Joanna Blochowiak · Cristina Grisot
Stephanie Durrleman
Christopher Laenzlinger *Editors*

Formal Models in the Study of Language

Applications in Interdisciplinary Contexts

Springer

Formal Models in the Study of Language

Joanna Blochowiak · Cristina Grisot
Stephanie Durrleman · Christopher Laenzlinger
Editors

Formal Models in the Study of Language

Applications in Interdisciplinary Contexts

Springer

Editors
Joanna Blochowiak
Department of Linguistics
University of Geneva
Geneva
Switzerland

Stephanie Durrleman
Department of Psycholinguistics
University of Geneva
Geneva
Switzerland

Cristina Grisot
Department of Linguistics
University of Geneva
Geneva
Switzerland

Christopher Laenzlinger
Department of Linguistics
University of Geneva
Geneva
Switzerland

ISBN 978-3-319-48831-8 ISBN 978-3-319-48832-5 (eBook)
DOI 10.1007/978-3-319-48832-5

Library of Congress Control Number: 2016956847

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

This collection of articles is dedicated to Jacques Moeschler, Full Professor at the University of Geneva. His work in formal semantics and pragmatics, as well as in the framework of Relevance Theory, has impacted the research of many scientists in the field of formal linguistics as shown by the heterogeneity of the contributions to this book.

It pays homage to the rich and diverse nature of Jacques Moeschler's work and to his scientific expertise in the domain of Language Sciences, and more broadly, in that of cognitive sciences.

It has been intended as a 'Festschrift' for his 60th birthday to which many of his colleagues and friends have more than happily contributed. Among the authors, there are both budding researchers who initiated their careers under Jacques Moeschler's supervision, experienced researchers who have collaborated with him over the years, as well as other colleagues who wanted to join us for this celebration.

The 'Festschrift' partly developed into the volume 'Formal Models in the Study of Language', which proposes innovative, empirically motivated theoretical models and their application to various linguistic phenomena.

Contents

Formal Models in the Study of Language: Introduction

Joanna Blochowiak, Cristina Grisot, Stéphanie Durrleman and Christopher Laenzlinger

1 Introduction

1.1 Background Context

The present volume, originally presented as an electronic collection of papers in honour of Jacques Moeschler for his 60th birthday, focuses on the application of formal models in the study of language in a variety of innovative ways. The contributions, by seasoned and budding linguists of all different linguistic backgrounds, reflect Jacques Moeschler's diverse and visionary research over the years. He has investigated a series of aspects of natural language, such as *negation*, *causality*, *temporality* and their expression through *pragmatic connectives*, *logical*

J. Blochowiak (✉) · C. Laenzlinger
Faculté des Lettres, Département de Linguistique, Université de Genève, Geneva, Switzerland
e-mail: Joanna.Blochowiak@unige.ch

C. Laenzlinger
e-mail: Christopher.Laenzlinger@unige.ch

C. Grisot
Faculté des Lettres, Département de Linguistique, Université de Genève, Geneva, Switzerland
e-mail: Cristina.Grisot@unige.ch

C. Grisot
Centre de Sciences Cognitives, Université de Neuchâtel, Neuchâtel, Switzerland

S. Durrleman
Faculté de Psychologie et des Sciences de L'éducation, University of Geneva, Geneva, Switzerland
e-mail: Stephanie.Durrleman@unige.ch

J. Blochowiak et al. (eds.), *Formal Models in the Study of Language*,
DOI 10.1007/978-3-319-48832-5_1

words and *verbal tenses*. He has also addressed questions about the *structure of pragmatic meaning* and the *speaker's commitment*. This research has been carried out from several perspectives and in an interdisciplinary framework, including both theoretical and empirical validation (i.e. corpus and experimental work), as well as human and automatic processing of language. His numerous collaborations are the direct result of his continued interest in interface phenomena as well as in interdisciplinary approaches and methodologies.

The common thread throughout Jacques Moeschler's research has been to propose formalized models based on cross-linguistic data regarding the expression of negation, causality and temporality in natural language. More precisely, his work on the development of linguistic and cognitive models has been realized by adopting the Chomskyan perspective of generative grammar, as well as the pragmatic relevance theoretic cognitive framework (Sperber and Wilson 1986; Wilson and Sperber 2004, 2012).

Jacques Moescher's first pragmatic study was on negation (Moeschler 1982), in the framework of conversational analysis. He then turned to argumentative properties of negation, on the influence of Ducrot's theory of argumentation (Moeschler 1991), as well as to a pragmatic model and typology of negative sentences in French (Moeschler 1992, 1997). In the past few years, he has addressed new issues related to negation: *negative particulars* and *pragmatic meaning as implicature* (Moeschler 2007, 2012b), and he has developed one of the first derivational models of descriptive and metalinguistic negation (Moeschler 2010). More recently (Moeschler 2015b), negation has been proposed as a basic test for a general approach to semantic and pragmatic inference (entailment, presupposition, explicature and implicature).

Connectives have been the second topic of Jacques Moeschler's research since his first work on concessive connectives (Moeschler 1989). Via some excursus on time and causality, emphasis has been placed on connectives expressing causal and temporal relations (as *parce que* 'because', *donc* 'so' and *et* 'and'). In addition, logical connectives and their relations to their pragmatic meaning have been extensively developed in a synthesis article on implicatures (Moeschler 2012a). The relationships between temporal, causal and inferential connectives have also given rise to a precise distributional analysis of *parce que, donc* and *et* (Moeschler 2011), an examination of their argumentative contribution (Moeschler 2009) as well as the nature of their multi-dimensional meaning (entailment, explicature and implicature, Moeschler 2015a, b).

Another aspect of Jacques Moeschler's research is the expression of temporality. This research has focused on two issues regarding temporal reference. The first issue is the meaning and the function both at the discourse and cognitive level of individual verbal tenses in French, such as the Passé Simple or the Imparfait. Moeschler et al. (1998) were the first to propose a pragmatic and procedural approach to verbal tenses and their contribution to discourse comprehension through determining the temporal location of eventualities on the time line (before, simultaneously or after the moment of speech). The second issue regards temporal discourse relations holding among eventualities and the notion of temporal

coherence at the discourse level. Moeschler (2000) applied this to French verbal tenses and proposed the Model of Directional Inferences (MDI). According to the MDI, eventualities may be temporally and causally linked through various types of relations. In the comprehension process, the hearer makes inferences with respect to the direction of temporal and causal relations, which can be of four types: backward, simultaneous, forward or undetermined. These inferences are made on the basis of conceptual relations such as *push-fall*, verbal tenses, connectives and world knowledge (i.e. contextual assumptions).

