

## CONTRACTUAL ROLE OF MODALITY AS CONVERGENCE STRATEGY IN TECHNICAL RESEARCH ARTICLES

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**ABSTRACT.** *Within the ample theoretical frameworks of dialogicality, textual evaluation, and pragmatic cooperation, the present study explores the contractual role of modality as convergence strategy and embedded subjective space throughout the inferential and evidentiality-based structure of the research article. The analysis of fifty samples dealing with aeronautical engineering and related disciplines, written by Spanish researchers and native speakers of English, confirms that the use of modality as positive politeness device varies cross-culturally. It likewise reveals the existence of pragmatic failures in the writings of native Spanish speakers despite their publication in renowned international journals. Such failures may be attributed to typological and instructional factors related to the command of boosting and hedging techniques.*

**KEYWORDS:** *cooperative contract, convergence strategies, embedded discursive spaces, textual evaluation, modality, boosting and hedging.*

**RESUMEN.** *Dentro del amplio marco teórico definido por el enfoque dialógico, el concepto de evaluación textual, y los principios de cooperación pragmática, este estudio investiga la función contractual de la modalidad como estrategia de convergencia y espacio discursivo integrado a través de la estructura deductiva y evidencial del artículo de investigación. El análisis de cincuenta muestras sobre temas relacionados con la ingeniería aeroespacial y campos afines, escritos por investigadores españoles y por hablantes nativos de la lengua inglesa, confirma que el uso de la modalidad como recurso de cortesía positiva depende de factores culturales, y revela asimismo la existencia de fallos pragmáticos en los escritos de los hispanohablantes nativos. Dichos fallos se pueden encontrar incluso en publicaciones especializadas de ámbito internacional y son atribuibles a causas de índole tipológica y pedagógica.*

**PALABRAS CLAVE:** *contrato de cooperación comunicativa, estrategias de convergencia, espacios discursivos integrados, evaluación textual, modalidad, "boosting y hedging".*

## 1. INTRODUCTION

Much of the recent (and extensive) literature on the analysis of technical and scientific discourse assumes a dialogical view of the written text as largely deriving from Bakhtin's theory and one of the pillars of Swales' Genre Analysis: the notion of *process*. On an *interactive* discursive plane (Sinclair 1981) and all throughout such communicative process, the writer may, to a greater or lesser extent, leave the imprint of his/her presence (often referred to as *authorial visibility* or *voice*) and display an awareness of his/her readership (in the form of politeness strategies), which contribute to the ongoing negotiation of relationships between both entities (reader and writer).

Likewise, together with this evaluation of affective meaning, an assessment of the propositional content takes place within Sinclair's (1981) *autonomous* plane (concerned with text organization; that is, with the consistency and coherence of the message). Thus, the traditional concept of *textual evaluation*, restricted mainly to epistemic and value judgment, has recently broadened its operative scope and turned into a superordinate term (Hunston 1994, 2000) that gathers Halliday's (1985) *ideational* and *interpersonal* macrofunctions and is realised through three major resources: modality, viewpoint, and metadiscourse.

According to Givón (1982), every argumentative text, be it oral or written, entails an implicit communicative contract between the reader/listener and the speaker/writer, intended to establish credibility and involve the decoder in the argument. Givón distinguishes three degrees of propositional evidentiality: a) unchallengeable, taken for granted facts, b) confident but challengeable assertions, and c) doubtful or hypothetical statements. Only the last two cases do require evidential justification because the first type of propositions is in contrast presented as an unquestionable general truth (therefore unmodalized) and reaches the maximum credibility score along Givón's scale. Besides this epistemic commitment, Grice's (1975) cooperative principle maxims come into play, as well as other communicative and specifically argumentative premises.

The objective of this paper is to provide some insight into the main modal strategies shaping the tacit contract between writer and reader in technical research articles at both the rhetorical and sentential levels. It also attempts to give an overview of the most recurrent patterns/errors in the professional writing of Spanish researchers as compared with that of native speakers of English. A minor goal is to determine the nature of the *embedded subjective spaces* (Sanders and Spooren 1997) defined by epistemic and attitudinal evaluation in a *supposed* objective genre.

