On the Semantics and Pragmatics of 'Identifier *So*'

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1   Introduction

The mechanisms by which reference is established in discourse have been among the most well studied in linguistics. However, such studies have predominantly been focused on reference to entities[1] through the use of lexical and pronominal noun phrases. Less well studied, and indeed less well understood, is a form in English that establishes reference to an event through the use of verb phrases, specifically the form which Bolinger (1972) called 'identifier *so*', as exemplified in (1–3).[2]

(1) In fact, in substantiating these fears, Judge Bork again essentially concedes that economic freedom is a component of the Constitution: "We already have clauses that could be used to protect economic freedom – and were *so used*." (*Wall Street Journal*)

(2) "...and with complete premeditation resolved that His Imperial Majesty Haile Selassie should be strangled because he was head of the feudal system." He was *so strangled* on Aug. 26, 1975, in his bed most cruelly. (*Chicago Tribune* 12/15/94)

(3) In fact, it is interesting that, in English at least, there is virtually no marking of an NP with respect to the Discourse-status of the entity it represents. Of course, if an NP is indefinite and is thereby understood as evoking something Hearer-New, we can infer Discourse-new. However, if it is not *so marked*, then, with one exception, we cannot tell from its form whether it has occurred before in the discourse. (from text of Prince (1992))

While previous works have described a number of interesting properties associated with this anaphor, none to date has succeeded in providing a comprehensive account of its use and meaning. This is perhaps not surprising, as this form is notorious for having quite a varied set of apparently idiosyncratic properties.

In this paper, we present an analysis of identifier *so* based on the informational structure of the discourse in which it is used. Drawing upon a large corpus of naturally occurring data, we show that anaphoric expressions containing *so* impose a set of constraints on the information status of their

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[1]Here and throughout the paper, we use the term *entities* broadly to denote the class of things that can be referred to linguistically, which, in addition to entities proper, includes events, states, propositions, and so forth.

[2]Throughout the paper, we use italics to mark the *so* and associated verb in discourses consisting of more than one sentence.

referents that is not found for any of the various types of NP anaphora in English. Furthermore, we show that different constraints apply depending on whether *so* appears in preverbal or postverbal position.

We then consider the event anaphor *do so* in light of our analysis. In contrast to previous approaches that treat *do so* as a highly idiosyncratic form, we demonstrate that many of its properties are afforded a compositional explanation as predicted by our more general account of identifier *so*. This explanation and a variety of naturally occurring data that provide empirical support for it put to rest any claims that *do so* imposes a parallelism constraint on the syntactic form of the clause containing the antecedent. Certain idiosyncracies do remain, however; in particular we show that *do so* amalgamates properties of both preverbal and postverbal uses of *so*.

2   Reference, Information Status, and Discourse Models

As hearers comprehend a discourse, they build a semantic model representing the entities that have been introduced thus far and the relationships that hold between them (Webber, 1978; Sag and Hankamer, 1984). They utilize a variety of information sources to accomplish this, including their knowledge store, their model of the discourse that has occurred up until the point of the current utterance, the content of the current utterance itself, and their immediate surroundings, for instance, objects currently in their view. Referring expressions vary in the signals they communicate with respect to how they should be interpreted in light of these sources of information. Here, we focus on three aspects of the information status of entities with respect to these information sources: hearer status, discourse status, and salience.

Prince (1992) analyzes information status in terms of two crosscutting dichotomies: *hearer status* and *discourse status*. From the speaker's perspective, the hearer status of an entity depends on whether the speaker believes it is known or unknown to the hearer at the time of reference; entities that are believed to be known to the hearer are *hearer-old*, otherwise they are *hearer-new*. For instance, by using the indefinite *a woman* in (4a), the speaker conveys that the hearer is not already familiar with the woman being referred to (i.e., she is hearer-new), hence the hearer creates a new referent in his/her discourse model.[3] On the other hand, use of a proper name, as in (4b), conveys that the speaker believes Oprah Winfrey is hearer-old, i.e. already familiar to the hearer.

(4) a. I saw a woman on the subway today.

b. I saw Oprah Winfrey on the subway today.

In contrast, the discourse status of an entity depends only on whether it has already been introduced into the discourse at the time of reference; an entity that has been so introduced is *discourse-old*; otherwise it is *discourse-new*. Hence, produced discourse initially, both *a woman* and *Oprah Winfrey*, in (4a) and (4b) respectively, are discourse-new. In contrast, the referent of *the woman* in (5) is at that point discourse-old, since she had been introduced previously.

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[3]Of course, it could turn out that the hearer was already familiar with the woman:

(i) I saw a woman on the subway today. She turned out to be Oprah Winfrey.

In such a case, the hearer will merge the representation for the newly created woman in the first sentence with that of Oprah Winfrey upon interpreting the second sentence.

(5) I saw a woman on the subway today. The woman looked like Oprah Winfrey.

Considering hearer and discourse status together, entities can have one of three information statuses: hearer-old/discourse-old (cf. *the woman* in (5)), hearer-new/discourse-new (cf. *a woman* in (5) and (4a)), and hearer-old/discourse-new (cf. *Oprah Winfrey* in (5) and (4b)). An entity cannot be both hearer-new and discourse-old, as any entity already introduced into the discourse is presumably known to the hearer from that point on.

