

Null Operator Structures in English

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1. Introduction

The purpose of this thesis is to survey theories on null operator(=NO) constructions with special reference to English, and to provide adequate accounts for the properties and distribution of the NOs and the phenomena closely related to them, within the principles and parameters approach to the grammar of natural languages.

We assume that NO constructions should follow more or less directly from independently needed, general principles of Universal Grammar

(=UG). The syntax of NO constructions presumably provides a reflex of the interaction of certain abstract principles in UG. There are no specific rules in the grammar dealing with NO constructions but their distribution and interaction may result from the interaction of principles of UG and Language-particular rules, which interact to yield the distribution and interpretation of NO construction in English. The study is conducted within the framework of Government-Binding theory presented originally in Chomsky (1981) and elaborated further in Chomsky (1986a, b).

Chomsky (1973) argues that relative clauses as in (1) are derived by deletion of an overt wh-operator which has previously been moved to COMP, as shown in (2)

(1) the person Bill saw

(2) a. [_{NP} the person_i [_{s'} [_{COMP} who]_s Bill saw t_i]]

b. [_{NP} the person_i [_{s'} [_{COMP} [_s Bill saw t_i]]]]

We assume that who is deleted after the movement to COMP from the position of t since it is a kind of dummy operator which has no semantic content. But it is against the principle of the Null Hypothesis to posit a category at D-structure, which would be deleted at S-structure.

In Chomsky (1977), NO constructions include relative clauses, infinitive relatives, purpose clauses, clefts, pseudoclefts, topicalizations, and comparatives, which show the same island effects as wh-movements.

"On Binding" (=OB: Chomsky 1980) argues that, in NO constructions, a base-generated PRO moves to COMP, creating an operator-variable chain analogous to that created by overt wh-operator movement. This is referred to as an empty category-headed A'-chain. Let's look at the examples in (3) below.

(3) a. John bought it [_{CP} [_{IP} PRO to play with PRO]]

b. John bought it [_{CP} PRO_i [_{IP} PRO to play with t_i]]

OB obviates the need for wh-movement by assuming that PRO containing the feature [+wh] moves to COMP, namely the Spec of CP. Therefore, in (3b) the PRO in the Spec position of CP functions as an operator, and that in the second as an argument PRO. But there are problems with positing the existence of the two PROs since we have no motivation for seeing similarities or differences between operator PRO and argument PRO

the men, though it is not locally bound by the men and is not the trace of the men. The value of the variable *e* is the referent of the matrix subject the men. However, this conclusion presupposes that the variable *e* must be A-free in the domain of the operator that A'-binds it, like normal R-expressions. Since *e* is a variable A'-bound by O, the structure must have been derived by application of Move- α from the D-structure (6).

(6) The men are too stubborn [_S COMP [_S PRO to talk to O]]

The relation of O to *e* in (5) is indeed a case of Move- α since the gap *e* satisfies the Subjacency Condition, along with other conditions that follow from the assumption that movement is involved in these constructions.

NO constructions are extended to parasitic gap (=PG) constructions in Chomsky (1985b).

(7) Which paper_i did you read t_i [_{PP} before [_{CP} O_j [_{IP} PRO filing t_j]]]

In (7), if the PG is regarded as trace left by wh-movement, it violates the Adjunct Condition or CED or Subjacency Condition since the PG may be moved out of the adjunct PP, but if we assume that the PG t_j is the trace of the movement of the NO to the Spec of CP in the adjunct clause, we have a chain consisting of the NO and the PG. Under this hypothesis, an element may be allowed to be extracted from within the adjunct clause containing the PG since no barrier intervenes between the NO and its gap. The NO analysis of PG constructions is conceptually and empirically motivated by several phenomena.

We assume that NO constructions involve predicational NO constructions and PG constructions. They exhibit complete distinction with respect to structural properties and licensing mechanisms, as proposed in Aoun and Clark (1984) and Browning (1987).

According to Aoun and Clark (1984), NOs may occur in two types of contexts, one of which involves the local binding of the NO by an element in an A'-position and the other of which involves a predication structure. NOs are treated as anaphors in the first context and as predicate variables in the second context. A predication structure is involved in constructions such as purposive clauses and tough constructions, which involve the local binding of the NO by an element in A'-position.

Aoun and Clark's proposal that NOs are anaphors accounts for the

locality requirements which hold between the parasitic A'-chain and the real A'-chain in the case of PG constructions. The locality constraints concern the domain in which the NO must be licensed. The NO must be A'-bound in its governing category. Aoun and Clark restrict these claims to NOs in PG constructions. However, the claims do not apply to predicational NO constructions which are provided as counter-examples.