## 2. CONTRACTUAL FEATURES OF THE RESEARCH ARTICLE

On examining the various parameters at work in the agreement between reader and writer throughout the research article, it should be noted that there is an overall tendency towards convergence and hence towards the accomplishment of positive-face politeness, whose ultimate goal is affiliation. Of the four Gricean maxims (quantity, quality, manner,

relation), only the first one is usually transgressed for the sake of linguistic economy, which imposes a considerable amount of taken for granted elements in discourse. Quality (i.e. sincerity) stands out as the *core premise* indispensable to the contract.

There are, in addition, four other communicative premises (see Figure 1) affecting the participants' expectations as well: *cooperation*, *flexibility*, *objectivity*, and *acceptance of difference* (Perelman and Olbrechts-Tyteca 1989). Whereas cooperation clearly demands an assumed response from the reader (an acceptance or a refusal of the writer into the scientific community), flexibility (i.e. in turn-taking) appears at first as an unattainable condition given the monological nature of the research article, although the writer can employ manipulative strategies, like Thompson's (2001) *reader-in-the-text*, to produce a more reader-oriented (and consequently more dialogical) message. Objectivity, on the contrary, tends to be mitigated with hedging and impersonalization, whose lack of involvement neutralizes the possibility of conveying face-threatening acts (FTAs) through categorical assertions. Finally, neither the reader nor the writer is obliged to compromise in order to accept mutual differences: defensiveness, criticism or conflict may arise during the reading/writing processes and can solely be prevented by means of solidarity and politeness strategies showing an awareness of the different statuses and roles regarding the *truth* reported.

|                        |     |                                                                                                                                                                                                                                             |
|------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GRICEAN MAXIMS         |     | <ul style="list-style-type: none"><li>_ Quantity (-) ➡ profusion of TFG elements!</li><li>_ Quality (+) ➡ sincerity as <i>core premise</i>!!</li><li>_ Manner (clarity) (+)</li><li>_ Relation (pertinence) (+)</li></ul>                   |
| COMMUNICATIVE PREMISES |     | <ul style="list-style-type: none"><li>_ Cooperation (+)</li><li>_ Flexibility (-) ➡ (+) ( reader-in-the-text)</li><li>_ Objectivity (+) ➡ (-) (hedging + impersonalization)</li><li>_ Acceptance of difference (-) ➡ (+)</li></ul>          |
| ARGUMENTATIVE PREMISES |     | <ul style="list-style-type: none"><li>_ Relevance of issue (+) ➡ role of abstracts!</li><li>_ Compatible values (-)</li><li>_ Compatible goals (+)</li><li>_ Acceptance of credibility (+)</li><li>_ Acceptance of consensus (+?)</li></ul> |
| GIVÓN'S                | (>) | <ul style="list-style-type: none"><li>_ TFG ➡ general truths (unmodalized)</li></ul>                                                                                                                                                        |
| EVIDENTIALITY /        |     | <ul style="list-style-type: none"><li>_ Relative certainty ➡ epistemically modalized propositions</li></ul>                                                                                                                                 |
| CREDIBILITY            | (<) | <ul style="list-style-type: none"><li>_ Doubt ➡ hypotheses</li></ul>                                                                                                                                                                        |
| SCALE (1982)           |     |                                                                                                                                                                                                                                             |

Figure1: Outline of the implicit cooperative premises in the research article.

On the other hand, a number of specific argumentative premises operate in the course of the reasoning development. Firstly, the centrality of the issue must be stated, which is normally done in abstracts and introductions. Secondly, there is no guarantee that reader and writer share the same beliefs and assumptions (*compatible values*) on the topic under discussion, but have nonetheless an intention to cast light on the issue, come to a valid conclusion, contribute to the progress of the discipline (*compatible goals*), and arrive at an agreement of opinion (*acceptance of consensus*). The reader is even more deeply committed to this cooperative transaction, if one might say so, because right from the outset he/she is expected to accept the credibility status of the writer, and by extension, of the whole text.

The last set of variables at play are the three evidential constituents of Givón's credibility scale. Let us remember that the maximum credibility corresponded to general truths and *TFG elements* (i.e. taken for granted elements, frequently accompanied by hedging and impersonal constructions to avoid excessive dogmatism or face-threatening impositions on the reader), and gradually decreased from the relative certainty of epistemically modalized propositions (often signaling the indirectness of the source of knowledge with modal and reporting structures), to the dubious reliability of hypotheses. In short, communicative contracts in research articles can be viewed as a mutual engagement of the parties in a cooperative dynamics ruled in turn by certain limiting implicatures stemming from genre constraints, such as the violation of the quantity maxim so as to avoid a non-desirable *overinformativeness*, even at the expense of finding repercussion in the fulfillment of the manner maxim (e.g. by increasing hedging and obscurity of expression).