As Prince notes, the use of a definite NP in English signals that its referent is hearer-old, whereas use of the indefinite signals hearer-new.[4] These markings, however, do not directly reflect discourse status. For instance, definites can have referents that are either discourse-old (e.g., *the woman* in (5)) or discourse-new (e.g., *Oprah Winfrey* in (4b)). Prince makes an interesting observation about the asymmetry between the ways in which discourse status and hearer status are realized in referential NPs:

> In fact, it is interesting that in English, at least, there is virtually no marking of an NP with respect to the Discourse-status of the entity it represents. Of course, if an NP is indefinite and is thereby understood as evoking something Hearer-New, we can infer Discourse-new. However, if it is not so marked, then, with one exception, we cannot tell from its form whether it has occurred before in the discourse. (Prince, 1992, p. 304)

The one exception that Prince identifies is the case of pronouns, which brings us to our third factor affecting information status, namely salience. As Prince notes:

> Pronouns indicate that the entities they represent are salient, i.e. appropriately in the hearer's consciousness ... at that point in the construction of the discourse model. Therefore, they are presumably already in the discourse model. Therefore, they are Discourse-old. However, at any point in (discourse) time, only a subset, usually proper, of the entities already evoked are salient and hence representable by a pronoun. (Prince, 1992, p. 304)

Prince claims, correctly in our view, that pronouns do not mark discourse-oldness in the way that definite, lexical NPs mark hearer-oldness; for example, even for salient entities the use of a pronoun is often optional. However, in treating all salient entities as discourse-old, Prince is including (by presumption) those entities which have yet to be actually introduced into the discourse but which are nonetheless salient due to their position in the surrounding environment. Following Prince's (1981) earlier terminology, we will henceforth refer to such entities as *situationally evoked*. Indeed, one can use a pronoun in such cases:

(6) [Oprah Winfrey walks onto the subway]
    A to B: She must be happy about the outcome of her trial.

However, we differ from Prince in that we consider only those entities that have been explicitly (that is, linguistically) introduced into the discourse to be discourse-old. At the moment when the pronoun occurs in (6), for example, Winfrey is highly salient, yet discourse-new. (Of course,

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[4]A precise characterization of the meaning and function of definiteness has proved elusive; for discussion, see Birner and Ward (1994).

after the use of this referring expression, the referent becomes discourse-old, as is the case when an indefinite NP is used to introduce a referent into the discourse via linguistic means.) As a result, we posit not only that pronouns do not directly mark discourse status, but that they imply nothing with respect to it. They simply mark for hearer-old and salient.

Finally, there is also a type of referring expression that is used to specify an entity that is, strictly speaking, hearer- and discourse-new, but is nonetheless dependent on some other entity which is discourse-old. Prince (1981; 1992) refers to such expressions as *inferrables*. Examples include familiar cases of part-whole reference such as that in (7).

(7) He passed by the Bastille and *the door* was painted purple. (Prince, 1992, ex. 17b)

While there is no previous mention of a door at the time *the door* is uttered, the creation of such a referent is licensed by the object introduced by the NP *the Bastille*, under the assumption that the Bastille has a (main) door associated with it and that the door being referred to is that door.

In sum, we have characterized the information status of entities as consisting of three properties: hearer status, discourse status, and salience. Different types of referring expressions impose different values of these properties on their referents. None of these referring expressions, however, appears to be sensitive to discourse status.

3   Discourse Properties of 'Identifier *So*'

We now consider the anaphoric properties of 'identifier *so*' in light of the constraints it imposes upon the information status of its referent. Following Bolinger (1972), we posit that different constraints hold based on the relative position of the anaphor and the verb with which it is associated. These two types, which we term preverbal and postverbal *so*, are illustrated in (8a) and (8b), respectively.

(8) Oprah spent two weeks studying law to prepare for her court case.

    a. By so studying, she was able to handle herself well on the witness stand.

    b. She studied so in order to handle herself well on the witness stand.

We consider these cases in turn.

3.1   Preverbal *So*

The three examples of identifier *so*, presented above in Section 1 and repeated below for convenience, are all cases of preverbal *so*:

(9) In fact, in substantiating these fears, Judge Bork again essentially concedes that economic freedom is a component of the Constitution: "We already have clauses that could be used to protect economic freedom – and were *so used*." (=1)

(10) "...and with complete premeditation resolved that His Imperial Majesty Haile Selassie should be strangled because he was head of the feudal system." He was *so strangled* on Aug. 26, 1975, in his bed most cruelly. (=2)

(11) In fact, it is interesting that, in English, at least, there is virtually no marking of an NP with respect to the Discourse-status of the entity it represents. Of course, if an NP is indefinite and is thereby understood as evoking something Hearer-New, we can infer Discourse-New. However, if it is not *so marked*, then, with one exception, we cannot tell from its form whether it has occurred before in the discourse. (=3)

We first consider the constraints on information status that preverbal *so* imposes on its referent. As is generally the case for definite NP reference (both lexical and pronominal), preverbal *so* requires that its referent be hearer-old; otherwise its use is infelicitous, as demonstrated in (12a) and (13a). Compare these examples with (12b) and (13b), in which the verb appears without *so*.[5]

(12) In fact, in substantiating these fears, Judge Bork again essentially concedes that economic freedom is a component of the Constitution:

a. #"We already have clauses that could be so used by opponents of the administration's trade policy."

b "We already have clauses that could be used by opponents of the administration's trade policy."

