Introduction

Inquisitive semantics is a new semantic framework mainly intended for the analysis of linguistic information exchange. Information exchange can be seen as a process of raising and resolving issues. Inquisitive semantics provides a new formal notion of issues, which makes it possible to model various concepts that are crucial for the analysis of linguistic information exchange in a more refined and more principled way than has been possible in previous frameworks. In particular:

1. The semantic content of both declarative and interrogative sentences can be represented in an integrated way, capturing not only the information that such sentences convey, but also the issues that they raise;
2. Similarly, conversational contexts can be modeled as encompassing not just the information that has been established in the conversation so far, but also the issues that have been brought up;
3. And finally, it becomes possible to formally represent a broader range of propositional attitudes that are relevant for information exchange: besides the familiar information-directed attitudes like knowing and believing, issue-directed attitudes like wondering can be captured as well.

This book provides a detailed exposition of the most basic features of inquisitive semantics, and demonstrates some of the advantages that the framework has with respect to previously proposed ways of representing semantic content, conversational contexts, and propositional attitudes.

This introductory chapter will proceed to argue in some detail why a framework like inquisitive semantics is needed for a satisfactory analysis of information exchange (Section 1.1), and will end with a global outline of the remaining chapters (Section 1.2).
1.1 Motivation

The most basic question that needs to be addressed in more detail before we introduce the new formal notion of issues that forms the cornerstone of inquisitive semantics is why such a notion is needed at all for the analysis of linguistic information exchange. This will be done in Section 1.1.1.

A second fundamental point that we want to make is that the analysis of linguistic information exchange does not just require a semantic theory of declaratives and another semantic theory of interrogatives side by side, but rather an integrated theory of declaratives and interrogatives; neither sentence type can be fully understood in isolation. Reasons for this will be given in Section 1.1.2.

Finally, a third important point is that a semantic theory of declaratives and interrogatives should not employ two different notions of semantic content, one for declaratives and one for interrogatives, but should rather be based on a single notion of semantic content that is general enough to capture both the information that sentences convey and the issues that they may raise. This point will be substantiated in Section 1.1.3.

1.1.1 Why do we need a formal notion of issues?

There are several reasons why a formal notion of issues is needed for the analysis of linguistic information exchange, and each of these is related to one of the three aspects of information exchange listed above: some arise from the need for a suitable notion of semantic content, some from the need for a suitable model of conversational contexts, and yet others from the need for a sufficiently refined representation of the mental states of conversational participants. We will discuss each in turn.

Reason 1: To represent the content of interrogative sentences. The semantic content of a declarative sentence is standardly construed as a set of possible worlds, those worlds that are compatible with the information that the sentence conveys (as per the conventions of the language; additional information may be conveyed pragmatically when the sentence is uttered). This set of worlds is referred to as the proposition that the sentence expresses.

This notion of semantic content works well for declarative sentences, whose main conversational role is indeed to provide information. For
instance, the main communicative function of the declarative sentence in (1) below is to convey the information that Bill is coming.

(1) Bill is coming.

But information exchange typically does not just consist in a sequence of declarative sentences. An equally important role is played by interrogative sentences, whose main conversational role is to raise issues.

Can the semantic content of an interrogative sentence be construed as a set of possible worlds as well? Consider the example in (2), a polar interrogative:

(2) Is Bill coming?

Frege (1918) famously proposed that the interrogative in (2) and the declarative in (1) can indeed be taken to have the same semantic content:

An interrogative sentence and an indicative one contain the same thought; but the indicative contains something else as well, namely, the assertion. The interrogative sentence contains something more too, namely a request. Therefore two things must be distinguished in an indicative sentence: the content, which it has in common with the corresponding sentence-question, and the assertion. (Frege, 1918, p. 294)¹

So the idea is that declaratives and interrogatives have the same semantic content—a proposition—but come with a different force—either assertion or request. This idea has been quite prominent in the literature, especially in *speech act theory* (Searle, 1969; Vanderveken, 1990).² However, as noted by Frege himself, it is limited in scope. It may work for simple polar interrogatives, but not for many other kinds of interrogatives, like (3)–(4):

(3) Is Bill coming, or Sue?
(4) Who is coming?