In the past five years, Jacques Moeschler's research on negation, connectives and verbal tenses has taken a cross-linguistic and experimental perspective. The first two topics are addressed in the on-going project LogPrag funded by the Swiss National Science Foundation[1] and the last one was investigated in the COMTIS and MODERN Sinergia projects funded by the Swiss National Science Foundation.[2] The outcomes of these projects have pointed to several crucial findings: (1) a cross-linguistic perspective is necessary in order to have an accurate picture of temporal reference and a fully explanatory theory of pragmatic connectives and logical words in natural language, (2) grammatical and lexical aspect, as well as tense are relevant elements for expressing temporal reference and they have very rich interactions among them and with other elements, such as temporal connectives and temporal adverbials, (3) a linguistic expression, such as a verbal tense or a connective, may encode both conceptual and procedural information which is necessary in the interpretation process and which is not effective at the same level of meaning (i.e. entailment, explicature, implicature) (Moeschler et al. 2012; Grisot and Moeschler 2014 for verbal tenses).

In sum, the past and present topics of Jacques Moeschler's research have given rise to linguistic and cognitive models explaining different phenomena of natural language, which have further been developed through rich collaborations. The present volume contains articles written by close collaborators and peers of Jacques Moeschler to honour his work in celebration of his 60th birthday.

1.2 Formal Models in the Study of Language

The construction and application of formal models in linguistics have proved their descriptive and explanatory power for building robust theoretical accounts as well as empirical testing, validation and adjustment of the theories. Investigating linguistic communication includes dealing with syntax, semantics, pragmatics, as well as their interfaces, and with human and computational processing of natural

[1]LogPrag (The Semantics and Pragmatics of logical words, n° 10012_146093).

[2]COMTIS (Improving coherence of machine translation output by modelling intersentential relations, CRSI22_127510, 2010-2013) and MODERN (Modeling discourse entities and relations for coherence machine translation, CRSII2_147653, 2013-2016).

language. This volume proposes innovative, empirically motivated theoretical models and their application to various linguistic phenomena. All contributions show the growing interest of contemporary linguistic research for an interdisciplinary theoretical and methodological framework. The book is composed of three parts, each of them focusing primarily on one of the three types of models accounted for in this volume: linguistic, cognitive and computational. One of the greatest strengths of these formal models, as illustrated throughout the book, is that they allow concrete empirical testing, which in turn allows the re-adjustment of the initial theory standing behind the model tested.

Part I

The articles included in the first part of this volume show how different formal models can be applied to the analysis of diverse problems situated at the interfaces, such as the syntax and pragmatics of quantifiers, the syntax, semantics and pragmatics of tense, aspect and deictic expressions, as well as the semantics and pragmatics of negation and connectives.

Laenzlinger and Soare's contribution is rooted in the Cartographic trend of Generative Grammar. The aim of their paper is to extract a set of properties that systematically captures the features responsible for certain Relativized Minimality effects. Such an analysis allows the identification of the ameliorating/aggravating features and establishing of a hierarchy of the ameliorating features. Rizzi and Belletti investigate the interface of syntax, phonology and semantics, with a direct application to Romance languages, and argue that the syntactic position influences the prosody and meaning of a sentence. Through the use of question-answer pair discourse fragments, this paper highlights the conditions on the felicitous use of topics and provides a clear-cut distinction between new information focus, corrective focus and mirative focus. The morphology-syntax interface is studied by Newmeyer in his paper focusing on possible and impossible morpho-syntactic rules predicted by the Saussurian sign-based approach to language (Sign Theory of Language (STL), Bouchard 2013). More specifically, he points out some potential problems for STL, such as extraposition of phonological "heavy" elements or the order of morphemes in Chinese compounds based on the number of syllables they contain.

The subject of quantifiers is discussed in the two next contributions from syntactic and pragmatic points of view, respectively. First, Puskas addresses the question of floating quantification and proposes to re-examine some of its aspects based on French data. In particular, she puts forth the idea of an overt movement of floating quantifiers to a dedicated position motivated by an interpretative requirement related to the property of distributivity. Second, Reboul's article offers a critical analysis of Everett's claims about the non-existence of universal quantifiers in Pirahã. She demonstrates that taking into account basic pragmatic factors allows to demonstrate flaws of Everett's arguments and to argue in favour of the universal existence of similar systems of quantification across languages.

Delfitto and Fiorin's paper assesses two accounts of the progressive and imperfective: the 'event-based' approach, which is able to account for the

imperfective paradox, and the 'perspective-based' approach, which is supported by experimental findings. Using the formal framework of possible world semantics, the paper offers a third solution that has the advantage to account for both the imperfective paradox and the experimental findings.

The semantics-pragmatics interface is investigated by Asic with respect to pronominal adverbs, Horn with respect to negation and Blochowiak with respect to connectives. In her article, Asic studies the semantics-pragmatics interface with application to the system of spatial deictic adverbs in Serbian. It is demonstrated that in order to account for the meanings of the three pronominal static adverbs in Serbian, the standard oppositions in terms of spatial features are not enough. The paper proposes a new account in which the basic semantics of these expressions is defined and, more importantly, the crucial role of the pragmatic import for their interpretation is enlightened. Horn focuses on the role of the Singular Square, a tool originally created by Aristotle to treat the interrelation of singular statements as a device to clarify and explain the natural language tendency for a formal contradictory (apparent wide-scope) negation $\neg p$ to strengthen a contrary of p in a variety of syntactic and lexical contexts. Blochowiak proposes an analysis of so-called causal connectives which aims at investigating the parameter order (iconic, e.g. cause-consequence vs. non-iconic, e.g. consequence-cause) and demonstrating that their uses go well beyond causality. The analysis formally takes into account the laws, i.e. a sub-class of contextual assumptions referring to non-accidental generalizations that work as premises in the reasoning behind connectives. The claim is that the order does not directly pertain to causes and consequences but to the order of implication (antecedent-consequent) induced by the laws.