(13) His Imperial Majesty Haile Selassie was head of the feudal system.

a. #He was so strangled on Aug. 26, 1975, in his bed most cruelly.

b. He was strangled on Aug. 26, 1975, in his bed most cruelly.

However, unlike definite NP reference, referents of preverbal *so* must also be discourse-old. That is, its referent cannot be situationally evoked no matter how salient it is, as can be seen in (14a) and (15a):

(14) [A and B together have just witnessed Haile Selassie being murdered by strangulation]

a. A: #He was so strangled most cruelly.

b. A: He was strangled most cruelly.

(15) [A and B have just witnessed a vote in Congress that repealed an amendment of the Constitution]

a. A: #By so changing the constitution, Congress is setting a dangerous precedent.

b. A: By changing the constitution, Congress is setting a dangerous precedent.

Furthermore, as is the case with pronouns, the referent of preverbal *so* must be salient.[6] While reference to something introduced more than one sentence back is possible with preverbal *so*,

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[5]We use '*' to indicate syntactic ungrammatically, '??' to indicate semantic anomaly, and '#' to indicate pragmatic infelicity.

[6]Note that the requirement that a referent be discourse-old does not preclude cataphoric uses. As shown in (i) and (ii), both pronouns and the preverbal *so* construction can be used cataphorically to refer to entities that are being introduced within the same sentence as the anaphor itself:

(i) If you're concerned about her, I'd appreciate your visiting Mrs. Waverly this afternoon.

(ii) If you're so inclined, I'd appreciate your visiting Mrs. Waverly this afternoon.

intervening material that constitutes a major shift of topic renders such reference infelicitous, as can be seen in (16):

(16) With complete premeditation, they resolved that His Imperial Majesty Haile Selassie should be strangled because he was head of the feudal system. They also resolved to commit a variety of other violent acts, although those would come somewhat later. Obviously, these people were very prone to violence.

    a. #Selassie was so strangled on Aug. 26, 1975, in his bed most cruelly.

    b. Selassie was strangled on Aug. 26, 1975, in his bed most cruelly.

The preverbal *so* construction can also be used in cases in which the referent might be characterized as an inferrable. For instance, in (17),

(17) Regarding a possible Elvis Presley stamp, Postmaster General Frank notes that anyone so honored must be "demonstrably dead" for 10 years. (*Wall Street Journal*)

the use of *so honored* indicates that there is a discourse-old 'honoring' event, but none has been explicitly introduced into the discourse. This induces the hearer to infer one from what *has* been said. In this case, the referent – roughly "issuing a stamp with X's picture on it" – will be inferrable as long as the hearer is willing to accommodate the inference that such an action would constitute an 'honoring'. While interpreting this passage seems effortless, upon closer analysis one finds a rather extensive chain of inference that must be carried out in constructing an appropriate referent.

There are also instances of preverbal *so* whose interpretation is based upon a generalization of the referent, rather than the referent itself. For instance, in (18),

(18) We have already noted that this formulaic utterance "Guess what" is virtually dedicated to doing pre-announcements, as are various extensions and variants of it, such as "Guess what I did today," "Guess who I saw," etc. This account of composition is only rarely available; precious few configurations of talk are *so dedicated*, and even those that are are contingent on their position. (from the text of Schegloff (1996, p. 12))

the interpretation of *so dedicated* is most likely not intended to be "dedicated to doing pre-announcements", but instead to something more general along the lines of "dedicated to a very specific conversational function".

Interestingly, the preverbal *so* construction can also be used when a manner of the action denoted by the verb is discourse-old, but the action itself is not:

(19) Only about $20 billion of Latin America's $350 billion foreign bank debt is going through debt-reduction programs this year. But that's about four times the amount *so treated* last year. (*Wall Street Journal*)

(20) Most Kidder employees declined to take calls from the press yesterday saying they had been *so ordered* by management. (*Wall Street Journal*)

	Hearer-old	Discourse-old	Salient
Definite Lexical NP	√		
Pronoun	√		√
Preverbal *so*	√	√	√

Table 1: Constraints on Information Status by Type of Anaphora

The interpretation of preverbal *so* in (19) can be paraphrased as "treated by sending through debt-reduction programs", and in (20) as "ordered to decline to take calls from the press", both representing manner information that is discourse-old.

Given such examples, one might be led to analyze preverbal *so* as synonymous with *(in) that way*, and indeed the two expressions have much in common. Of course, so treating preverbal *so* begs the question of what the anaphoric properties of *(in) that way* are. But nonetheless there are clear differences between them, most notably that *(in) that way*, like definite NP reference in general, allows for referents that are situationally evoked, as can be seen in examples (21) and (22):

(21) [A and B have just witnessed Haile Selassie being murdered by strangulation]

    a. A: I can't believe he was strangled (in) that way!

    b. A: #I can't believe he was so strangled!

(22) [A and B are looking at tags on corpses]

    a. A: They shouldn't be labeled (in) that way.

    b. A: #They shouldn't be so labeled.

In addition, *(in) that way* is less constrained in that it can establish reference to a manner modifying a distinct event previously evoked in the discourse, whereas *so* cannot:

(23) A: John sings beautifully.

    B: Yeah, and he writes that way too.

    B': #Yeah, and he so writes too.

To summarize thus far, the preverbal *so* construction imposes a set of constraints on the information status of its referent that is not shared by any of the various kinds of NP anaphora in English: It must be discourse-old (and, thus, hearer-old) and salient. These constraints are summarized in Table 1.