Moreover, as has been argued extensively in the more recent literature (see especially Groenendijk and Stokhof, 1997), even the idea that a plain polar interrogative has the same content as the corresponding declarative is problematic. In particular, when applied to *embedded* cases it is not compatible with the principle of *compositionality*, which requires that the semantic content of a compound expression be determined by the semantic content of its constituent parts, and the way in

¹ The page reference is to the translated version, Frege (1956).
² See also recent work on questions in dynamic epistemic logic (van Benthem and Minică, 2012).
which these parts are combined. To see this, compare the following two examples, which contain embedded variants of the declarative in (1) and the polar interrogative in (2), respectively:

(5) John knows that Bill is coming.
(6) John knows whether Bill is coming.

If the embedded clauses had the same content, then by the principle of compositionality the two sentences as a whole should also have the same content. But this is clearly not the case. So the embedded clauses must differ in content.

Thus, the standard notion of semantic content does not seem applicable to interrogative sentences. Rather, what we need for interrogatives is a notion of content that directly captures the issues that they raise. 3

Reason 2: To model conversational contexts It has been argued extensively in the literature that conversational contexts have to be modeled in a way that does not only take account of the information that has been established in the conversation so far, but also of the issues that have been brought up, often referred to as the questions under discussion (Carlson, 1983; Groenendijk and Stokhof, 1984; van Kuppevelt, 1995; Ginzburg, 1996; Roberts, 1996; Büring, 2003; Beaver and Clark, 2008; Tonhauser et al., 2013, among others). We will briefly discuss two reasons why this is important. First, it is needed to develop a formal theory of pragmatic reasoning and the conversational implicatures that result from such reasoning. And second, it is needed for a theory of information structural phenomena like topic and focus marking. Let us first consider pragmatic reasoning.

A key notion in pragmatic reasoning is the notion of relevance. When is a contribution to a conversation relevant for the purposes at hand? One natural answer is that a contribution is relevant just in case it addresses one of the issues under consideration. Even if the issues under consideration only partially characterize what is ‘relevant’ in a broader sense, this partial characterization is crucial for a formal theory of conversational implicatures. For, the issues under consideration influence which conversational implicatures arise. To see this, consider the following examples:

3 There is an extensive literature on the semantics of interrogatives (Hamblin, 1973; Karttunen, 1977; Groenendijk and Stokhof, 1984, among many others), and inquisitive semantics strongly builds on the insights that have emerged from this work. A detailed comparison will be provided in Chapter 9.
B’s utterance is exactly the same in both cases, but the issue that it addresses is different. As a result, in (7), where the question under discussion is what B did this morning, there is a conversational implicature that B did not do anything besides reading the newspaper, i.e., that he did not do the laundry for instance. On the other hand, in (8), where the question under discussion is what B read this morning, there is a weaker conversational implicature, to the effect that B did not read anything besides the newspaper. This does not imply that he did not do other things, such as the laundry. Thus, we see that pragmatic reasoning is sensitive to the issues that are at play in the context of utterance.

Now let us illustrate the importance of contextual issues for information structural phenomena. We will concentrate on focus marking. Languages generally have grammatical ways to signal which part of a sentence is in focus and which part is backgrounded. In English, the focus/background distinction is marked intonationally: focused constituents receive prominent pitch accents, while backgrounded constituents do not. In other languages, focus is sometimes marked by means of special particles or by means of word order.

Which constituents should be marked as being in focus and which should be marked as being backgrounded is determined, at least partly, by the issue that is being addressed. To see this, consider the following examples, where capitalization is used to indicate focus marking by means of prominent pitch accents.

(9) A: Who did Alf rescue?
    B: Alf rescued BEA. / #ALF rescued Bea.

(10) A: Who rescued Bea?
     B: ALF rescued Bea. / #Alf rescued BEA.