### 3. ANALYSIS

A qualitative analysis of an incipient corpus of fifty research articles with an average length of 4,500-5,000 words has been conducted to determine evaluative and contractual patterns. Half of the articles have been written by native English-speaking researchers and, the other half, by native Spanish-speaking professionals, twenty of whom are professors at the Technical School of Aeronautical Engineering of Madrid. All papers deal with aeronautical engineering or related fields and have been published in relevant international journals between the years 1993 and 2001<sup>1</sup>. Special emphasis has been laid on the introduction and discussion sections, where evaluation is most frequently located to pursue convergence. Even though epistemic and affective meanings inevitably intermesh, in this study they will be treated separately for practical purposes, given that every epistemic judgment carries attitudinal values but not viceversa. This does not, in any case, mean an adherence to the Hallidayan separation of modal and ideational elements.

### 3.1. *Modality as convergence strategy*

The modal repertory of non-native writers (Spanish writers, called SW all along this study) predominantly expresses certainty through the use of *can* and *will* and exhibits a significantly low proportion of probability and possibility meanings through *would*, *should*, and *may* (Figure 2). The underuse of this last verb, remarkably, runs counter to its high frequency of use in the academic prose by native English speakers (Biber *et al.* 1999). Yet there are three more findings that deserve further commentary: first, no occurrences of *might* have been detected, which not only seems to suggest that SW's modalization of possibility nuances is rather poor but also entails pragmatic implications. True, *might* denotes a multiplicity of possibilities (versus the unilateral and less remote possibility expressed by *could*) that facilitate the construction of a *reader-in-the-text* (Neff *et al.* 2001a, forthcoming). Second, the root or deontic uses of *must*, *may* and *have to* (i.e. those indicating obligation, duty, need, or commitment) are scarce and border on FTAs: common action and recommendations are presented as abrupt impositive directives on the reader rather than as proposals. Here are some examples (emphases mine):

1. "...larger ratios *must* be avoided..."
2. "It *must* be computed for payload and range modifications..."
3. "A new limitation in range *must* be marked."
4. "It *must* be realised that..."
5. "We think that we *must* consider the case of an intrinsic conduction process (in this last example the strong obligation combines with an *inclusive we* addressing the reader)"

Native English writers (NW) would use *should* instead to tone down the brusqueness of the imposition. Notice, however, that in the first two cases SW combine the deontics with the passive voice, which serves as mitigator. Swales (1990: 137) features the results and discussion sections of research papers as "having variable proportions of passive structures", in contrast to introductions. The reason why might well depend on FTA mitigating needs, whereas the abundance of passives in the methodology section is typically due to a *literal* reporting of procedures in an agentless fashion. Third, there appears to be a mismatch in the expression of epistemic meanings between some modal verbs: *can* absorbs the possibility uses of *may*, and *have to* the deductive contexts of *must* (e.g. "X then *has to* be greater than.../negative/zero.").

