a larger research project, *Evidentiality in a Multidisciplinary Corpus of Research Papers in English*, currently in progress at the Universidad de Las Palmas de Gran Canaria. The corpus covers three register domains, namely, computing, law and medicine, and contains research papers from 1998 to 2008. They have been randomly selected from several online databases of scientific journals.

Journals with a high impact factor were selected first. Sociological characteristics were then taken into account to select the articles, for instance, they should be written in English, and at least one of their authors should be a native speaker of the language. These criteria would allow for a unified account of the findings. In order to analyse the evidential and epistemic uses of modals, we have taken twenty papers and focused on the complete article with the exception of abstracts, which are frequently studied as an

independent genre. Besides, abstracts tend to repeat what is given as introductory material and so the same language is likely to appear. The computing subcorpus, of 277,826 words, was interrogated using the *Onicom*¹ corpus tool (*Online Interface for Corpus Management*), which is web software designed to implement and retrieve data following sociological and linguistic criteria, including genre variables. Thus, my methodology combines computer and manual analyses. The purpose of the former is to initially detect single adverb forms, and the latter considers context in order to identify those adverbials showing potential evidential meaning.

Numerous studies in different fields have examined academic writing in order to describe its rhetorical organisation (Wood 1982; Peng 1987; Swales 1990; Thompson 1993; Nwogu 1997; Posteguillo 1999; Kanoksilapatham 2005; among others). All of them coincide in following Swales' (1981, 1990) model of genre-analysis in which the research article (RA) can be divided into different sections, that is, the traditional IMRD format: Introduction, Methods, Results and Discussion. Thus, each section is subdivided into moves that are distinguished according to content and linguistic criteria. Kanoksilapatham (2005: 274) labels the sections and moves for the RA, and subdivides each move into different steps: "the function of Introductions is to contextualize a research study, claim its novelty, and present main features of the study (Swales 1990)"; the methods section explains "procedures used in the study" (Kanoksilapatham 2005: 276); the results section "describes the findings in an ostensibly objective manner" (Kanoksilapatham 2005: 279), and the discussion stage "contextualizes the reported study and relates it to previous work in the field, reflecting a sense of membership in the larger scientific community" (Kanoksilapatham 2005: 283).

Posteguillo (1999) has specifically focused on the structure of the computing research article to conclude that there is a general lack of systematicity in how contents are organised in this type of RAs. This author (1999: 139) states that the IMRD model is not always followed in a straightforward fashion in computing RAs. This is the case of the method section, which is normally replaced by either the *explanation of algorithm* move or the *process of implementing a system* move. Posteguillo (1999: 153) also claims that "computer engineers avoid this term, and make subdivisions in their explanations or add comments comparing their applications and algorithms with those of other fellow researchers to the point of making a clear definition of this section quite difficult". The observed lack of structural precision, which is closely connected to the fact that the discipline is recent, leads him to outline computing RAs into three moves: introduction, results and conclusion. In our corpus, all the RAs follow the IMRD model, and most of them add a Conclusion section in which the authors give recommendations for future research.

4. RESULTS AND DISCUSSION

The analysis of the texts gives the results shown in the pie chart below:

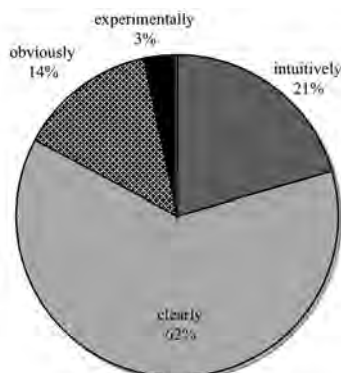


Figure 2. *Initial stance single adverbs in corpus.*

As this chart shows, the form *clearly* outnumbers the other adverbs in the corpus and accounts for more than fifty percent of occurrences. *Clearly* is followed by the forms *intuitively* and *obviously*. The adverb *experimentally* is used sparingly to show evidential information. In the following sections I describe these adverbs in my corpus of scientific texts.