If the question is who Alf rescued, as in (9), then the response that Alf rescued Bea must be pronounced with a prominent pitch accent on Bea. Placing a pitch accent on Alf instead results in infelicity. On the other hand, if the question is who rescued Bea, as in (10), then the same response, i.e., that Alf rescued Bea, must be pronounced with a prominent pitch accent on Alf rather than Bea. Thus, we see that focus
marking, just like pragmatic reasoning, is sensitive to the issue under discussion.⁴

**Reason 3: To model issue-directed propositional attitudes and capture the meaning of verbs that report such attitudes**  In order to understand linguistic information exchange, it is important to have a way of representing the information that is available to the agents participating in the exchange, as well as the issues that they are interested in. In other words, we need to be able to model what the agents *know* or *believe* at any given time, and also what they *wonder about*. Knowledge and belief are information-directed propositional attitudes; wondering is an issue-directed propositional attitude. The standard way to model the knowledge and beliefs of an agent is as a set of possible worlds, namely those worlds that are compatible with what the agent knows or believes. Such a set of worlds is thought of as representing the agent’s *information state*. Similarly, in order to capture what an agent wonders about, we need a representation of her *inquisitive state*. For such a representation, we again need a formal notion of issues.

Moreover, turning back to language, just like there are verbs like *know* and *believe* that describe the information state of an agent, as in (11) below, there are also verbs like *wonder* and *be curious* that describe the inquisitive state of an agent, as in (12).

(11) John knows that Bill is coming.
(12) John wonders who is coming.

Clearly, in order to analyse the meaning of verbs like *wonder* we do not only need a suitable representation of the content of the interrogative clause that the verb takes as its complement (here, *who is coming*), but also a suitable representation of the inquisitive state of the subject of the verb (here, *John*).

### 1.1.2 Declaratives and interrogatives cannot be treated separately

The analysis of linguistic information exchange requires a semantic theory of declaratives and one of interrogatives. A question that naturally arises, then, is whether the two sentence types could be analysed separately, or whether a more integrated approach is called for. Below we

⁴ Besides pragmatic reasoning and information structural phenomena like topic and focus marking, it has been argued that a model of conversational contexts that comprises the issues that have been raised is also needed for a suitable analysis of discourse particles (see, e.g., Rojas-Esponda, 2013) and presupposition projection (e.g., Tonhauser et al., 2013).
give two reasons why neither declaratives nor interrogatives can be fully understood in isolation, making an integrated approach necessary.

**Reason 1: Mutual embedding**  Declarative and interrogative sentences can be embedded into one another, as exemplified in (13)–(15).

(13) Bill asked me who won. embedded interrogative
(14) Who told you that Jane won? embedded declarative
(15) Bill asked me who told you that two-level embedding Jane won.

So the meaning of a declarative sentence is sometimes partly determined by the meaning of an embedded interrogative sentence, and vice versa. Clearly, then, a complete semantic account of declaratives cannot be achieved without getting a handle on interrogatives, and the other way around, a complete semantic account of interrogatives is impossible without a treatment of declaratives. Thus, the two have to be analysed hand in hand; considering them in isolation is bound to lead to incomplete theories.

**Reason 2: Interpretational dependencies**  As illustrated in (16) and (17), the interpretation of a declarative sentence sometimes partly depends on the issue raised by a preceding interrogative. Notice that examples (16)–(17) differ from the previous examples (7)–(8) in that they contain the particle only.

(16) A: What did you do this morning?
    B: I only read the newspaper.  \(\sim\) B did not do the laundry
(17) A: What did you read this morning?
    B: I only read the newspaper.  \(\not\sim\) B did not do the laundry

If the question is what you did this morning, as in (16), then the truth of the statement that you only read the newspaper requires that you did not do other things, such as the laundry. On the other hand, if the question is what you read this morning, as in (17), then the truth of the statement that you only read the newspaper just requires that you did not read anything else, while it is compatible with the fact that you did do other things besides reading, such as the laundry. Thus, not just the pragmatic implicatures that a declarative statement may induce, but even its truth-conditional content can depend on the issue that is addressed, which again means that analyzing declaratives in isolation,
without taking interrogatives into account as well, is bound to lead to an incomplete theory.

1.1.3 Why do we need an integrated notion of semantic content?

As we discussed above, the notion of semantic content that is commonly assumed for declarative sentences does not seem suitable for interrogative sentences. In principle, this does not mean that there is anything wrong with this standard notion. We could attempt to construe a suitable notion of content for interrogatives, and maintain the existing notion for declaratives. This, indeed, is the approach that has been taken in most previous work (see Groenendijk and Stokhof, 1997, for an overview). We will argue, however, that a single, integrated notion of semantic content is to be preferred.