Browning (1987) argues that predicational NO constructions are licensed under non-thematic predication. A complex predicate containing the predicational NO licensed by the agreement chain holding between its Spec and its subject. However, PG constructions are not licensed under predication, but by the Chain Link Condition.

In this respect, the main focus of the thesis is given to the correlation and distinction with respect to predicational NO constructions.

In Chapter 2 we discuss predicational NO constructions in Browning (1987). We proceed to discussions, with the main focus on some predicational NO constructions such as relative clauses, Clefts, tough-constructions, etc.

We introduce Chomsky's (1986a) Strong Binding Condition and Contreras' (1989) analysis of the ungoverned predicational NO. We argue that predicational NOs may be ungoverned and behave like PRO and be subject to control. However, it is argued that there are problems with Control in connection with an ungoverned PRO in the COMP position in a predicational clause. We make clear that predicational NOs must be licensed under predication, rather than by Control as in PRO.

IN chapter 3 we sum up our discussions and provide concluding remarks.

II. Null Operator Constructional of Predication

In this chapter, we discuss predicational NO constructions. It is argued that predicational NO constructions are licensed under non-thematic predication (Browning 1987), while θ -role assignments license thematic predication holding between a simple predicate and its Spec and its subject.

On the assumption that predicational NOs are ungoverned since predicational NO structures are not complements but adjuncts to the matrix verbs, Contreras (1989) argues that predicational NOs behave like PRO and are licensed by Control Theory. More specifically, they may be licensed either by c-commanding antecedents or be discourse-licensed.

On the basis of these considerations, in this chapter we discuss Browning's (1987) analysis, based on Williams' (1980, 1986) Predication Theory, and Contreras' (1989) analysis of ungoverned predicational NOs. It

is argued that the analysis of operator PRO is not relevant to the interpretation of standard PRO. We suggest that the problems with the operator PRO analysis do not arise with NO analysis. We argue for Browning's argument that predicational NO are predicate variables to create complex predicates form predicational clauses, which are licensed under non-thematic predication.

2.1. Theoretical Background

2.1.1. Types of Predicational Null Operator Construction

Chomsky (1977) argues that following properties are involved in wh-movement.

- (1) a. It leaves a gap
- b. Where there is a bridge, there is an apparent violation of the Subjacency Condition, the Propositional Island Constraint (PIC) and the Specified Subject Condition (SSC).
- c. It observes the Complex NP Constraint (CNPC).
- d. It observes wh-Island Constraints.

The constructions analyzed as involving wh-movement in the basis of the properties in (1) include the following.

- (2) Indirect Questions
 - a. I wonder who_i Bill met t_i
 - b. * I wonder what_i Bill discussed the claim that John had mishandled t_i
- (3) Tensed Relatives
 - a. the man who_i Bill met t_i
 - b. * the case_i Bill discovered the claim that John had mishandled t_i
- (4) Comparatives
 - a. Mary isn't the same as she was t_i five years ago
 - b. * Mary isn't the same as John believes Bill's claim that she was t_i five years ago.
- (5) Topicalization
 - a. This book_i, I really like t_i
 - b. * This book_i, I accept argument that John should read t_i

(6) Clefts

- a. It is this book_i that I really like t_i
- b. * It is this book_i that I accept the argument that John should read t_i

(7) Infinitival Relatives

- a. I found a book_i for you to read t_i
- b. * I found a book_i for you to insist on the principle that Tom should read t_i

(8) Degree clauses

- a. John_i is tall enough for you to see t_i
- b. * John job_i is important enough for us to insist on the principle that the committee should advertise t_i

(9) Easy complements

- a. John_i is easy for us please t_i
- b. * John_i is easy for us to describe to Bill a plan to assassinate t_i

In Chomsky (1980) purposive clauses are included in wh-movement constructions,

- (10) a. John bought Bill a new toy_i/it_i to play with t_i
- b. * John bought it_i to devise a plan with t_i

Based on Chomsky (1977), Browning (1987) classifies relatives, tough-constructions, purposives, too degree clauses, and clefts as predicational NO constructions. She excludes indirect questions since they do not involve NOs. Topicalization is also excluded since NOs are not always involved in Topicalization structures. Topicalization involves adjunction to IP.

In this chapter we analyze relatives, though-constructions, and clefts.