4.1. *Clearly*

The *OED* gives a wide array of related meanings for *clearly*, such as *plainly*, *manifestly*, *evidently*. In many respects, the use of *clearly* seems to be related to the entailment of truth concerning the proposition hedged, and this is evident in definition 5.b of this entry “Used parenthetically,=..., it is clear,...; the truth or correctness of the assertion being the thing that is clear”. This relationship between truth and clarity has been challenged by Barker and Taranto (2002: 19), who claim that “it is an illusion due to the implications that the assertion has for the state of the discourse”. Tseronis (2009: 56) asserts that the adverb *clearly* shows strong authorial commitment since it “is warranted on evidence the source or quality of which is strong enough to justify such a degree”. For this author (2009: 71), the addition of *clearly* to frame a proposition may have the same meaning as if this device were removed since, contextually, it may not affect its truth-conditional semantics. Using his own example, to assert *He is dead* and *Clearly, he is dead* show the same degree of authorial commitment towards the propositional truth.

In the analysis of samples, I have encountered different uses of *clearly*. One first use of this adverb presents evidential nuances but it may also be understood as a style stance adverb, somehow matching with the *OED* meaning *plainly*. This is the case of (1) below in which the adverb functions as an evidential device. This suggests earlier

knowledge attesting the factuality of the proposition hedged. This idea is supported by the string “as evidenced by the different behaviour [...]”. Despite this evidential function, *clearly* has an interpersonal function to show the author’s commitment towards the proposition by making it explicit. This being the case and following Tseronis (2009), the use of *clearly* here does not affect the truth-conditional semantics of the proposition.

- (1) **Clearly**, 38.5% is close to subsystem 1’s real time allocation, as evidenced by the different behavior in the two overload episodes, while 35% is less than the real time allocation (Northcote1998networkCOM).

Clearly can also refer to prediction and inferential reasoning as in the examples below:

- (2) This problem was most acute when the data was most amessyo and the acosto function most complex. **Clearly**, the solution is that researchers will need to repeat their sampling and validation procedures a number of times in order to gain confidence in their results (Shepperd2001softwareCOM).
- (3) **Clearly** these two approaches will go together very well. We plan to discuss this new multilevel adaptive grid smoothing strategy in a follow-up paper. We will not discuss it further here (Sheffer2002gridCOM).
- (4) Therefore, the median tends to be significantly smaller than the average. The coarser grid has a drastically smaller computational cost but can potentially “miss” very small details in the planar mesh, generated in areas where the three-dimensional mesh has very high curvature.

Clearly, using a uniform grid for the grid (mesh) smoothing step creates a problem (Sheffer2002gridCOM).

All these examples of *clearly* indicate evidential meaning. In (2), the adverb is used in the fashion of a cognitive evidential of the type *I think/I conclude* showing the authors’ deductions based on previous knowledge, but also the authorial commitment to the framed proposition. A similar use is present in (3). In this case, *clearly* refers to deduced knowledge, which has not yet been tested, but the testing of which is planned as part of future research. With the use of *clearly*, the authors may seek to give the impression of absolute conviction that the proposition hedged is true, but this is a pragmatic effect. We also find the combination of this adverb and the future marker *will* with a deontic meaning. This reinforces the idea of factuality concerning the proposition, despite the fact that the concept of clarity does not necessarily entail the idea of truthfulness, as Barker and Taranto (2002) have rightly pointed out. The last example also shows inferential evidentiality, since information is deduced from logical reasoning. The form *clearly* establishes the truthfulness of the evidence following from the implicit hypothesis, which results from a non-finite clause functioning as subject of the hedged proposition. In other words, in the light of the evidence owned, the authors are led to the conclusion that, *if* a uniform grid is used, a problem will arise.

The use of *clearly* framing conditional clauses occurs repeatedly in the corpus to mark the path of logical deduction/reasoning explicitly stating the mode of knowledge, as shown in the following instances:

- (5) **Clearly**, if both α_2 , σ_2 , δ and x have to be estimated, we have to iterate between (21) and (22) (Woods2006stochasticCOM).
- (6) **Clearly**, if hypervolume calculations are incorporated into the execution of an algorithm (as opposed to hypervolume used as a metric after execution is completed), there is a much stronger requirement for those calculations to be efficient. The ideal for such use is an incremental algorithm that minimizes the expense of repeated invocations (While2006algorithmCOM).
- (7) We call the domain wherein all elements nonnegative the linear domain of (16). In the linear domain, (16) reduces to the linear subspace ode (13), and it is thus relatively straightforward to investigate the behavior in this domain. **Clearly**, if H is a nonnegative permutation matrix (Lemma 3) then it is in the linear domain: the following Lemma investigates the behavior of the more general case for H in the linear domain (Plumbley2004nonnegativeCOM).
- (8) The model, therefore, requires bits of storage. **Clearly**, if the maximum number of patterns that can be stored in a Hopfield memory is $M < N$, then the RCAM model is more compact. There is also the added consideration of the overheads associated with amount of space required to store the memory patterns (memory data) (Wilson2003studyCOM).