3.2 Postverbal *So*

Bolinger (1972) argues that postverbal *so*, as illustrated above in (8b), is subject to a variety of constraints that do not apply to the preverbal *so* construction. These constraints arise from a condition of 'indefiniteness', a term for which he is unable to provide a precise definition. Instead, Bolinger provides three examples of the kinds of indefinite predicates to which postverbal *so* is restricted.

First, the more subjective the referent, the more indefinite it is; thus, events described in subjective, or 'value-oriented', terms will permit *so*, whereas those described in more objective, or 'physical', terms will not. To see this, compare the physical predicate in sentence (24a) (*mathematically*) with the value-oriented predicate in (24b) (*courteously*).

(24) a. *If you thought that the questions could be answered mathematically, why didn't you answer them so? [from Bolinger (1972, p. 180); judgments in the original]

b. If you thought that the questions could be answered courteously, why didn't you answer them so?

Second, predicates that refer to conditions 'already in existence' are definite and thus disallow postverbal *so*, whereas predicates that 'look to the future' are indefinite and thus permit *so*. This distinction is exemplified in (25a-b).

(25) a. *I want the equipment to be in proper order for tomorrow morning; please leave it so tonight.

b. I want the equipment to be in proper order for tomorrow morning; please arrange it so tonight.

Here, *leave* refers to a pre-existing state of affairs, and thus is definite, whereas *arrange* refers to a future state and is therefore indefinite.

Finally, verbs of saying can be either definite or indefinite depending on their degree of assertability. Predicates that involve a 'positive assertion' disallow postverbal *so* (26a), whereas those that involve a (mere) claim or an uncertainty do not (26b); furthermore the verb must be 'affirmative' (26c).[7]

(26) a. *I assert/declare/reveal so.

b. I guess/think/suppose/say so.

c. *I (don't) disbelieve/doubt/deny so.

In fact, there are at least two types of postverbal *so* at work in these data, neither of which patterns exactly like the preverbal *so* construction. The first type, exhibited in (24) and (25), differs from preverbal *so* with respect to the information status of its referent; most notably, it permits situationally evoked referents, as illustrated in (27).

(27) [Andy is holding a newborn baby with one hand behind her head, and shows Gregory.]

Andy: It's important to hold her *so*, because the muscles in her neck aren't yet developed.

Furthermore, as noted by Bouton (1970), the VP *do it so* can be used when the *it* specifies an event and the *so* is manner-referring, as in (28):

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[7]Note that this restriction applies to the verb itself (e.g., *I disbelieve so*) rather than the larger VP or S in which it occurs (e.g., *I don't believe so*).

(28) [John pours another martini for Mary out of the wrong side of the decanter, creating a big spill.]

Mary: You shouldn't do it so! [*do it* = 'pour the drinks', *so* = 'that way']

Here, the direct object position is occupied by *it*, specifying the event of pouring drinks, while the adverb *so* is used deictically to specify the particular manner of pouring.[8]

The postverbal *so* appearing in constructions like *guess so*, *think so*, and *remain so* is yet a different form. Unlike the manner-referring meaning just described, this *so* patterns with preverbal *so* in not allowing situationally evoked referents, as exemplified in (29):

(29) [A and B have just witnessed Haile Selassie being murdered by strangulation]

a. A: I can't believe it!

b. A: #I can't believe so!

Nonetheless, the *so* of these expressions serves a function quite different from preverbal *so*. A speaker's use of *believe so* is not interpreted as an instruction to the hearer to find a previous 'believe' event in the discourse, nor is it used to refer to a manner in which the believing event is performed. Rather it is used to refer to and affirm a previous and salient proposition that serves as a valid argument of *believe*.

akin to the preverbal "so it seems"?

In sum, there are several distinct uses of postverbal *so*, none of which patterns exactly like the preverbal *so* construction with respect to its anaphoric properties. In the next section, we discuss yet another distinct form of postverbal *so*, the *do so* construction. We find that while it too does not pattern with these other forms of postverbal *so*, it does have much in common with the preverbal *so* construction.

4   Do So

Previous accounts of the *do so* construction, illustrated in (30), have noted its seemingly idiosyncratic syntactic and anaphoric properties (Lakoff and Ross, 1966; Anderson, 1968; Bouton, 1970; Halliday and Hasan, 1976; Hankamer and Sag, 1976; Quirk et al., 1985; Miller, 1990; Ward, Sproat, and McKoon, 1991; Cornish, 1992; Fu and Roeper, 1993; Dechaine, 1994); however, none has managed to provide a satisfactory explanation of those properties.

(30) Bill signed the legislation, and Al *did so* too.

In this section, we provide a compositional explanation of the anaphoric properties of *do so* and show that they follow from our more general account of *so*. As background, we begin by describing the well-known dichotomy between *deep* and *surface* anaphora originally proposed by Hankamer and Sag (1976), in which *do so* was treated as a surface anaphor. We then present data that show that *do so* actually has properties of both surface and deep anaphora, and thus is not categorizable within this dichotomy. We then describe the syntactic and semantic properties of *do so*, and show

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[8]Note that these facts contradict the claims of Williams (1977), who suggests that *so* cannot refer to situationally evoked referents solely because of its adverbial status. Cornish (1992) adopts Williams' explanation.

that they parallel its preverbal *so* correlate, *so doing*. By considering *do so* and *so doing* to be different realizations of the same form, we show how our analysis of the preverbal *so* construction can account for the anaphoric properties of *do so*.