Part II

The articles included in the second part of this volume present the application of formal models to the treatment of cognitive issues related to the use of language. In particular, they represent cognitive accounts dealing with different aspects of language interpretation, such as the context, the speaker's commitment, the construction of ad hoc concepts, the underdetermination of natural language, the relation between theory of mind and language in Autism Spectrum Disorders, and finally, the place of human language, i.e. a cognitive faculty specific to the human species, in the animal world. The cognitive models of languages presented in this part are mostly developed within the relevance theoretic framework (a pragmatic theory of human cognition), as well as within a socio-cognitive approach to language interpretation.

Wilson's article proposes a cognitive account of human interaction and analyzes cases of figurative uses of language. She offers arguments against a common treatment of a series of phenomena like hyperbole, banter, understatement, jokes and rhetorical questions as in cases of irony in the experimental literature. Assimakopoulos investigates the notion of context, which is viewed in cognitive terms as sets of assumptions that are brought to hold during the processing of an utterance. His suggestion is that contexts are psychological constructs (mutual and

manifest assumptions that will be activated during the inferential comprehension process) built during the interpretation process.

In a different pragmatic framework, Kecskes investigates human communication as involving the notions of recipient design (from the hearer's perspective) and salience (from the speaker's perspective). His suggestion is that salience is linked to the previous context (lexically encoded), whereas relevance dominates actual situational context. Boulat and Maillat's article investigates the notion of commitment, as it was developed in Relevance Theory and, more specifically, in Moeschler (2013). Their main claim is that for the hearer, the strength of the contextual assumptions and contextual implications derived from the interpretation of a given utterance is (in part) a function of the degree of commitment the hearer assigns to them. Saussure's article investigates the semantics-pragmatics interface by analyzing the nature of semantic ambiguity expressed by French modal verbs. He provides evidence for the thesis according to which the meaning of French modal verbs is underdetermined, but has nevertheless a conceptual basis, with the exception of the epistemic *devoir* (*must*).

Regarding the interface between grammar and cognition, Mauri argues that the selection of grammatical strategies is connected to the more general function of constructing sets, which is naturally close to the construction of categories. Experimental work is conducted by Durrleman to elucidate links between grammar and cognition in autism spectrum disorders (ASD), with results suggesting that syntax plays a privileged role in Theory of Mind (ToM) reasoning in ASD, even as compared to other abilities thought to influence ToM, such as Executive Functioning. Finally, Anderson investigates the differences between human language and animal communication. Even if animals convey meaning via their communicative behaviour, there is a gap between human language and other systems of animal communication. Anderson argues against a "functionally referential" view and builds upon recent studies on animal behaviour to claim that animal signals can be only analysable in pragmatic terms. Therefore they lack the intrinsic component of human language meaning, that is, the semantic content following from the grammatical organization of phrases and sentences.

Part III

The third part of this volume addresses human and automatic computational models developed in a corpus-based approach to natural language in order to investigate language variation, language universals and discourse related issues.

Grisot's and Popescu-Belis and Zufferey's articles present follow-up research carried out in collaboration with Jacques Moeschler that focus on computational models of the role played by verbal tenses and discourse connectives in language interpretation. Grisot provides an account of temporal coherence in discourse as it is expressed by verbal tenses that guide the hearer toward the intended temporal inference, which was validated in offline experiments with humans and in automatic annotation experiments. Popescu-Belis and Zufferey argue that Jacques Moeschler's descriptions of causal connectives have provided valid theoretical insights on the nature of their procedural meaning, confirmed by human and automatic

processing, as well as acquisition studies across several languages. Rocci and Musi address the semantics-pragmatics interface with respect to the Italian modal adjective *possibile* ('possible') in a corpus of economic-financial news. They found that the different syntactic constructions of the predicative and attributive uses of the adjective are found to impose constraints on the adjective's readings and on the type of conversational background they are compatible with, indirectly affecting the inferential construction of discourse representations. Romero Trillo and Fuentes's article presents a corpus-based investigation of the expression of beauty and addresses the more general question regarding the universal or cultural status of shared perceptions and emotions in humans.

Haeberli, Merlo and Wehrli's articles focus on three different approaches to investigating some specific syntactic phenomena. Thus, Haeberli studies adverb placement and the placement of object pronouns in a translation corpus and tests hypotheses about translation effects of the source language onto the target language. In Merlo's work, large-scale, data-intensive computational modelling techniques are used to address fundamental comparative linguistic questions in a so-far uncharted territory of the study of language: the study of quantitative properties of complex abstract linguistic representations. She investigates, in the area of word order, whether frequencies – both typological and corpus-based – are systematically correlated with abstract syntactic principles at work in structure building and movement, and to higher-level structural principles of efficiency and complexity. Wehrli investigates the syntax-semantics interface and gives an account of the automatic treatment of French pronominal clitics developed for the multilingual syntactic parser called FIPS. The object-orientation design of the parser allows the implementation of generic procedures corresponding to universal rules/principles like Merge and theta role assignment, while allowing the implementation of specific procedures corresponding to (family) language properties, such as pronominal cliticisation (including reflexive/reciprocal clitics) in Romance languages.

To conclude, this volume offers a rich array of linguistic topics approached in different theoretical frameworks and using a series of complementary methodologies. Despite this apparent diversity, all the studies illustrate Jacques Moeschler's research through applying empirically-based formal models of language to the study of natural language, a cognitive faculty specific to the human species. Developing these formal models is a necessary step towards enhancing our understating of this faculty.