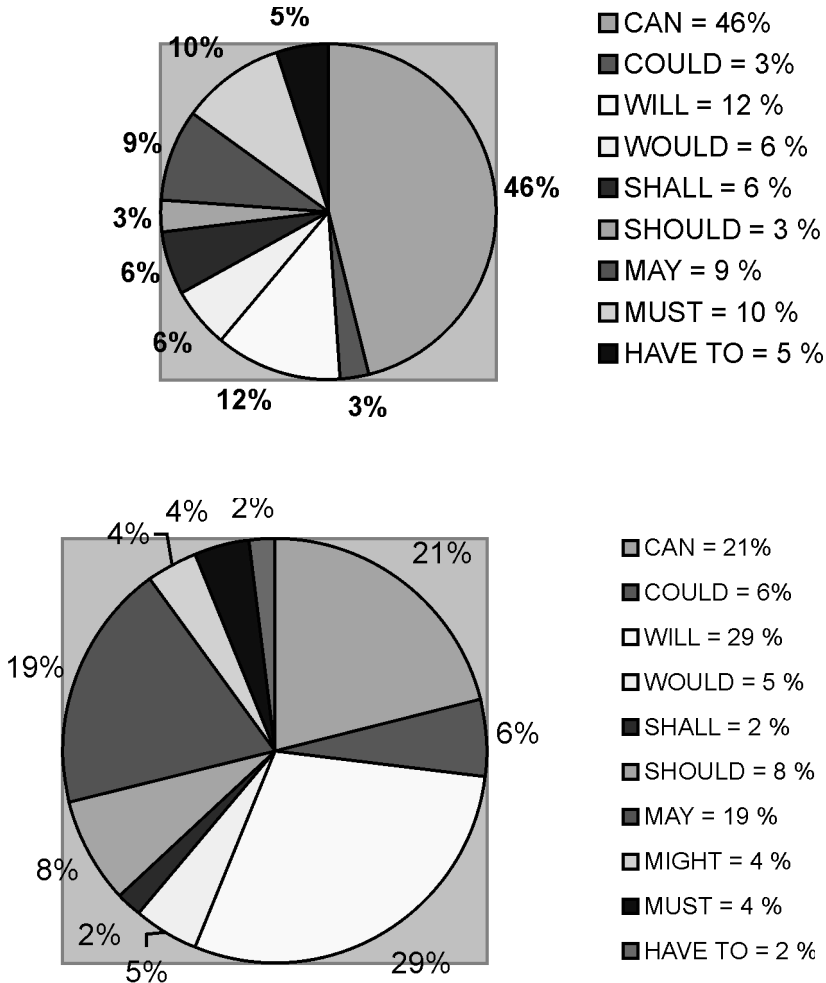


Figure 2: Comparison of the modal repertoires of SW and NW  
(Average percentages from the total number of occurrences)

Part of these epistemic mismatches may be caused by the twofold tendency of SW towards an overuse of *can*, on the one hand, and non-modalization, on the other. To begin with, *can* embodies three basic meanings in the writings under consideration: certainty, possibility, and politeness/solidarity, all three accounting for the overwhelming percentage of this verb within their modal repertoire (virtually half of the tokens) and for the little variety of this latter in comparison with that of NW. While the *certainty use* constitutes an empty modal meaning equivalent to an absence of modalization (see examples 6 and 7), the *possibility use*, as has been previously commented, fills the slots

that should be occupied by *may* (example 8), and the *politeness/solidarity* meaning seems to derive from a transfer of pragmatic norms from L1 to L2. Such transference of sociolinguistic conventions from Spanish to English conforms to the politeness scheme (-distance, -power) (Neff *et al.* 2001b, forthcoming) and results in *I/we embeddings* (I/we + CAN + Verb of perception or mental/verbal activity) seldom utilized by NW. Their purpose is to build a common ground between reader and writer as a positive-face device. In line with these findings, Hernández-Flores (1999) demonstrated that modal verbs performed a similar convergent role in unrequested advice as ways of seeking feedback or inclusion in Spanish conversation. Opposed to this trend, the politeness pattern (+distance, -power) is found to dominate most of the NW articles scrutinized (see the impersonal structures under example 8). The following examples may help illustrate the foregoing point altogether (my italics):

6. “X *can* be obtained by solving this equation” (*can* be could be here substituted by *is*, since there is no potentiality but current fact: the equation is actually solved in the paper) ➔ neutral dynamic modality
7. “This *can* be due to...” (NW would use *may* instead of *can*) ➔ Epistemic use
8. “As *we can* see...” (*can* is perfectly omissible here. In fact, NW resort to impersonal constructions of the type *It can/will be seen that...* or *As seen/shown in figure X...*) ➔ Neutral dynamic modality under a subject-oriented formulation

Besides the pragmatic causes just enumerated, the overuse of *can* by SW appears closely bound to other typological and instructional factors pointed out by previous studies on academic writing and grammatical description: the Spanish verb *poder* is inherently ambiguous and polysemic (Silva-Corvalán 1995) for it agglutinates deontic and epistemic meanings (e.g. ability, permission, and possibility), as well as the dynamic uses discerned by Palmer (1979/1990: 35-8), either neutral or subject-oriented, so it is not surprising that SW ignore more detailed alternatives like *may* or *might* and set up a symmetrical correspondence of uses with the past form *could*. Furthermore, SW experience a phenomenon of accommodation of their scanty modal repertory to their actual expressive needs (Neff *et al.* 2001b, forthcoming): *can* is the first modal verb learned in Spanish EFL classrooms and high-school syllabi in general introduce the rest of modal resources sparsely and superficially, embedded in topical units and without much insistence upon the various shades conveyed by each of them.