4.1 Hankamer and Sag's Dichotomy

The earliest and best-known account of the anaphoric properties of *do so* can be found in Hankamer and Sag (1976), henceforth H&S. In their classic study of anaphora, H&S argue for a categorical distinction between so-called *deep* and *surface* anaphora. Surface anaphors are 'syntactically controlled', in that they require a linguistic antecedent of an appropriate syntactic form. Examples include VP-ellipsis, gapping, and stripping. Deep anaphors, on the other hand, only require a referent of an appropriate semantic type, and thus may be 'pragmatically controlled' (i.e., situationally evoked). Examples include pronominals and event referential forms like *do it* and *do that*.

In Sag and Hankamer (1984), this dichotomy is revised to distinguish between two types of anaphoric processes, 'ellipsis' (their earlier surface anaphora) and 'model-interpretive anaphora' (their earlier deep anaphora). The former process obtains antecedents from propositional representations, which maintain the surface syntactic constituent structure of a sentence. On the other hand, model-interpretive anaphora locates referents in a discourse model, where the representations are purely semantic in nature.[9]

The distinction between the two types of anaphora is illustrated in (31a-c). Henceforth, we will refer to the clause containing the anaphor as the *target* clause, and the clause giving rise to the referent as the *source* clause.

(31) A peace agreement in the former Yugoslav republic needs to be drawn up.

   a. An agreement in North Korea does too. [VP-ellipsis (surface)]

   b. * Jimmy Carter volunteered to. [VP-ellipsis (surface)]

   c. Jimmy Carter volunteered to do it. [event anaphora (deep)]

According to H&S, (31a) is acceptable because the source representation is a surface VP and is therefore retrievable from its propositional representation. By the same token, (31b) is unacceptable because the putative source *draw up a peace agreement* is not a surface VP in its propositional representation. [10] On the other hand, (31c) is acceptable because *do it* is a deep anaphor, and therefore is interpreted with respect to a discourse model, in which a purely semantic representation for *draw up a peace agreement* can presumably be found.

In the H&S dichotomy of anaphora, the requirement that there be a syntactic antecedent for surface anaphora implies that the antecedent must be linguistic, i.e., that surface anaphora cannot be situationally evoked. The unacceptability of situationally evoked VP-ellipsis is shown in (32a), in contrast to the acceptability of *do it* anaphora in the same context shown in (32b).

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[9]For historical reasons, we will continue to use the original 'surface' and 'deep' terminology of Hankamer and Sag (1976).

[10]A number of researchers (Dalrymple, Shieber, and Pereira, 1991; Hardt, 1992; Kehler, 1993), however, have provided numerous examples in which VP-ellipsis is felicitous despite a mismatch of syntactic form between the source and target clauses.

(32) [Hankamer points gun offstage and fires, whereupon a blood-curdling female scream is heard. Sag says:]

    a. *Jorge, you shouldn't have! [surface] (=Sag & Hankamer 1984, ex. 5d; judgments in the original)

    b. Jorge, you shouldn't have done it! [deep] (=Sag & Hankamer 1984, ex. 5e)

    c. *Jorge, you shouldn't have done so! [surface]

Despite the superficial similarities with deep-anaphoric forms like *do it* and *do that*, H&S treat the anaphor *so*, and consequently the form *do so*, as a surface anaphor. The motivation for this classification is the fact that *do so* lacks the ability to specify situationally evoked referents, as illustrated by the unacceptability of (32c).[11]

To summarize thus far, the two hallmarks of surface anaphora are: (1) that there must be a linguistically evoked antecedent, and (2) that the antecedent must be of an appropriate syntactic form. In contrast, deep anaphora only requires a semantic referent of the appropriate type, and allows for such referents to be situationally evoked.

4.2 *Do So*: Neither Deep nor Surface Anaphora

Given the data presented in the previous section, we take the evidence that *do so* does not allow reference to situationally evoked referents to be compelling and definitive. We argue here, however, that *do so* does not satisfy the other characteristic of surface anaphora, namely the requirement that there be a syntactically parallel antecedent. An examination of naturally occurring data has turned up many instances of *do so* in which no parallel surface-syntactic VP is available. We have classified these data into five subgroups, and provide representative examples below.

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[11]Some of the VP-ellipsis data (cf. (32a)) have been called into question. Schachter (1977) provides a number of felicitous examples of VP-ellipsis with situationally evoked referents, such as (i) and (ii):

    (i) [John tries to kiss Mary. She says:]

       John, you mustn't.

    (ii) [John pours another martini for Mary. She says:]

       I really shouldn't.

In a reply to Schacter, Hankamer (1978) argues (convincingly, in our opinion) that such cases are either formulaic or conventionalized, occurring only as "illocutionally charged expressions" and not generally as declarative statements or informational questions. In any case, (iii) and (iv) illustrate that *do so* does not permit such anaphora, even in the restricted contexts identified by Schachter.

    (iii) [John tries to kiss Mary. She says:]

       #John, you mustn't do so.

    (iv) [John pours another martini for Mary. She says:]

       #I really shouldn't do so.

Voice alternation   In each of the following examples, there is a voice mismatch between the source and target clauses: The main verb of the source clause occurs in the passive voice and the main verb of the target clause in the active voice.