References

Bouchard D (2013) The nature and origin of language. Oxford University Press, Oxford

Grisot C, Moeschler J (2014) How do empirical methods interact with theoretical pragmatics? The conceptual and procedural contents of the English Simple Past and its translation into French. In: Romero-Trillo J (ed) Yearbook of corpus linguistics and pragmatics 2014: new empirical and theoretical paradigms. Springer International Publishing, Switzerland, pp 7–33

Moeschler J (1982) Dire et contredire. Pragmatique de la négation et acte de réfutation dans la conversation. Peter Lang, Berne
Moeschler J (1989) Pragmatic connectives, argumentative coherence, and relevance. Argumentation 3(3):321–339
Moeschler J (1991) L'analyse pragmatique des conversations. Cahiers de linguistique française 12:7–29
Moeschler J (1992) Théorie pragmatique, acte de langage et conversation. Cahiers de linguistique française 13:108–124
Moeschler J (1997) La négation comme expression procédurale. In: Forget D, Hirschbühler P, Martineau F, Rivero M-L (eds) Negation and polarity syntax and semantics. John Benjamins, Amsterdam, pp 231–249
Moeschler J (2000) Le Modèle des Inférences Directionnelles. Cahiers de linguistique française 22:57–100
Moeschler J (2007) Why are there no negative particulars? Horn's conjecture revisited. Gener Gramm Geneva 5:1–13
Moeschler J (2009) Causalité et argumentation: l'exemple de parce que. Nouveaux Cahiers de linguistique française 29:117–148
Moeschler J (2010) Negation, scope and the descriptive/metalinguistic distinction. Gener Gramm Geneva 6:29–48
Moeschler J (2011) Causal, inferential and temporal connectives: why parce que is the only causal connective in French. In: Hancil S (ed) Marqueurs discursifs et subjectivité. Publications des Universités de Rouen et du Havre, Mont-Saint-Aignan, pp 97–114
Moeschler J (2012a) Conventional and conversational implicatures. In: Schmid HJ (ed) Cognitive pragmatics. Mouton de Gruyter, Berlin, pp 407–443
Moeschler J (2012b) Pourquoi n'y a-t-il pas de particuliers négatifs? La conjecture de Horn revisitée. In: Schnedecker C, Armbrecht C (eds) La quantification et ses domaines. Honoré Champion, Paris, pp 423–435
Moeschler J (2013) Is a speaker-based pragmatics possible? Or how can a hearer infer a speaker's commitment? J Pragmat 48(1):84–97
Moeschler J (2015a) Argumentation and connectives. How do discourse connectives constrain argumentation and utterance interpretation?. In: Capone A, Mey J (eds) Interdisciplinary studies in pragmatics. Culture and society. Springer, Cham
Moeschler J (2015b) La frontière sémantique-pragmatique existe-t-elle? La question des présupposition et des implicatures révisitée. In: Rabatel A, Ferrara-Léturgie A, Léturgie A (eds) La sémantique et ses interfaces. Actes du colloque 2013 de l'Association des Sciences du langage. Ed. Lambert-Lucas, Limoges, pp 263–288
Moeschler J, Grisot C, Cartoni B (2012) Jusqu'où les temps verbaux sont-ils procéduraux? Nouveaux Cahiers de linguistique française 30:119–139
Moeschler J, Jayez J, Kozlowska M, Luscher J-M, de Saussure L, Sthioul B (1998) Le temps des événements: pragmatique de la référence temporelle. Kimé, Paris
Sperber D, Wilson D (1986) Relevance: communication and cognition. Blackwell, Oxford
Wilson D, Sperber D (2004) Relevance theory. In: Horn L, Ward G (eds) Handbook of pragmatics. Blackwell Publishing, Oxford, pp 607–632
Wilson D, Sperber D (2012) Meaning and relevance. Cambridge University Press, Cambridge

Part I
Linguistic Models

A Feature-Based Account of Weak Islands

Christopher Laenzlinger and Gabriela Soare

We would like to thank Luigi Rizzi, Ur Shlonsky and Liliane Haegeman for discussions and comments on a previous version of this paper.

Abstract The objective of this paper is to explore to what extent the Relativized Minimality view of locality developed in Rizzi (Relativized minimality. MIT Press, Cambridge, MA, 1990) coupled with a fine-grained featural analysis as in Starke (Move dissolves into merge. Dissertation. Université de Genève, 2001) and Rizzi (Structures and Beyond. The cartography of syntactic structures. Oxford University Press, Oxford/New York, 2004a) can account for a gradient of extraction from Weak Islands (WI) in French as well as in Italian and Romanian. The more general aim is to show that such an explanation holds cross-linguistically. On the basis of a series of tentative descriptive generalizations, we aim at identifying a set of formal properties to capture them. Some of these properties are related to the interplay of the features that enter the specifications of the intervener, on the one hand, and the extractee, on the other. We also aim at identifying the ameliorating/aggravating features and furthermore at establishing a hierarchy of ameliorating features.

Keywords Generative grammar · Weak islands · Locality · Comparative syntax · Micro-parameters · Features · Intervention/extraction · French · Italian · Romanian · English

1 Introduction

In language an element can be displaced to a position which is different from the position where it is inserted into the structure. Even though movement can proceed long-distance (though in steps, cyclically), it is subject to locality constraints. These constraints are classified into two classes: (i) there are domains which are completely impervious to movement; (ii) there are others where certain types of

C. Laenzlinger (✉) · G. Soare
Faculté des Lettres, Département de Linguistique,
Université de Genève, Genève 4, 1211 Geneva, Switzerland
e-mail: Christopher.Laenzlinger@unige.ch

G. Soare
e-mail: gabi.soare20@gmail.com

J. Blochowiak et al. (eds.), *Formal Models in the Study of Language*,
DOI 10.1007/978-3-319-48832-5_2

elements (i.e. the intervener) occurring on the movement path of the moving element (i.e. the extractee) have the capacity of blocking movement. Put differently, they intervene on the movement of an element. Whereas the locality constraint is absolute for cases like (i), it is selective for cases like (ii). In this article, we are going to focus on the second type of locality effects, i.e. those created by a specific intervening constituent. The goal of this paper is to identify the locality effects arising from the asymmetries between a moved quantificational element and another element, when the moved element is a wh-word and the intervener is also a wh-word. The hypothesis to work with is that the combination of the Relativized Minimality (RM) approach with a fine-grained feature system provides a locality system capable of predicting subtle gradations in intervention effects.

The objective of this paper is to explore to what extent the Relativized Minimality view of locality developed in Rizzi (1990) coupled with a fine-grained featural analysis as in Starke (2001) and Rizzi (2004a) can account for a gradient of extraction from Weak Islands (WI) in French as well as in Romanian and Italian. The more general aim is to show that such the account that captures the three languages can also hold cross-linguistically. In order to achieve this goal, we will proceed along two axes.