Reason 1: Common building blocks

Declaratives and interrogatives are to a large extent built up from the same lexical, morphological, and intonational elements. Clearly, we would like to have a uniform semantic account of these elements, i.e., an account that captures their semantic contribution in full generality, rather than two separate accounts, one capturing their semantic contribution when they are part of declarative sentences and the other when they are part of interrogative sentences.

To make this concrete, consider the following two examples, a declarative and an interrogative which are built up from exactly the same lexical items and also exhibit the same intonation pattern (we use ↑ and ↓ to indicate rising and falling intonation, respectively).

(18) Luca is from Italy↑ or from Spain↓.
(19) Is Luca from Italy↑ or from Spain↓?

In uttering the declarative in (18), a speaker provides the information that Luca is from Italy or from Spain, and she does not request any further information from other conversational participants. On the other hand, in uttering the interrogative in (19), she takes the information that Luca is from Italy or Spain for granted, and requests other participants to provide further information determining exactly which of the two countries he is from.

Both sentences contain the disjunction word or. In declaratives, or is normally taken to yield the union of the semantic values of the disjuncts. In (18), each disjunct expresses a proposition, standardly represented as
a set of possible worlds: the semantic value of the first disjunct is the set of worlds where Luca is from Italy, and the semantic value of the second disjunct is the set of worlds where Luca is from Spain. The proposition expressed by (18) is the union of these two sets, i.e., the set of all worlds where Luca is from either country.

This seems a reasonable account of or in declaratives. But what is the role of or in interrogatives? Ultimately, we would like to have an account of or that is general enough to capture its semantic contribution in both declaratives and interrogatives in a uniform way. Assuming different notions of semantic content for declarative and interrogative sentences constitutes an obstacle for such a uniform account. By contrast, as we will see, such an account naturally comes within reach once we assume an integrated notion of semantic content. In this approach, the semantic content of a complete sentence should capture both the information that the sentence conveys and the issue that it raises (where of course, either may be trivial), and the semantic content of any sub-sentential constituent should capture the contribution that this constituent makes both to the information conveyed and to the issue raised by the sentence.

Reason 2: Entailment  Entailment is normally thought of as a logical relation between declarative sentences. One sentence is taken to entail another if the first conveys at least as much information as the second. This logical relation plays a central role in the standard logical framework for natural language semantics. For one thing, predictions about entailment constitute one of the primary criteria for empirical success of semantic theories. That is, a theory is assessed by testing its predictions about entailment. But besides this, entailment is important in various other respects as well. For instance, it plays a crucial role in the derivation of quantity implicatures, which involves comparing the sentence that a speaker actually uttered with other sentences that the speaker could have uttered instead. This comparison is done in terms of informative strength, which is captured by entailment (see Grice, 1975, and much subsequent work). Similarly, entailment is needed to formulate interpretive principles like the Strongest Meaning Hypothesis, which has been argued to play a crucial role in the resolution of semantic underspecification, for instance in the interpretation of plural predication (Dalrymple et al., 1998; Winter, 2001). And as a final example, entailment has been used to characterize the distribution of positive and negative polarity items in terms of upward and downward
entailing environments (e.g., Ladusaw, 1980; Kadmon and Landman, 1993).

Clearly, we would like our theories of quantity implicatures, plural predication, polarity items, etc., to apply in a uniform way to declarative and interrogative constructions. However, since the standard notion of entailment compares two sentences in terms of their informative, truth-conditional content (and sub-sentential expressions in terms of their contribution to the informative content of the sentences that they are part of), it does not suitably apply to interrogatives. For this reason, the scope of entailment-based theories such as the ones just mentioned is currently restricted to declaratives.

What we need, then, is a notion of entailment that is general enough to apply to both declaratives and interrogatives in a uniform way. We expect, for instance, to be able to account in a uniform way for the fact that the declarative in (20a) entails the one in (20b), and for the fact that the interrogative in (21a) entails the one in (21b).

(20) a. The number of planets is 8.
    b. The number of planets is even.
(21) a. What is the number of planets?
    b. Is the number of planets even?

For this, we need a notion of entailment which is sensitive to both informative and inquisitive strength. Such a notion can be naturally defined once we operate with a notion of semantic content that encompasses both informative and inquisitive content.