(33)   ... since regardless of which bit is initially assigned, it will be flipped if more information is gained by *doing so*. [=flipping it] (from text of Magerman (1994, page 29))

(34)   Section 1 provides the examples to be derived by Gapping, and a formulation of Gapping capable of *doing so*. [=deriving the examples] (from text of Neijt (1981))

(35)   As an imperial statute the British North America Act could be amended only by the British Parliament, which *did so* on several occasions. [=amended an imperial statute] (Groliers Encyclopedia)

Similar examples were previously cited by Dalrymple, Shieber, and Pereira (1991) in arguing against syntactic-based reconstruction for VP-ellipsis.

(36)   The formalisms are thus more aptly referred to as information- or constraint-based rather than unification-based, and we will *do so* here. [=refer to the formalisms as information- or constraint-based] (from text of Shieber (1989, p. 41))

(37)   It is possible that this result can be derived from some independent principle, but I know of no theory that *does so*. [=derives this result from some independent principle] (from text of Mohanan (1983, p. 664))

In these examples, the source clause is not of a suitable form at the surface-syntactic level to license surface anaphora in the target. However, we assume that purely semantic representations of the events denoted by these clauses are available as referents in the discourse model (where presumably the distinction between active and passive is neutralized), and therefore *do so* patterns like deep anaphora in this respect.

Nominalizations   In each of the following examples, the referent of *do so* is evoked by a nominalization contained within the source clause:[12]

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[12]Some speakers find these cases to be marginal as compared to the other types of mismatches we have uncovered, and in fact it is not very difficult to construct examples in which *do so* is completely infelicitous when intended to specify a referent evoked by a nominalization. We believe that this is not due to the mismatch of syntactic form between a nominalization and a VP, but instead due to the low level of salience generally associated with the semantic representations of events evoked by nominalizations. One way to test this hypothesis is to substitute *do it* for *do so* in these examples; to our knowledge *do it* is uncontroversially believed to access purely semantic referents. Thus, (i), for instance, has a marginality similar to that of (38).

(i)   The defection of the seven moderates, who knew they were incurring the wrath of many colleagues in *doing it*, signaled that it may be harder to sell the GOP message on the crime bill than it was on the stimulus package. [=defecting]

This fact, along with the fact that *do so* is readily acceptable with other types of syntactic mismatch, suggests to us that the marginality of the examples in this section is likely due to extraneous (and independently motivated) factors, and not to a mismatch between source and target clauses.

(38) The defection of the seven moderates, who knew they were incurring the wrath of many colleagues in *doing so*, signaled that it may be harder to sell the GOP message on the crime bill than it was on the stimulus package. [=defecting] (Washington Post)

(39) For example, in the dialogue of Figure 2, the purpose of the subdialogue marked (3) is to support the agents' successful completion of the act of removing the pump of the air compressor; the corresponding SharedPlan, marked (P3) in Figure 3, specifies the beliefs and intentions that the agents must hold to *do so*. [=successfully complete the act of removing the pump of the air compressor] (from text of Lochbaum (1994))

(40) Even though an Israeli response is justified, I don't think it was in their best interests to *do so* right now. [=respond] (token provided by Dan Hardt)

In each case, *do so* is felicitously used to refer to an event in the discourse model, even though that event was evoked by a non-VP constituent at the level of syntax.

Split antecedents   The following examples are cases of 'split antecedents', in which the event being referred to depends on which discourse entity serves as the agent of the referent:

(41) Fortunately, the first person to die in 1990 and the first couple to file for divorce in 1990 were allowed to *do so* anonymously. [=die / file for divorce] (Roeper (1990), cited by Dalrymple, Shieber, and Pereira (1991).)

(42) What I am suggesting is that when we delay, or when we fail to act, we *do so* intentionally... [=delay / fail to act] (Brown Corpus, cited by Meijs (1984))

We assume that no syntactic machinery exists for copying VPs from multiple source clauses to the syntax of the target clause. The resolution of these cases is therefore presumed to be performed at the semantic level.

Other form mismatches   The following examples also display a syntactic form mismatch between the source and target clauses:

(43) There was a lot more negativity to dwell on, if anyone wished to *do so*. [=dwell on more negativity] (*Wall Street Journal*)

(44) With or without the celebration, Belcourt is well worth seeing, and you can *do so* year round. [=see Belcourt] (*Wall Street Journal*)

Similarlya, Cornish (1992) cites (45) as a case in which the antecedent is contained within a deverbal adjectival phrase, noting that it is problematic for Hankamer & Sag's deep/surface dichotomy:

(45) He went on to claim that the allegedly high-spending Labour authorities had, by *so doing*, damaged industry and lost jobs. [=spending highly] (=Cornish 1992, ex. 19d)

Again, the necessary event representations in these examples are presumably available in the discourse model, but the necessary syntactic VP sources — required under the hypothesis that *do so* is licensed by syntactic parallelism — are not.

These data suggest that *do so* patterns with deep-anaphoric forms in requiring only a suitable semantic referent. On the other hand, it remains the case that *do so* is infelicitous with situationally evoked referents, per surface anaphora. Therefore, *do so* cannot be appropriately characterized as belonging to either category, and we conclude that the requirement for syntactic parallelism and the ability to specify situationally evoked referents need to be distinguished in any general theory of anaphora.

4.3   Syntactic and Semantic Properties of *Do So*

Before attempting to explain the anaphoric properties of *do so* discussed in the previous sections, we will first outline some of its syntactic and semantic characteristics, especially given its superficial similarity to other forms which nonetheless have quite distinct properties.