Firstly, on the basis of a series of tentative descriptive generalizations on French, we aim at identifying a set of formal properties to capture them. Some of these properties are related to the interplay of the features that enter the specifications of the intervener, on the one hand, and the extractee, on the other. We also aim at identifying the ameliorating/aggravating features and furthermore at establishing a hierarchy of ameliorating features in French.

The second axis is (micro-)comparative in the sense that it extends the area of investigation to the languages mentioned above in an attempt to refine the preliminary generalizations for French cross-linguistically. The major theoretical objective of this paper is that it will lay down a uniform analysis of extraction from WI for fairly closely related languages (Romance).

Our comparative study is situated in the theoretical framework of Cartography (Rizzi 1997, 2001a, 2004a, Cinque and Rizzi 2008 and related work) and of the Minimalist Program (Chomsky 1995, 2000, 2004, 2008). It ultimately bears on one of the central research themes in syntactic theory, a principle of locality capable of explaining subtle degrees of extractability.

The paper is organized as follows. Section 2 presents the theoretical framework related to movement and locality. In Sect. 2.1, the concept of Impenetrability is discussed (strict locality and strong barriers), while in Sect. 2.2, (selective) intervention locality is expressed in terms of Relativized Minimality. Section 3 deals with different cases of extractions from weak islands mainly in French and English. In Sect. 3.1, some asymmetries in weak island extraction are analyzed in terms of RM intervention involving feature identity and geometry. In Sect. 3.2, the argument-adjunct asymmetry in weak (wh-)islands is treated according to a feature-based computation of RM (selective) intervention. Section 3.3 is concerned with extractions from infinitive wh-islands, which are more permissive than extractions from a tensed clause. In Sect. 3.4, extraction of a wh-adjunct across

another wh-adjunct is taken into consideration. Slight effects on wh-argument extraction are revealed with respect to the [Animacy] property in Sect. 3.5 and to the categorial (DP/PP) property in Sect. 3.6. Section 4 is devoted to a discussion of weak islands in two other languages, namely Italian in Sect. 4.1 and Romanian in Sect. 4.2. It will be shown that, despite slight differences, the asymmetries observed for French hold for both languages. In Sect. 5, a feature hierarchy for A'-elements that involves aggravating (Q-)features and improving (Arg-)features is derived from all the asymmetries in weak island extractions observed in French, Italian and Romanian. Section 6 contains the conclusions.

2 Locality

Natural language syntax makes extensive use of movement: elements are typically pronounced in positions different from those in which they receive some of their interpretive (i.e. thematic) properties. The theoretical framework of movement is laid down in Chomsky's (1977) seminal paper "On *Wh*-Movement" which adopts and builds on his 1973 "Conditions on Transformations". It consists of the general movement rule "Move *wh*-phrase", which is shown to underlie a number of seemingly different constructions, later identified as A' constructions.

A fundamental idea of modern formal linguistics is that apparently unbounded syntactic dependencies consist of a sequence of local dependencies such as those established by the cyclic (Comp to Comp) movement of a wh-phrase from its original position:

(1) Who$_i$ do you think [that Paul said [that Andy hopes [that Mary had met t$_i$]]]?

The theory of locality is a major component in those theories which assume that syntactic derivations involve movement operations. The identification of locality principles that constrain movement operations has enriched the scientific debate on how linguistic computations work, providing evidence on how the human cognitive system for language computes structures, and raising questions on the generality or task-specificity of computational principles embodied in language.

Ever since the 1960s, a number of formal locality principles have been put forth. Rizzi (2011:210) summarises them as intervention and impenetrability:

(A) Intervention: a local relation is disrupted by the intervention of an element with certain properties which make it a potential participant in that local relation.
(B) Impenetrability: certain syntactic configurations are impervious to local rules, which cannot take place across their boundaries.

Below the two concepts are taken over and discussed.[1]

[1]For the possible unification of the two concepts see Rizzi (2010).

2.1 Impenetrability

Though couched in different terms, impenetrability can be traced back to Ross' (1967) Island Constraints (see, for instance, (2) exemplifying the Complex NP Constraint) and Chomsky's (1973) Subjacency, in terms of Bounding Nodes or Barriers (Chomsky 1986). An influential thorough discussion about the impermeability to local rules is Huang's (1982) Condition on Extraction Domain. The concept has been discussed more recently by Nissenbaum 2000 and Chomsky 2001 (the Phase Impenetrability Condition of Phase Theory).

(2) * Whom$_i$ do you know [the date [when Mary invited t_i]]?

In the original formulation (Chomsky 1973), the Subjacency Condition was based on the notion of bounding nodes. The principle stated that a moved phrase can cross at most one bounding node; Chomsky (1977) proposed that the bounding nodes for English are NP and IP, thus forcing wh extraction to proceed cyclically, from Comp to Comp (see Rizzi 1982 for a parametrisation for Italian). As such, movement is strictly local.

As said, a natural development of Subjacency in the Minimalist Program is the Phase Impenetrability Condition. It states that only the edge of a phase, i.e. the head and the specifier, can be accessed for movement, the complement of a phase head being opaque (this being a consequence, in fact, of the cyclic spell-out mechanism). CP and vP constitute phases. Within this view of locality long-distance movement is a result of successive-cyclic movement through the edges of different phases. In the course of the derivation, the phases are transferred to the interface systems for spell-out and interpretation.

2.2 Intervention Locality: Relativized Minimality

Intervention locality is expressed, in different forms, by the principle of Relativized Minimality (Rizzi 1990, 2004a and much subsequent work) or the Minimal Link Condition/Minimal Search (Chomsky 1995; Chomsky 2000). Chomsky's (1964) A over A Condition (Chomsky 1964) can also be subsumed under intervention. Similarly, the interpretive locality effects in multiple wh constructions discussed by Beck (1996, 2006) and Pesetsky (2000) are also instantiations of the intervention concept.

This paper focuses on Intervention locality. It proposes to investigate several types of configurations to be discussed in more detail in Sect. 2.3.

An illustration of intervention locality is provided below. These are the examples discussed by Rizzi (2011: 221).