The sketchy modalization observed in the Spanish articles confirms Holmes' view (1988: 23) that the use of hedges (modalizing mitigators of certainty) varies cross-culturally. It is as well in accordance with Hoyer's conclusion (1997: 252-54, 258) that native Spanish speakers tend to underuse stance markers in L1 and when speaking English encounter special difficulties with those subject to idiomatic collocations (e.g. *may/might* + *well*). It should be added that, most probably owing to the aforementioned instructional factors (and exceptions apart), SW show a deficient handling of hedging

and boosting techniques and hence of the establishment of tenor (i.e. the Hallidian term for the interpersonal component in any text).

For Hyland (2000), evaluation basically consists of a subtle interplay between boosting and hedging. Usual boosting tools are the indicative mood, the adverbs of certainty (e.g. *obviously, clearly, surely, definitely, certainly...*) and their adjectival counterparts (e.g. *obvious, clear, sure, definite, certain...*), intensifiers (e.g. *all, totally, completely, very...*), nominal /adjectival expressions of positive affect (e.g. *interest(ing), importance /important, crucial(ity)...*) and emphatic devices such as syntactic inversions, *emphatic do*, etc. They can be used to back up speculation, state the centrality of the message, infuse the reader with a feeling of membership to a specific discourse community, or win him/her over to the writer's view.

Hedging, on the contrary, mitigates certainty (and therefore the writer's authority) and creates an effect of fuzziness, provisionality, and anticipated rebuttal by means of conditional clauses and the subjunctive mood, adverbs of doubt (e.g. *perhaps, maybe, possibly, probably...*) and their adjectival counterparts (e.g. *possible, probable...*), indefinite quantifiers and deintensifiers (e.g. *partly, some, quite, a little, somewhat, rather...*), and tentative verbs, either modal (*would, should, can, could, may, might...*) or lexical (*hint, suggest, seem, appear...*), among several other resources. Spanish articles were noted to present an obvious imbalance between boosters and hedges, with almost a total predominance of the former, materialized into (emphasis mine):

9. an overabundance of positive affect qualifiers

"...We have an *excellent* theory for..."

"The two digital techniques of generating turbulence indicator functions described in this paper are *sound efficient* and can be readily applied to a large class of intermittently turbulent flows."

10. overt attitudinal comments through disjuncts

"*Fortunately*, the values do not produce significant differences."

11. certainty adverbs

"...which is, *of course*, different from..."

12. lexical verbs revealing strong commitment

"Here we *show* that..."

"We have *shown/demonstrated* that...// Two of us *have demonstrated* that..."

Although non-modalization (which seems a natural tendency of SW) is *per se* a type of boosting device and does partly explain the prevalence of this function all throughout, most cases involve overt markers and take place precisely in the making of refutable, risky, or even threatening claims. This suggests a considerable lack of

expertise on behalf of SW and an ignorance of rhetorical genre standards (not of format conventions). Of special interest are the last instances contained within example 12: not only do they discard the less arrogant (and more native-like) options offered by tentative, non-factual lexical verbs (e.g. *try*, *attempt*, *seek*, *intend to*) but also make use of the present perfect, which adds a tinge of completion and definitiveness, thus enhancing the presumptuous and self-confident tone.

A final important aspect of the treatment of boosting and hedging in SW samples is the expression of assertive value judgments by means of *speculation* and *interpretative labelling*<sup>3</sup>. Both evaluative modes, coined by Skelton (1997), are characteristic of *interpreted truths* (i.e. discussions of findings in the research article) and share the covert function of either drawing the reader's attention to data that are not statistically significant or hint possibilities for future research. They differ, however, in their object of open assessment: interpretative labelling qualifies the value of the results through gradable adjectives and adverbs, and speculation estimates what they mean in the research by means of comparative, inferential, and reporting structures. Interpreted labelling, to sum up, is linked with values and speculation with facts, although occasional overlaps may occur.