It is well-known that in contrast to the auxiliary *do* of VP-ellipsis, it is main verb *do* that participates in *do so* anaphora. Several tests may be applied to establish this distinction. First, as noted by past researchers (Hankamer and Sag, 1976; Quirk et al., 1985; Miller, 1990; Dechaine, 1994, inter alia), VP-ellipsis is possible with auxiliaries besides *do*, as illustrated in (46a-c), whereas *do so* is restricted to main verb *do*, as illustrated in (47a-c).

(46) a. Bill signed the legislation, and Al did too. [auxiliary *do*]

b. Bill has signed the legislation, and Al has too.

c. Bill will sign the legislation, and Al will too.

(47) a. Bill signed the legislation, and Al did so too. [main verb *do*]

b. *Bill has signed the legislation, and Al has so too.

c. *Bill will sign the legislation, and Al will so too.

Furthermore, whereas VP-ellipsis is possible with stative referents, *do so* is limited to events ((Lakoff and Ross, 1966; Anderson, 1968; Bouton, 1970; Hankamer and Sag, 1976; Quirk et al., 1985; Miller, 1990; Dechaine, 1994); inter alia):

(48) a. Bill likes McDonald's, and Hillary does too.

b. ??Bill likes McDonald's, and Hillary does so too.

c. Al wants to be president, and Tipper does too.

d. ??Al wants to be president, and Tipper does so too.

Finally, as Miller (1990) notes, the *do* of *do so* does not undergo auxiliary inversion unlike the *do* of VP-ellipsis. Thus, compare the *do so* anaphora in (49a-c) with the VP-ellipsis in (49d-e):

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(49) a. Hillary did so.

      b. *Did Hillary so?

      c. Did Hillary do so?

      d. Hillary did.

      e. Did Hillary?

Past research has also determined that the *so* of *do so* is syntactically an adverb. As pointed out by Bouton (1970) and Quirk et al. (1985), inter alia, the *so* in *do so* contrasts with the pronominals *it* and *that* in *do it* and *do that* anaphora respectively, in that it does not passivize, as shown in (50a-c).[13]

(50) a. *...and so was done by Hillary.

      b. ...and it was done by Hillary.

      c. ...and that was done by Hillary.

Furthermore, unlike the other event anaphors, *do so* does not undergo clefting, as illustrated in (51a-d).

(51) a. It is that which Hillary did.

      b. *It is so which Hillary did.

      c. What Hillary did was that.

      d. *What Hillary did was so.

Previous accounts have been more equivocal on identifying the type of syntactic relationship that holds between main verb *do* and adverbial *so*. One might be tempted to treat *do* as a transitive verb, on analogy with *do it* and *do that*. However, such an account would quickly run into difficulties. First, *do* would then subcategorize for an adverbial, which would make it almost unique among English verbs with respect to its subcategorization properties.[14] Furthermore, one would have to stipulate that *do* subcategorizes for this one adverb alone; that is, *do* does not generally permit adverbials in this position, e.g., *do slowly, *do quietly.[15] We are thus led toward treating the *do* of

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[13]See Bouton (1970) and Hankamer and Sag (1976) for additional arguments that *so* is adverbial, as opposed to an NP or pro-S.

[14]The only other verb we know of that obligatorily subcategorizes for a manner adverbial is *word*, e.g. *She worded the letter *(carefully)*.

[15]A small number of other highly restricted uses of intransitive *do* with adverbials exist in Modern English. First, expressions such as *do well* or *do poorly*, which are quite distributionally restricted, require some type of competitive or otherwise evaluated event as a referent. For instance, whereas the expression *do well* is acceptable in (i), it is not so in (ii), cf. the form *do it well* in (iii):

    (i) Bill had his debate today. I'm sure he did well.

    (ii) Bill wrote his final project report today. ??I'm sure he did well.

do so as an intransitive verb, a position for which we present some historical evidence in the next section.[16]

Perhaps surprisingly, *do so* does not appear to have much in common with the other forms employing postverbal *so* discussed in Section 3.2. First, *do so* does not pattern with the more manner-oriented meaning of postverbal *so*, as that meaning permits reference to situationally evoked referents. Second, despite possible syntactic similarities with *believe so*, *think so*, and *remain so*, the *so* in *do so* is semantically quite different in that it is not used in the 'affirmative' sense noted for these other verbs.[17]

The evidence suggests instead that the semantic properties of *do so* correlate strongly with the preverbal *so* construction in general, and the *so doing* construction in particular. Like *do so*, *so doing* requires that its referent be non-stative, as illustrated by the contrast between (52b) and (52d), indicating that it is the main verb *do* that is operative.

(52) a. Bill signed the legislation and Al did so too.

b. Bill signed the legislation and, in so doing, made the Republicans angry.

c. #Bill liked the legislation and Al did so too.

d. #Bill liked the legislation and, in so doing, made the Republicans angry.

Thus, the *so doing* construction is distinct from the *so did* construction, in which it is auxiliary *do* that is operative, as seen in the contrast between (52d) and (53):

(53) Bill liked the legislation, and so did Al.

Likewise, one does not find the analog of *so doing* for other auxiliaries (e.g., **so canning*, **so wasing*), whereas one does find the analog of *so did* with other auxiliaries (e.g., *so can*, *so was*).

To summarize to this point, we have presented evidence for treating *do so* as a combination of an intransitive main verb *do* and an adverbial *so*. These properties are shared with the *so doing* construction, suggesting that they are in fact different realizations of the same underlying form. In this observation we find the explanation of the observed anaphoric properties of *do so*.