2.1.2. Predication Theory

In Williams (1980), predication is the relation which holds between predicates and their subjects. Predicates refer to NP, VP, AP, PP, S, AND S'. Among these, NP, VP, AP, and PP are simple, headed predicates. In the case of simple predication, the subject is the external argument which receives a θ -role from the head of the predicate. The subject satisfies the θ -criterion at the θ -position. Therefore, it is an argument with closed, complete, saturated function. On the other hand, predicates are non-

argument XP in θ -position, so they are not θ -marked and have open, one-place, incomplete function requiring saturation. Generally, an argument refers to an NP, but a sentence can be an argument when it is θ -marked like an NP and involves closed, complete function requiring saturation, since a head is saturated if its θ -roles are fully realized.

- (11) a. The enemy destroyed the city.
 b. The enemy's destruction of the city.

In (11a), the θ -roles of destroyed, the head of the VP, are fully realized since they are assigned to The enemy (subject) and the city (object). Therefore, destroyed is saturated. Similarly in (11b), destruction, the head of the NP, is saturated as having closed, complete function since its θ -roles are fully realized by the enemy and the city as in (11a).

In contrast, the clausal categories S (=IP) and S' (=CP) are "complex predicates" and are able to function as such when they contain "predicate variables."

- (12) a. [_S PRO VP]
 b. [_S {PRO/WH} S]

PRO and in (12b) are predicate variables since they occupy open positions in and create one-place predicates from the S or S', which are defined as complex predicates.

- (13) John_i promised Bill [PRO to leave]_i

In (13), the clausal complement (PRO to leave) is a complex predicate formed by the predicate variable PRO. The complex predicate is saturated by the subject John. PRO cannot be replaced by a lexical NP since, by definition, lexical NPs do not occupy open positions. If they did there would no longer be a predicate variable to create a complex predicate from the S.

According to Rothstein (1983), subjects and predicates must m-command each other, a relationship which has a basis in the concept of c-command by Aoun and Sportiche (1981).

- (14) Aoun and Sportiche c-command
 α c-commands β if and only if every maximal projection dominating α also dominates β .

Mutual c-command, i.e., α c-commands β c-commands α means that α and β share all Maximal projections. That is to say, there is no maximal projection dominating α which does not also dominate β and there is no maximal projection dominating β which does not also dominate α .

(15) [_{NP} John]_{VP} made [_{AP} [_{NP} Bill]_{AP} sick]]

In (15) the subject NP John receives a θ -role from the predicate VP and they m-command each other. The predicate AP assigns a θ -role to the NP Bill and they m-command each other. Thus, the predicate-subject relation is licensed.

We will now consider relative clauses.

(16) a. the man [_{CP} {who_i / O_i} [_{IP} I saw t_i]]
 b. * the man [_{CP} [_{IP} I know [_{CP} {who_i / O_i} [_{IP} Bill likes t_i]]]]

In (16a), the overt wh-operator who and the null operator O are dummy operators which cannot determine the values of their variables to create the predicate of the argument the man from CP. That is, CP is a complex predicate which is saturated only by the argument the man.

who or O in (16b) is a predicate variable and the containing CP may be a complex predicate, but CP and its potential subject the man do not m-command each other. Therefore, predication fails and CP is not saturated. Thus, an overt or NO of a relative clause must be in the Spec of the relative clause, i.e., they cannot appear in the Spec of a lower CP contained in the relative clause, due to the violation of the m-command condition by the intervening maximal projections, as illustrated in (16b).

We will next consider infinitival relatives.

(17) a. a man [_{CP} [_{IP} PRO to do the job]]
 b. * the people_i [_{CP} [_{IP} it is illegal [_{CP} PRO_i to cross this border]]]
 c. * the woman_i [_{CP} [_{IP} John_j is too stubborn [_{CP} PRO_i to bother herself, about e_j]]]

In (17a), there is no predicate variable in the Spec position of CP, but CP would be a complex predicate if it is assumed either that PRO moves to the Spec of CP and becomes a predicate variable or that CP is deleted as a non-

variable and the AP containing O is a complex predicate, and O is adjoined to AP to satisfy the mutual m-command condition on subject-predicate relations. The subject John is raised from the Spec position of AP to receive a θ -role from be, which assigns a θ -role to the NP trace of John. easy assigns a θ -role to CP following it. Thus, the predicate relation between AP and the subject t is licensed and t is identified by John. But the problem is how the θ -role is assigned to NP, the subject of AP, by be.