As shown in Figure 3 below, native Spanish researchers preferently choose interpretative labelling as evaluative option to explain and justify results. Common *labelling* adjectival expressions of positive affect are *acceptable*, *important*, *interesting*, *reasonable*, *significant*, *successful*, *insightful*, *convenient*, and *precise*. Conversely, speculation is much less opted for and is accomplished through expressions like *consistent with*, *in accord/agreement with*, *demonstrate*, *confirm*, *it is expected that*, *analogous to*, *in strict analogy to*, *may result in/from*, *remain (well) above/below*...

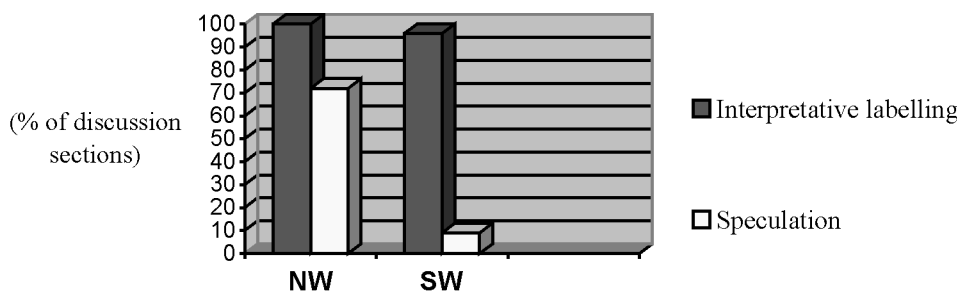


Figure 3: *Prevalent evaluative modes in discussions written by SW and NW.*

There are substantial differences in the percentages of NW and SW discussions resorting to speculation, whose figures apparently reveal a considerably more favorable disposition from NW to elucidate the significance of findings within the research framework. This practice can be considered another politeness strategy (although ultimately aimed at persuasion) since it clears the way for the reader's interpretation of

the *new* information (Skelton's *evidential truth*), usually by creating a comparative *intertext* of preceding and/or simultaneous references as overt evaluative commentaries or in citation form.

### 3.2. *Embedded modal discursive spaces and their contractual role*

The idea of subject-bound discursive domains to represent predicated information has been extensively developed by the cognitive linguists Sanders and Spooren (1997). Depending on their linguistic *indicators* (i.e. key grammatical expressions defining the domain relationship), such spaces can be marked as temporal (e.g. *then, next, ago...*), spatial (e.g. *here, there, behind...*), hypothetical (e.g. *if only...*), of possibility (e.g. *maybe...*), or of perspective (e.g. *he/she* thinks that...vs *I* think that...). Following this cognitive orientation (*op.cit.*106), modality is then understood as a complex kind of subjectivity combining those spaces, as an interplay of *perspectivization* and *subjectification* which in the present analysis has been found to be construed differently by NW and SW. Deontic modals indicate *perspectivization*: in other words, the link of the modified information with *a* subject in the discourse, usually a socio-physical force, someone or something other than the discourse subject. It is worth pinpointing that, despite being negligible in proportion to evidential meanings, the deontic uses of SW fall into pragmatic failure for just displacing this external socio-physical force by the discursal subject. Epistemic modalization, nevertheless, signals *subjectification* (i.e. the connection between the information and *the* subject of the discourse) and presupposes some evidence as basis for the writer's claim, thereby expressing his/her commitment along a gradation or continuum.

Overall, SW modality can be categorized as *essentially epistemic*. This means that it tends towards subjectification and especially to 1<sup>st</sup> person embeddings, plural for solidarity purposes but truly manifesting the writer's current commitment with an implicit encoding of him/herself. It can be further described as *subjective, of medium commitment, and wavering between neutral and negative shadings*. It is subjective because, applying Nuyts' (1992) distinction between objective and subjective modality, its predication scope affects the interpersonal level of the clause (it expresses the writer's commitment with regard to the content of the predicate) and belongs on the proposition layer. Contrarily, objective modality deals with the representational level of the clause, belongs on the predication layer, and concerns the writer's evaluation of a state of affairs in terms of his/her knowledge. SW's prevalent use of modal verbs defines their modality as subjective, though the occurrence of modal adverbs is low as compared with that of their counterpart adjectival clauses (e.g. *It + be + epistemic adjective*). This tendency may be plausibly justified by the conjunction of three facts: a) that in Romance languages periphrastic constructions are much more likely to occur than single-word adverbials (Hoye 1997: 281), b) that Peninsular Spanish modalization, in the main, consists of mood shifts (indicative/subjunctive, e.g. "*X es...*" vs. "*...que/si X fuera/fuese...*"), differing from the Latin-American variety,