(iii) Bill wrote his final project report today. I'm sure he did it well.

Note, however, that despite its restricted domain, this construction is nonetheless compositional. Second, one might consider the greeting *How do you do?* as *do* plus the manner adverbial *how*; however, this expression is clearly a fixed (and essentially unanalyzable) idiom and thus not germane to the issue at hand.

[16]Interestingly, although modern American English lacks a fully productive use of intransitive *do*, British English does appear to have such a use after modals and auxiliaries (Quirk et al., 1985):

(i) Bob says he is going to join the Labour Party. It will be interesting to see whether he does do. (=Quirk et al. 1985, ex 12.22a)

[17]There is a superficially similar construction involving *do* in which *so* is used with this affirmative sense:

(i) [Context: Sally is teasing Johnny at school]
Sally: I know you have a crush on Cindy.
Johnny: Do NOT!
Sally: Do SO!

In this *do so* construction, intoned with a contrastive pitch accent on *so*, it is the auxiliary — and not main verb — *do* that is operative; thus, it is not the same *do so* construction we have been addressing here.

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4.4 An Account of *Do So*

In Section 3.1, we proposed an account of the information status constraints that preverbal *so* imposes on its referents, specifically that they must be discourse-old and salient. While these constraints impose no requirement of parallel syntactic form, the fact that the referents of preverbal *so* must be discourse-old precludes the possibility of their being situationally evoked.

In this light, *so doing* is simply a special case of the preverbal *so* construction, in which the *doing* can be seen as the most general class of events. Thus, the *so doing* construction is simply a form of hyponymic reference, as is commonly found with NP anaphors.[18] This progression from specific to more general classes is illustrated in (54a-c).

(54) John Gotti dispensed with his mob boss by shooting him in broad daylight, with plenty of witnesses around.

a. By so shooting him, Gotti established himself as his victim's likely successor. [same verb]

b. By so murdering him, Gotti established himself as his victim's likely successor. [more general hyponym]

c. By so doing, Gotti established himself as his victim's likely successor. [most general hyponym]

This analysis accounts for all of the properties of *so doing* and *do so* described thus far. First, these forms specify semantic referents without regard to syntactic parallelism, just as we would expect of any anaphoric expression interpreted with respect to a discourse model. In fact, given the syntactic properties of *do so*, it is not particularly surprising that there is no requirement for syntactically parallel antecedents. Such requirements have been posited for forms of ellipsis (e.g., VP-ellipsis, gapping) in which the syntactic representation of the clause containing the ellipsis is assumed to have an empty node. The need for syntactic parallelism arises either from the fact that a deletion process has applied at this node (Sag, 1976) or from the need to *reconstruct* syntactic material at this node (Williams, 1977; Kitagawa, 1991; Lappin, 1993; Fiengo and May, 1994; Hestvik, 1995). Unlike these forms of ellipsis, however, there is no syntactic evidence that *do so* leaves behind an empty node in the syntax, and thus there is no site for deletion or reconstruction.

Second, the referents of both forms are restricted to non-stative events. This constraint results simply from the fact that stative referents are not 'doings', that is, *doing* is not a more general class of these referents, so hyponymic reference fails. Finally, we have explained why neither form can specify situationally evoked referents, as they are simply special cases of the preverbal *so* construction whose referents must be discourse-old.

The remaining issue is how a postverbal *so* construction like *do so* came to have the anaphoric properties of preverbal *so*. The historical development of *do so* may shed further light on this question. For instance, Higgins (1992) describes the Old English form *swa don*, from which *do so* is derived, in the following way:

...the *swa don* construction was...a construction of a full verb *don* with a deictic-anaphoric manner adverbial *swa*, having a sense something like "to act in such a manner,

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[18]For example:

(i) John Gotti was arrested today. *The mobster* is accused of killing his former mob boss.

in that manner". The verb is intransitive and has a very general sense, being used of the acts and activities of agents. The adverb is a manner adverb, modifying the verb in the usual fashion of manner adverbials, the only special property being that it picks up its content from the context. (Higgins, 1992, p. 5)

Higgins' characterization of the properties of *swa don* is consistent with our analysis of *do so* and, as our account would predict, one finds the adverb in *swa don* realized in preverbal position. It would appear that in the move from *swa don* to *do so*, the form underwent syntactic changes while keeping its anaphoric properties relatively intact.

5   Conclusion

In this paper, we drew upon a large corpus of naturally occurring data to provide an analysis of identifier *so* based on the informational structure of the discourse in which it occurs. It was shown that anaphoric expressions marked with *so* impose a combination of constraints on the information status of their referents that is not found for any NP anaphor in English. Furthermore, different constraints were shown to apply depending on whether the anaphor appears in preverbal or postverbal position.

We then considered the event anaphor *do so* in light of our analysis. In contrast to previous works treating *do so* as a highly idiosyncratic form, we showed that many of its properties are afforded a compositional explanation as predicted by our more general account of *so*. Our account puts to rest the oft-heard claim that *do so* imposes parallelism constraints on the syntactic form of the clause containing the antecedent. Certain idiosyncracies remain, however; in particular we showed that *do so* amalgamates properties of preverbal and postverbal uses of *so*. This might be explained by the properties of the Old English form from which *do so* is derived, in which the adverb was realized in preverbal position.

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