- (20) a. * I consider John_i [_{NP} O_i [_{NP} a great admirer of e_j]]
 b. * John_i is/has become [_{AP} O_i [_{AP} proud of e_j]]
 c. * I consider John_i [_{AP} O_i [_{AP} proud of these picture of e_j]]

In the sentences in (20), O is contained within NP or AP which is a predicate independently of the presence of a chain. By hypothesis, APs and NPs are structurally able to host NOs. O in (20) is a predicate variable which is able to from the complex predicate NP or AP and its subject NP do not m-command each other, so the subject-predicate relation is not licensed and the structures are correctly predicted to be ungrammatical.

2.2. Relevant Constructions

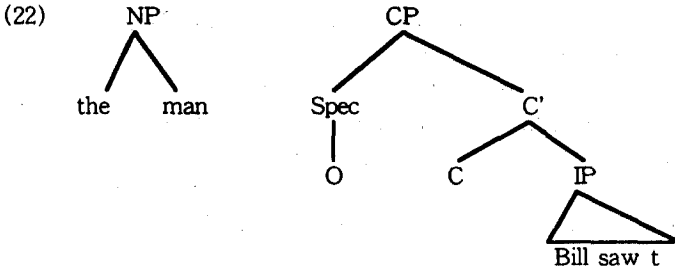
Now we consider how non-thematic predication is applied to predicational NO constructions.

2.2.1. Relative Clauses

It is well-known that overt or null relative operators must be in the Spec of CP within relative clauses, as in (21)

- (21) a. the man [_{CP} who_i [_{IP} Bill saw t_i]]
 b. the man [_{CP} O_i [_{IP} Bill saw t_i]]

Here, the relative operators here are predicate variables creating the complex predicate of the argument the man from CP. CP is saturated by the argument the man. If we assume that vertical binding is involved in the structure as in thematic predication, but distinct from θ -role assignments, then we can say that the operator who or O is vertically bound by the containing maximal projection CP. The complex predicate CP must be linked to the subject the man by an agreement chain since it is not licensed by a θ -role assignment.



In (22), O and C may have index-sharing by Spec-Head agreement. Then C's index percolates up to CP via the Head-Projection agreement. The Spec-head agreement and Head-Projection agreement constitute vertical binding. Thus, CP, which has a predicate variable, is linked to its subject the man and is predicated of it. The structure in (22) also satisfies Browning's (Revised) TRAC, since maximal projection may not intervene between CP and the subject NP.

The (Revised) TRAC may account for the ungrammaticality of (23)

(23) * [_{NP} the man]_i [_{IP} I know [_{CP} O_i Bill likes t_i]]

Here, the relative O must in the Spec of the relative clauses, i.e. it cannot appear in the Spec of the lower CP contained in the relative clause. O is vertically bound by CP by means of Spec-Head and Head-Projection agreement. However, CP cannot be linked to and predicated of the subject NP since the maximal projection IP comes between CP and NP. Hence, (23) is correctly predicated to be ungrammatical. The agreement chain also applies to the interpretation of finite relative clauses not containing NO, as shown below.

(24) a man_i [_{CP} who_i [_{C_i} [_{C_i}]_i [_{IP} t_i [_{VP} fixed the sink]]]]

In (24), C agrees with its maximal projection CP by Head-Projection agreement and C agrees with who by Spec-Head agreement. Spec agrees with CP by CP vertical binding (Spec-maximal Projection agreement). Finally, the complex predicate CP is linked to its subject a man under non-thematic predication. Here TRAC is not violated since no maximal projection intervenes between CP and its subject a man.

Let us now consider an infinitival relative clause.

(25) a man_i [_{CP} [_{IP} PRO_i to fix the sink]]

In (25), PRO is an unidentified element like O. The Spec of IP (PRO) agrees with the head INFL (to) by Spec-Head agreement and the INFL agrees with IP by Head-Projection agreement. Thus, the Spec agrees with IP by IP vertical binding. IP is predicated of the subject NP a man under non-thematic predication. The structure satisfies TRAC and the mutual c-command condition since CP deletes due to a tree convention that a non-branching node may delete. PRO is still ungoverned after the deletion of CP since IP is not L-marked by the NP a man.