more frequently based on the structure modal verb + lexical device (e.g. “X puede/debe ser posible”), and c) that a transfer of euphonic register constraints prevailing in formal written Spanish may prevent SW from concentrating more than two adverbs ending with the suffix *-mente* (equivalent to English *-ly*) in the same paragraph, encouraging instead periphrastic adjectival alternatives (*op.cit.* 258). First-person embeddings, which are numerous, delimit an intermediate subspace or modal *no-man’s land* between the two modality types in Nuyts’ model. His syntactic criteria have been recently complemented by Biber *et al.* (1999) in their revision of the notion of subjectivity, now grounded on the degree of explicitness/subtlety transmitted in the expression of stance.

Moreover, SW modality expresses a *medium commitment* (Simpson 1993) because it focuses on probability and possibility meanings (those that should be conveyed by *may* but are nonetheless realized through *can* due to the idiosyncratic and instructional factors formerly discussed). A *strong* commitment would be realized by the deductive uses of *must* and certainty words, and a *weak* one by the more remote possibility nuances of *could* and *might*. The fluctuation between *neutral and negative shadings* (*op.cit.*) encapsulates the tendency towards non-modalization (neutrality) and the foregrounding of epistemic devices (negative shading). A *positive* shading would rather highlight the deontic and boulemaic systems. NW modality primarily coincides with that of SW in its orientation towards neutral-negative shadings, but diverges in its oscillation between medium and weak commitment, its more frequent and mitigated use of deontics (mostly impersonal directives acting as tactical metadiscourse, e.g. *It should be remembered/considered that...*), and its higher proportion of epistemic adverbs and nominals (e.g. *likelihood, hypothesis, estimate, assumption...*), a subjective resource virtually untapped by SW, as well as its more varied objective adjectival clusters containing scalar and numerical quantifiers (e.g. “X is twice as probable as...”) instead of the quantitative hedges profusely employed by SW (e.g. “X is quite probable”).

From a contractual standpoint, five models of writer/reader interaction have been identified to depict the commitment structure of SW articles. They have been called *engaging* (urging the reader to participate right from the onset), *slightly engaging* (a less urging variant in recommendation form whose invitation to common action is encoded as a perlocutionary act), *dogmatic* (framed by an unmodified statement of the relevance of the issue and a final categorical assertion as round-off point), *evaluative* (ending with an epistemic evaluation of possibilities), and *fading* (offering a decreasing gradation of personal involvement on behalf of the writer). All of them start either with *moves* 1 or 3 from Swales’ CARS model and allow for different modal variants (Figure 4). Those of NW comprise summaries, recontextualizations, blends, and even occasional personalization. Two habitual errors of SW, product of an insufficient pragmatic training, are the insertion of contextual truths (more fit for introductions) in discussion sections, a trend already recently detected by Williams (2001), and the opposite phenomenon: the presentation of interpreted truths as unmodalized contextual truths, which effects a FTA on the reader.

#### 1. ENGAGING MODEL

- a) Hypothesis (move 3 introduction in CARS model. NW variant = move 1)(E.g. *Let us suppose that  $z + 1$  is a one-parameter family of maps, where...*)
- b) Statement of centrality of present research (unmodalized). NW variant = summary of present research with impersonal passives)
- c) Invitation to the testability of the present research (common action writer/reader, modalized)
- d) Hypothesis (modalized)

#### 2. SLIGHTLY ENGAGING MODEL

- a) Assessment of centrality/gap in present research (move 1, introduction)
- b) Recommendation (modalized)(NW = recontextualisation/summary of present research)
- c) Restatement of gap/centrality (impersonal/unmod.)(NW = common action, modalized)
- d) Tentative solution (disguised common action: e.g. *...If approximate diffusion coefficients in a narrow range of conditions are desired, acceptable predictions may be made, especially if there exist some corresponding experimental data.//Further research is needed to refine the process and maximise joint failure load...*)