(3) How do you think [he behaved < how >]?
(4) *How do you wonder [who behaved < how >]?

The wh-adjunct cannot be extracted across another element of the same kind, that is the wh-subject *who*, which intervenes on the chain between *how* and its trace. (3) is not a case of intervention as *how* and the pronominal subject *he* are not of the same kind.

Relativized Minimality (Rizzi 1990) generalizes this observation to all local relations. Informally, X and Y cannot be related in the following configuration (3) when Z qualifies as an intervener:

(5) …X….Z…Y Z = the intervener

Intervention is defined hierarchically, in terms of c-command: the intervener Z c-commands Y but does not c-command X. The original implementation of RM took into account the following structural types of positions:

(6) (i) A'-positions, (ii) A-positions, and (iii) head positions.

Rizzi (2004a) shows that the typology in (6) is not fine-grained enough to make a difference between, say, two intervening adverbs *beaucoup* 'a lot' and *attentivement* 'carefully' in French. This is illustrated by the contrast in (7) discussed by Rizzi (2004a) and (2011).

(7) a. *Combien a-t-il beaucoup lu < combien > de livres?
'How many has he a lot read of books?'
b. Combien a-t-il attentivement lu < combien > de livres?
'How many has he carefully read of books?'

Though both adverbs are A' specifiers, only the quantificational adverb *beaucoup* 'a lot' creates an RM effect in (7a). The manner adverb *attentivement* 'carefully' in (7b) does not (see also Laenzlinger 1998) (for further critical discussions of the 1990 version of RM, see Rizzi (2004a)).[2]

This concept of locality is rephrased in Chomsky (1995) in terms of the Minimal Link Condition (MLC) in (8). This condition is violated when an intervener is identical in feature make-up to the target.

(8) Minimal Link Condition:
K attracts a only if there is no b, b closer to K than a, such that K attracts b. (Chomsky 1995)

As shown in Rizzi (2004a), the MLC can account for certain facts due to the fine-grained feature-based typology of interveners it relies on (i.e. identity of the attracting feature). However, such a system is too selective and loses an explanation for other facts, for instance, it cannot immediately capture (7a) where the Q-adverb

[2]Besides the movement account, there are alternative views. For instance, a pure semantic approach has been proposed to explain intervention effects in wh-questions (Beck 2006, Beck & Kim 1997, see also Szabolcsi & Zwarts 1993/1997, Szabolcsi & den Dikken 2003). Basically, a weak island violation would produce a semantically ill-formed structure (at LF).

intervener is not "attractable" to C.[3] However, a few words should be said about these two principles.

Both MLC redefined in terms of Agree (Chomsky 2000) and RM can treat intervention as a locality condition on syntactic relations. The former applies to the relation between a Probe and a Goal (Agree). The latter applies to (members) of chains formed by movement.

Both MLC and RM establish non-local relations among features. A natural theoretical move would be to consider them as facets of the same process or mechanism. However, there are some non-trivial problems in the attempt to reduce one to the other. First, Agree is a derivational relation, while RM is a condition on representations. Second, and perhaps more importantly, it is frequently claimed that the intervention effects which delimit Agree are different from those that hold of RM. A case in point is dative intervention in Icelandic (Holmberg and Hroarsdottir 2004 and references cited therein): A quirky dative subject in situ blocks Agreement between T and a lower nominative while failing to block raising of the nominative above the dative. On the face of it, it indeed looks like Agree is more stringently constrained than Move (chain formation).[4]

Rizzi (2004a) proposes a feature-based version of Relativized Minimality as a general formal intervention principle which is more fine-grained than the typology of positions in (6) and less selective than the feature identity of the MLC in (9). This version of Relativized Minimality (RM) is conceived of as a condition on representations.

(9) Y is in a Minimal Configuration (MC) with X iff there is no Z such that
(i) Z is of the same structural type as X, and
(ii) Z intervenes between X and Y.

Crucially, the structural typology is expressed in terms of classes of morphosyntactic features, along the following lines:

[3]Nevertheless, it is possible to assume that Attract from the Probe applies to a set of features or a feature class (e.g. Q).

[4]We note, however, that movement can "cheat" intervention in a way that Agree cannot. Concretely, movement can include a smuggling operation (in the sense of Collins 2005a) and raise the nominative—encapsulated within a larger category—above the dative, thus circumventing the intervention effect. Such an operation can be overtly observed in French. One can argue that the intervention of the dative in (ia) is circumvented in (ib) by moving the small clause *containing* the nominative above the dative, prior to movement of the nominative itself. (Belletti and Rizzi (2012) deal, in similar terms, with experiencer-subject verbs like *piacere* in Italian; see also Collins (2005b)).

(i) a. * Les enfants semble(nt) à Marie [< les enfants > heureux]
b. Les enfants semblent [< les enfants > heureux] à Marie < [les enfants heureux]>

Transposed to Icelandic, one could argue that smuggling cannot be triggered for Agree as it can only be licensed as a derivational stage of an independently-triggered movement operation. If this way of seeing things can be generalized, it may turn out that the intervention effects which constrain Agree are actually the same as those described for chain formation, namely, RM.

(10) a. Argumental: person, number, gender, case
b. Quantificational: Wh, Neg, measure, focus…
c. Modifier: evaluative, epistemic, Neg, frequentative, celerative, measure, manner,…
d. Topic

What this version of the principle says is that RM effects arise within the same feature class, but not across classes. To illustrate, consider (7) repeated as (11).

(11)

a. Combien$_{Quantificational}$ a-t-il beaucoup $_{Quantificational,Mod}$ lu <combien$_{Quantificational}$> de livres? *

b. Combien$_{Quantificational}$ a-t-il attentivement$_{Mod}$ lu <combien$_{Quantificational}$> de livres?

A quantificational specifier acts as an intervener on a quantificational chain (11a), but a pure modificational specifier does not, as in (11b).