In all these cases, *clearly* is intended to frame the *modus ponens* formulas used to show an inferential path. The adverb in all these instances is equivalent to the phrase *I deduce that/ I guess/ I believe*. A reworking of (6) would look as follows

- (6') I believe that, if hypervolume calculations are incorporated into the execution of an algorithm (as opposed to hypervolume used as a metric after execution is completed), there is a much stronger requirement for those calculations to be efficient.

Thus, the epistemic meaning of *clearly* in contrast to *I believe that* in (6') is of a pragmatic nature. *Clearly* is more effective in insisting on the idea of obviousness and verisimilitude than *I believe*, which patently lies in the realm of beliefs and subjectivity. I am not saying that *clearly* is less subjective than *I believe*, but it appears to be more convincing since the idea of clarity is wrongly associated with truthfulness. The use of *clearly* is not semantically speaking a warrant of truth of the proposition, or even of the logical operation. Actually, *clearly* seems to affect the consequence of the conditional, rather than the complete, formula.

4.2. *Intuitively*

According to the *OED*, the word *intuitively* refers to what is known by “immediate perception or direct mental apprehension; without the aid of intermediate ideas”. This

definition does not clarify whether “immediate perception” refers to one gained visually or aurally, hence a sensory type of evidentiality, or gained through the speaker’s mental processes, hence inferential evidentiality (van der Auwera and Plungian, 1998; Alonso-Almeida, forthcoming). In any case, *intuitively* is a type of adverbial that plainly gives an idea of the author’s stance towards his/her text, especially in academic writing since intuition is not scientifically measured. Intuition is not a warrant in itself, but it is a mode of knowing, and so *intuitively* should be considered as an evidential adverb. The use of *intuitively* places the proposition in the realm of faith rather than in that of factuality. One’s intuitions, no matter how sure we may feel about them, are not very reliable, and in science ideas/concepts based on intuitions need experimental unfolding to attest truth. An epistemic reading of *intuitively* indicates weaker commitment. The following are instances taken from my corpus:

- (9) **Intuitively**, an optimal experiment is one that provides the most additional information for discriminating among competing hypotheses. Unfortunately, such an experiment is difficult to design when more than a few variables are involved. In such situations, scientists typically resort to two extremes for experimental design: vary a few variables to some degree or vary them all exhaustively (Davis 1999designingCOM).
- (10) Intuitively, we can see that due to the well-groundedness of the sources with negative h_{ij} , and the finite variances of the sources with positive h_{ij} , then there will be a nonzero probability that the positives will outweigh the negatives as they sum to give each y_i (Plumbley2004nonnegativeCOM).

In (9), there is a contrast between what is possible if intuition is the mode of knowing and what is not possible according to the truth. This second idea is introduced by the attitudinal stance marker *unfortunately*, and reinforced by the use of the stance lexical item *difficult*. In the next instance, the weakness of *intuitively* as a mode-of-knowing device is somehow balanced by the use of the perceptual evidential device *we can see that*. The pragmatic effect of these two evidential devices on the hearer in terms of epistemic modality is that of higher authorial commitment than the deployment of *intuitively* alone.

4.3. *Obviously*

The form *obviously* belongs to the group of evidential adverbs such as *apparently* and *evidently*. *Obviously* refers to “what might be expected from the circumstances” (OED), and so it can be categorised as an inferential evidential. The ensuing pragmatic effect relates to the expression of truth, which the writers want to convey explicitly, as in the instances below:

- (11) Given the resulting planar graph, another observation can be made: since it is derived from the adjacency of fragments in the watershed output, the graph is not regular but,

more importantly, the nodes correspond to fragments of varying size and the edges to boundaries of varying length. **Obviously**, in evaluating the cut criterion, a long edge is more significant than a short one, thus, we generalize the mean cut to take account of this variation –by weighting each edge by the number of pixels along the corresponding boundary (O’Callaghan2005morphologicalCOM).