#### 3. DOGMATIC MODEL

- a) Extension of findings (move 3, introduction)
- b) Statement of centrality (unmodalized)
- c) Tentative conclusions (modalized, e.g. *We can therefore expect that at least...*) ➡ neutral dynamic meaning
- d) Categorical assertion (unmodalized, e.g. *X is satisfactorily accurate*)

#### 4. EVALUATIVE MODEL

- a) Statement of centrality through gap-marking (move 1, introduction) (NW variant = blend of moves 1 & 2 intro: assessment of centrality + summary of previous research)
- b) Restatement of gap/need (unmodalized)
- c) Common action (strong external obligation with *must*)(NW variant = use of *we*)
- d) Epistemic evaluation (possibility of common action, modalized, e.g. *Configurations like the 3-surface airplane could find a place among the possible designs.*) ➡ The author expresses his/her own opinion about the validity of the results—interpretative labelling. (NW evaluation + solidarity markers, e.g. *We will learn.../As we apply the theory...*)

#### 5. FADING MODEL

- a) Assessment of centrality (move 1, introduction)
- b) Categorical assertion (unmodalized)
- c) Perspectivized finding (passive, e.g. *This result has been found to be useful for...*)
- d) Restatement of centrality/validity (impersonalized)

Figure 4: Recurrent patterns of contract opening and closure in SW articles.

#### 4. CONCLUSION

The central claim of this paper has been to consider modality a convergence strategy within the cooperative contractual structure of the research article. It also makes the point that modal realizations can be viewed as culture-bound embedded subjective spaces determining the final arrangement of such cooperative contracts, and confirms as well the intertwining of epistemic and affective markers along a continuum or gradient (Givón 1982; Chafe 1986; Stubbs 1996) all throughout the *directional* (deductive) qualification of evidentiality that characterizes this type of genre. Some teaching implications can be equally drawn: firstly, the importance of sensitizing students and professionals towards the interactional nature of scientific/academic writing and of contemplating genre conventions together with cultural and situational pragmatic factors. Secondly, the need to train SW in the proficient handling of hedging and boosting techniques (and especially of reader-oriented hedges) in order to pre-empt pragmatic failures which every so often go unnoticed during the screening proceedings prior to publication.

#### NOTES

1. The sample sources have been extracted from the following publications: *AIAA* (American Institute of Aeronautics and Astronautics) *Journal*; *Anales de física*; *Chaos*; *Experiments in Fluids*; *International Journal of Heat and Mass Transfer*; *Journal of Aircraft*; *Journal of Fluids Engineering*; *Journal of Guidance, Control and Dynamics*; *Journal of Propulsion and Power*; *Journal of Tribology*; *Macromolecules*; *Materials Science and Technology*; *Microgravity Science and Technology*; *Physical Review*; *Physical Review Letters*; *Physics of Fluids B. Plasma Physics*; *Physics of Plasmas*; *Polymer*; *SAE Technical Paper Series* (*The Engineering Society for Advance Mobility Land Sea Air and Space International*).
2. In Palmer's view (1979/1990), the category of dynamic modality, related to physical necessity and possibility, is eminently subject-oriented since it involves the ability or volition of the sentence subject rather than the extrasentential interlocutors' knowledge or belief (epistemic modality) or their attitudes or duties (deonticity). However, the agent-oriented type is in fact one of the two subclasses into which dynamic modality branches out. The other one, called neutral dynamic modality, expresses circumstantial likelihood or necessity (eg. "It is a big place. You can easily park there."), while the subject-oriented type points at the potential of the subject of the sentence (eg. "Tobacco can ruin your health.").
3. Unlike NW, SW make a meagre and undiversified use of modals (with an overabundance of *can* in comparison with other modals, dynamic meanings included) in their speculations and interpretative labellings. Instead, they mostly resort to the following verbs: *to be*, *to have*, presentationals (*there is/are*), *seem*, *appear*, *constitute*, *result in*, *show*, and *conclude*. NW, by contrast, employ more sophisticated verbs such as *prove*, *exhibit*, or *pose*, and utilize modals widely, particularly *may*, to qualify the research product and procedures and figure out their significance within the overall process (eg. "X *may* involve some problems...", "X *may* also cause the resulting viscosity-T plot to be less steep...", "This *may* explain why the discrepancies were larger for this system...").

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