**Reason 3: Logical operations** Two declarative sentences can be combined by means of conjunction and disjunction.

(22) Peter rented a car and Mary booked a hotel.
(23) Peter rented a car or he borrowed one.

This does not only hold for root declaratives, but also for embedded ones.

(24) I believe that Peter rented a car and that Mary booked a hotel.
(25) I believe that Peter rented a car or that he borrowed one.

This is also true for interrogatives, both embedded and unembedded ones.\(^5\)

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\(^5\) While the possibility of conjoining interrogative sentences is uncontroversial, the possibility of disjoining interrogatives has been disputed by Szabolcsi (1997, 2015a) and Krifka (2001b). In Section 9.2.2 we will examine Szabolcsi’s argument in some detail. On
1.2 Main aims and outline of the book

Given the above considerations, our main high-level aims in this book will be to introduce:

1. A formal notion of issues that allows for a suitable representation of semantic content, conversational contexts, and propositional attitudes;

the basis of examples such as (27) and (29), we will argue that disjoining interrogatives is in principle possible, and that the meaning of the resulting disjunction is correctly derived by applying inquisitive disjunction to the meanings of the two interrogative disjuncts.

(26) Where can we rent a car, and which hotel should we take?
(27) Where can we rent a car, or who might have one that we could borrow?
(28) I’m investigating where we can rent a car and which hotel we should take.
(29) I’m investigating where we can rent a car or who might have one that we could borrow.

These parallels between declaratives and interrogatives exist not only in English, but in many other languages as well: words that are used to conjoin declaratives are also used to conjoin interrogatives, and words that are used to disjoin declaratives can often also be used to disjoin interrogatives.

What we would like to have, then, is an account of conjunction and disjunction that does not just apply to declaratives, but that is general enough to apply to both declaratives and interrogatives in a uniform way. As we will see, such an account comes within reach if we analyse declaratives and interrogatives by means of a single notion of semantic content that encompasses both informative and inquisitive content.

Besides conjunction and disjunction, another logical operation that can be performed both on declaratives and on interrogatives is *conditionalization*, as exemplified in (30) and (31).

(30) If Bill asks Mary out, she will accept.
(31) If Bill asks Mary out, will she accept?

This calls for an account of conditionals that applies uniformly, regardless of whether the consequent is a declarative or an interrogative sentence. Again, such an account is facilitated by a semantic framework which encompasses both informative and inquisitive content.

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2. A logical framework that allows for an integrated semantic analysis of declarative and interrogative sentences, with a single notion of semantic content which is general enough to deal with both sentence types at once, rather than a separate notion of semantic content for each sentence type.

The remaining chapters of the book broadly fall into two parts. The first part, spanning Chapters 2–4, provides a detailed exposition of the basic inquisitive semantics framework. The second part, consisting of Chapters 5–9, discusses several applications of the framework and compares it to previous work.

More specifically, Chapter 2 introduces the new notions of issues, propositions, and conversational contexts that form the heart of inquisitive semantics; Chapter 3 identifies the basic operations that can be performed on inquisitive propositions; and Chapter 4 presents an inquisitive semantics for the language of first-order logic.

Then, turning to the second part, Chapter 5 shows how the meaning of various kinds of questions occurring in natural languages can be captured in the framework developed in Chapters 2–4; Chapter 6 shows how to derive the meaning of various declarative and interrogative sentence types in a compositional way, providing a concrete illustration of the benefits of treating informative and inquisitive content in an integrated way; Chapter 7 argues that the truth-conditions of certain declarative sentences—in particular, conditionals—depend on the inquisitive content of their constituents, which shows that the richer notion of semantic content that inquisitive semantics provides is beneficial even if one is just concerned with declaratives; Chapter 8 discusses the representation of information-directed and issue-directed propositional attitudes, as well as the semantics of verbs like *know* and *wonder* which are used to report such attitudes; and Chapter 9 discusses the advantages of inquisitive semantics as a framework for the semantic analysis of interrogatives in comparison with previous work. Finally, Chapter 10 concludes with a schematic overview of the book, and discusses to what extent it meets the two high-level desiderata listed at the beginning of the section.

The Further Reading section at the back of the book provides some pointers to work that further extends or applies the framework presented here.