- (12) Since we intend to pursue a probabilistic analysis of the memory, we must define some statistical properties of the stored memory patterns. **Obviously**, the population statistics of the stored pattern sets can vary and this in turn will significantly affect recall. With this caveat in mind, we confine our attention to sets of stored memory patterns that satisfy the following restrictions (Wilson2003studyCOM).
- (13) Here, we would like to predict aspects such as duration and effort at an early stage in the development. A wide range of techniques have been proposed. These include statistical methods, parametric models, and machine learning (ML) methods. **Obviously**, this then raises the question which technique, or techniques, are “best.” Unfortunately, and perhaps unsurprisingly, there is no simple answer (Shepperd2001softwareCOM).

In all these cases, *obviously* shows how information is gained, but also conveys an evaluation of the information itself. From a semantic point of view, to assert that something is obvious does not necessarily entail truthfulness. The concept of obviousness relates to what is clear and easily perceived through the senses, i.e. evident, but the notion of what is evident very much depends on individuals and their selection of contextual premises. The implication of using *obviously* in these examples is to give the impression of factuality without requiring the authors to offer further demonstration. The pragmatic effect on the readers is clear. A proposition framed by *obviously* is intended to be accepted and shared. In this sense, *obviously* functions in the same way as *clearly*, and so *obviously* is allocated in the field of clarity, which does not attest to the truthfulness of the proposition qualified, as stated in section 4.1, above.

4.4. Experimentally

The adverb *experimentally* points to experience and perception as the means of gaining knowledge through empirical methods. There is just one example in the entire corpus. The adverb frames a proposition dealing with evidence of the sources of the authors’ information. The effect of the use of this adverb is to communicate reliability, since experiments point to scientific procedures. Experimental methods share some connection with the concept of truth, but one that has not yet been conclusively proved and demonstrated.

- (14) **Experimentally**, the supporting evidence can be found in Fig. 11(b) and its corresponding feasibility in Fig. 7(b), which shows that high feasibilities can only be achieved if the 0-1 convergence phase is included in the annealing schedule (Kwok2004noisyCOM).

5. CONCLUSIONS

In this article, I have examined evidential stance adverbs in initial position in a corpus of scientific computing articles. My findings suggest an authorial tendency to use adverbs in the field of clarity and obviousness. In all cases, these devices reveal the authors' intention of indicating source/mode of knowledge, and this is also seen as qualifying the status of the proposition in terms of truthfulness and factuality. In this sense, the form *clearly* is pragmatically interpreted as showing authorial commitment towards the contents, especially in those cases in which the sentential adverb does not affect the truth-conditional semantics of the proposition hedged. The presence of *clearly* also indicates inferential reasoning, i.e. shows deduction, and prediction. This form very frequently appears in conditional sentences to qualify only the consequence of the conditional formula.

The adverbs *obviously* and *experimentally* are also evidentials in this corpus. The former falls into the field of clarity and seeks to give the impression of factuality and truth. The latter also aims to convey empirical truth, even in those cases where verification may still be pending. All in all, none of these adverbs effectively implies truth, unless it is the truth of the author, which is dependent on specific contextual premises, some of which are exclusive to the speakers. Finally, the adverb *intuitively* refers to a kind of evidence that consists of one's personal ideas or assumptions about something. This type of evidence still requires further proof or empirical demonstration, and hence the adverb should be interpreted as presenting weaker commitment despite being extremely author-centered, which might lead one to suppose the opposite.

In general, this article has shown that adverbs, such as *clearly* and *obviously*, should be classified firstly as primarily evidential with possible epistemic readings as a pragmatic effect.

NOTES

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² Haumman (2007: 352), for instance, defines evidential adverbs in terms of certainty: "Evidential adverbs, e.g. *evidently*, *certainly*, *obviously*, *apparently*, etc. express degrees of certitude with respect to the speaker's subjective perception of the truth of a proposition".

³ One unresolved issue is represented by the English modal system, as claimed by Aikhenvald (2004), who reckons modals to be a borderline case between the lexical and the grammatical. This is indeed demonstrated in Alonso-Almeida and Cruz-García (2011) for the modal verb *may*. In this article, *may* is shown to have an evidential meaning which is not at odds with an epistemic meaning, and so inferential evidentiality is identified in the scientific medical register, and this in turn does not undermine the potential of *may* to convey an epistemic meaning of probability/possibility.

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