Thus, RM effects are triggered by interveners which bear features which are either identical or similar to the target, where "similar" is precisely understood as "belonging to the same feature class" (see also Starke 2001; Abels 2012; Lahousse et al. 2014 and Haegeman 2012). Configurations like (11) and others, known as asymmetries, to be discussed in Sect. 3.1, can be treated in terms Starke's (2001) system who proposes to treat locality in terms of the featural specifications of the elements involved. There can be different significant set-theoretic relations between the featural specifications of the intervener Z and the two elements, X and Y, which should enter into a local relation (see Friedmann et al. 2008 and Rizzi 2011):

(12) a. α… β… α (disjunction)
b. αβ…α …αβ (proper inclusion of the intervener)
c. * α…αβ …α (proper inclusion of the target)
d. * α …α … α (identity, simple case)
e. * αβ…αβ …αβ (identity, complex case)

While an intervener with disjoint featural specification (12a) or with a featural specification properly included in the specification of the target (12b) are well-formed, the remaining cases, with an intervener which is at least as richly specified as the target (12d-e), or more (12e), give rise to a violation of featural RM. Of special relevance for this paper is the proper inclusion case (12b), intended to capture cases of selective extractability from Weak Islands. This will be discussed below.

3 Extractions from Weak Islands

3.1 Asymmetries with Weak Islands

In Sect. 2.1, we introduced the fundamental empirical issue that this paper addresses: it is not the case that all elements are equally (un)extractable from weak islands. Some wh-elements can, to some degree, be extracted across certain types of elements.

Several asymmetries have been pointed out and discussed in the literature. Huang (1982) observed that while adverbial elements strongly resist wh-extraction from wh-islands, wh-arguments are at least marginally extractable, as shown below:

(13) a. ? Which problem do you wonder how to solve < which problem >?
b. * How do you wonder which problem to solve < how >?

(13) illustrates the argument-adjunct asymmetry: while adverbs fully show the expected RM effects for A' chains, arguments seem to be able to escape, at least in part. Since the mid-1980's, much work (Chomsky 1986; Rizzi 1990; Manzini 1992; Szabolcsi and den Dikken 2003, a.o.) has been done on the issue of how to best characterize the asymmetries and to identify the class of interveners determining RM effects on A' chains.

Related to the contrast in (13) it was observed that wh-arguments can be marginally extracted only if they have a special interpretation, i.e. if they are presupposed or discourse-linked (Pesetsky 1987; see also Comorovski 1989, Cinque 1990). Certain types of wh-phrases like *what the hell* or *what on earth* are incompatible with D-linking (these are Pesetsky's aggressively non-D-linked expressions) and thus cannot be extracted:

(14) a. ? Which problem do you wonder how to solve < which problem >?
b. * What the hell do you wonder how to solve < what the hell >?

The importance of D-linking (or the existence of a pre-established range of variables in the discourse) has also been discussed for English by Frampton (1991), for Italian by Rizzi (2001b), for French by Obenauer (1994, 1983).[5]

Another type of asymmetry observed in the literature on French is the one induced by negation (Ross 1983, Szabolcsi and Zwarts 1993/1997, Kuna and Takami 1997, a.o.). The asymmetry is exemplified in (15):

[5]In order to account for such exceptions to RM, distinct mechanisms have been proposed. Cinque (1990) and Rizzi (1990) propose a mechanism which makes recourse to referential indices with D-linked wh-arguments (see also Frampton 1991 for a critical discussion; Manzini (1992) for a different view on the asymmetries).

(15) a. Combien de problèmes ne sais-tu pas résoudre < combien de problèmes >?
How many of problems can't you solve?
b. * Combien ne sais-tu pas résoudre < combien > de problèmes?
How many can't you solve of problems?

It was also noted that certain kinds of quantificational adverbs expressing measure have a blocking effect on the extraction of the *combien* 'how' part of the argument *combien de livres/films* 'how many of books/films' (Obenauer 1983, 1994; see also (7) above). This is illustrated in the two pairs of examples below.

(16) a. Combien de livres a-t-il beaucoup consultés < combien de livres >?
How many of books has he a lot consulted?
b. * Combien a-t-il beaucoup consultés < combien > de livres?
How many of books has he a lot consulted?
(17) a. Combien de films a-t-elle peu aimés < combien de films >?
How many of films did she little like?
b. * Combien a-t-elle peu aimé < combien > de films?
How many did she little like of films?

One way to treat such asymmetries is Starke's (2001) system who proposes to treat weak islands and extraction out of Weak Islands in terms of RM (1990) coupled with a feature geometry, which gives rise to the relations already discussed in (12).

The crucial point is that beyond these well-recognized asymmetries, French presents a series of cases of subtle extractions from WI (see sections below) and it is the major aim of this paper to provide an empirical study of these extractions. The other major goal is to extend the empirical study to other languages (Italian and Romanian, see Sect. 4). Our working hypothesis is that RM (2004) and a fine-grained featural analysis (see also Haegeman 2012: chap. 3) can account for subtle effects cross-linguistically.

3.2 *The Argument-Adjunct Asymmetry Revisited*

Our preliminary investigation of WI in French has concentrated on some cases of wh-islands which are discussed in the sections below.

Consider the argument/adjunct asymmetry.[6] The important point is that the judgments below are not absolute (all the examples are deviant to some extent), but contrastive i.e. relative to each pair of sentences.

[6]The use of another interrogative verbal expression like *wonder* (instead of *know*) increases the deviance of extraction cases. The difference between *know* and *wonder* is plausibly related to the fact that only the latter is exclusively an interrogative verb (wonder [+ wh] versus know [+/-wh] selecting either an interrogative or an indicative clause, see (McCloskey 1992, and also Adger and Quer 2001 on the unselective property of verbs like *know*).

(18) a. * Comment ne sais-tu pas qui il va rencontrer?
How don't you know who he will meet
b. ?? Qui ne sais-tu pas comment il va rencontrer?
Who don't you know how he will meet

Extraction of the manner wh-adjunct *comment* across the wh-argument *qui* leads to strong ungrammaticality, whereas extraction of this wh-argument past the wh-adjunct leads to a somewhat better result. Our working hypothesis is that the contrast is to be sought in the featural make-up of the extractee and of the intervener. The wh-argument is specified [+wh, +Arg], whereas the adjunct has the feature [+wh]. In keeping with Starke's system the richer feature specification of the argument suffices to soften the RM effect. Derivationally, following Rizzi's (1997) split-CP hypothesis, the wh-adjunct moves to the specifier of the embedded FocP, while the wh-argument targets the specifier of the higher FocP.[7]

Let us compare the extraction case in (18) to (19).

(19) a. * Comment ne sais-tu pas lequel de ces problèmes tu peux résoudre?
How don't you know which of these problems you can solve
b. ok/? Lequel de ces problèmes ne sais-tu pas comment tu peux résoudre ?
Which of these problems don't you know how you can solve

RM effects substantially improve in (19b). In other words, the asymmetry argument-adjunct strengthens. The working hypothesis for the contrast in (19a-b) is the fact that the wh-argument extractee has a D-linked interpretation. Rizzi (2001a) considers D-linked wh-elements as being endowed with both wh and top-features and therefore are associated in some way with both a TopP and a wh operator position in the left periphery. It is this Top property that makes its extraction across a wh-element easier.[8] What (19b) illustrates is Starke's relation of inclusion of the features of the intervener into those of the target. Put differently, the extractee is more richly specified than the target and extraction is perfect (or almost perfect).

[7]Since long-distance wh-movement must respect phases given Chomsky's (2008) Phase Impenetrability Condition, the higher wh-element must move through Spec-ForceP (Spec-ForceP being the edge of the CP-phase), an escape hatch. Our analysis is consistent with the phase-based approach, but we will not spell out the consequence of phrasing things in phase theoretic terms.

[8]Topics in Romance CLLD (French in (i) below) can extract from wh-islands, since Top is a RM-feature distinct from Q/wh, as in (i).

(i) Cet homme, je ne sais pas qui va l'inviter.
This man I don't know who is going to invite (him).

3.3 *Extraction from Infinitive Weak Islands*

It is interesting to test the RM effects observed in the asymmetry in (18) in non-finite infinitive WI. This is shown below.

(20) a. * Comment ne sais-tu pas qui contacter?
How don't you know who to contact?
b. ? Qui ne sais-tu pas comment contacter?
Who don't you know how to contact

The observation is that RM effects improve in (20b). In (20b) extraction takes place across an infinitival sentence in French. One explanation for this improvement is to be sought in the 'reduced' or 'truncated' structure of the infinitival clause (Haegeman 2006; Rizzi 1993/4; Hooper and Thompson 1973). As proposed by Shlonsky (2006), the infinitival CP is a defective structure containing only FinP (allowing neither topicalization, nor focalization) and/or a mood projection given that the interpretation in (20b) is "Who don't you know how you can/should contact?" (hidden modal reading). The configuration in (20c) shows that the two Wh reach a different landing site:

c. $[_{\text{FocP}}$ Wh1 $[\ldots [_{\text{FinP/MoodP}}$ Wh2 $[\ldots]]]$
Who don't you know how to contact?

As a consequence, the featural make-up of the two wh-elements is different: $\text{Wh1}_{[\text{wh, foc}]}$ and $\text{Wh2}_{[\text{wh, fin/mood}]}$. This difference in feature composition weakens RM-effects (i.e. improves extraction) in infinitival wh-contexts.

The next question to ask is whether the same RM effect obtains with the extraction of another wh-argument, *quoi* 'what' and its 'lighter' form, which is a clitic, *que*. Our preliminary investigation suggests that there is a contrast between the two wh-arguments.

(21) a. ? Quoi, habituellement, /??Que ne sais-tu pas comment faire?
What don't you know how to do
b. * Comment ne sais-tu pas quoi faire?
How don't you know what to do

The differential RM effects between *quoi* and *que* can be attributed to the clitic nature of *que* (see discussion of the properties of *que* in Kayne 1975, Friedemann 1990).

3.4 *Wh-Adjunct Extraction Across Another Wh-Adjunct*

The examples below are illustrative of wh locative adjunct extraction across the manner adjunct.

(22) a. ? Où ne sais-tu pas comment te comporter?
Where don't you know how to behave?

b. * Comment ne sais-tu pas où te comporter?
How don't you know where to behave

The contrast shows that the locative wh-adjunct can marginally cross the manner wh-adjunct,[9] but the reverse configuration yields a strong intervention effect, i.e. a RM violation. The explanation for this contrast has to do with the featural make-up of the adjuncts.

Let us further compare the extraction of the locative wh-adjunct *où* 'where' across another type of wh-adjunct, the time adjunct intervener *quand* 'when':

(23) a. ?(?) Où ne sais-tu pas quand passer tes vacances?
Where don't you know when to spend your holidays
b.?? Quand ne sais-tu pas où passer tes vacances?
When don't you know where to spend your holidays

The contrast shows that, though judgments are very subtle, the locative wh-adjunct can be more easily extracted across the time wh-adjunct. What the data in (22) and (23) suggest is that in French the locative wh-adjunct is a better extractee than the time wh-adjunct, which, in its turn, is a better extractee than the manner adjunct. One other empirical aim of our study is to look into this kind of very subtle effect with these three types of adjuncts and understand what feature(s) makes the locative a better extractee. To the puzzle of the wh-adjuncts, it is worth taking into account another wh-adjunct, the reason *pourquoi* 'why'. Testing intervention effects with *pourquoi* 'why' would be interesting in itself as this adjunct is argued to have properties different from those of the other wh-phrases in that it is not sensitive to negation and it is merged in the left periphery of the clause, to mention only some (Bromberger 1992; Bolinger 1978; Stepanov and Tsai 2008; Rizzi 1990, 2001a; Shlonsky and Soare 2011, a.o.)[10] We leave this question for future research.

3.5 *Animacy ([+Human]) in Wh-Argument Extraction*

The examples below focus on wh-argument extraction across another wh-argument. To the best of our knowledge, this contrast has not been observed in the literature. It shows that the wh-argument *qui* 'who', specified for the feature [+ Human], is slightly more easily extractable across [-Human] argument than the reverse. This seems to suggest that the feature [+Human] may play an ameliorating feature for extraction from a wh-island, that is for RM effects.

(24) a. ? Qui ne sais-tu pas de quoi informer?
Who don't you know of what to inform

[9]Even if the manner adverb is selected as an argumental complement, it is not a θ-referential argument. Therefore, it is marked as non-argument..

[10]The French *pourquoi* 'why' is particularly interesting as it does not allow Stylistic inversion (Kayne 1984).