TRAC may account for the ungrammaticality of (26)

(26) * [_{NP} the man]_i [_{IP} I know [_{CP} O_i Bill likes t_i]]

In (26), O is vertically bound by CP via Spec-Head agreement and Head-Projection agreement. However, CP is not vertically bound by IP since successive vertical binding occurs only in thematic predication for the satisfaction of θ -roles. θ -roles are assigned successively in thematic predication, but non-thematic predication requires only index-sharing independently of θ -role assignments. In this structure, TRAC is violated because the maximal projection IP intervenes between NP and CP. Therefore, CP is not saturated as a complex predicate by the NP the man. Consider the ungrammaticality of the following sentence :

(27) * the people [_{CP} [_{IP1} it is illegal [_{IP2} PRO to cross the border]]]

In (27), PRO may not move to the Spec of CP since the trace (variable) would not be Case-marked and hence the Case Filter would be violated. CP deletes due to a tree convention that a non-branching node may delete. The maximal projection IP intervenes between NP and IP, so that (27) violates TRAC and no predication results.

From the cases of null relative clauses and infinitival relative clauses, we may see that there are two kinds of predicate variables. One is O in the Spec of CP and the other is PRO in the Spec of IP. Non-thematic predication analysis can account for the contrast between the two cases quite well.

2.2.2. Tough Constructions

As we have seen, adjectives of the easy-category never assign a θ -role to their matrix subjects when they have clausal complements: the matrix subject assumes the θ -role of its coindexed trace, exactly as in the case of movement. But adjectives of the easy-category also take clausal complements that prevent the matrix subject position from being a θ -position. Consider the structures below

- (28) a. John is easy to please.
 b. John is [_{AP} easy [_{CP} O_i [_{IP} PRO to please t_i]]]

The adjective in a tough-construction has only an internal θ -role to assign; in the case of (28) this θ -role is assigned to the complement clause CP. It is clear that the matrix subject is not licensed by a θ -role assignment, as the head A no longer has a free θ -role to assign. Hence the matrix subject John must be licensed via agreement with a predicate variable.

- (29) [_{IP} [_{NP₁} John_i]_{I'} PRES [_{VP} be [_{AP₁} [_{NP₂} t_i [_{AP₂} [O_i [_{AP₃} easy [_{CP} t'_i [_{IP} PRO to please t_i]]]]]]]]]]]

In (29) John is not the Spec of IP (the subject of IP), but the subject of the AP small clause. According to Chomsky (1986b), an AP small clause is a base-generated adjunction structure like relative constructions, so the subject of the AP small clause is not in the Spec position, but in the base-generated structure of the clause.

It is plausible to assume that O is adjoined to AP. O agrees with the adjective easy by Spec-Head agreement, and easy agrees with AP via Head-Projection agreement. Thus O is vertically bound not by CP, but by AP₂, which can be saturated by NP₂ by non-thematic predication. TRAC is satisfied since there is no maximal projection between AP₃ and NP₂. Therefore, O is identified since t, the trace of O, is strongly bound (a trace of an operator is strongly bound if the trace is bound operator, and its value is determined by the antecedent if the operator is dummy and has no semantic value). Thus, the trace here is, in a different sense, strongly bound since its value obtains through the dummy operator. On the other hand, John of NP₂ moves to NP₁ at SS to satisfy the Case Filter: since NP₂ has no Case, it has to move to NP₁ to be assigned Case.

2.2.3. Clefts

- (30) a. It is this book [_{CP} O_i that I really like t_i]
 b. * It is this book [_{CP1} O_i that I accept [_{NP} the argument [_{CP2} that John should read t_i]]]

Assuming NP movement where a NO is not involved, the grammaticality of (30a) is not predicated since CP and IP will be barriers. However, NO movement allows O to move to the Spec of CP since is no barrier between t and O.

"It isthat" is base-generated at DS and O is a predicate variable to create the complex predicate from CP. In (30a), CP vertically binds O by the agreement chain and is saturated by this book by the non-thematic predication. This analysis of the cleft clause seems to assume that CP is relativised clause of the NP this book. (30b) is ungrammatical since it violates CNPC and the Subjacency Condition and hence the movement of O to the Spec of CP is not possible. The same explanation may be applied to the following sentences.

- (31) a. This book [_{CP} O_i I really like t_i]
 b. * This book [_{CP1} O_i I accept [_{NP} the argument [_{CP2} that John should read t_i]]]

The topicalization structures in (31) may be accounted for by non-thematic predication. CP in (31a) is predicated of the subject this book under predication since there is no barrier between them. However, no predication occurs in (31b) since CNPC or the Subjacency Condition is violated and hence the movement of O is not allowed.

III. Summary and Conclusions

We have surveyed some approaches to NO constructions in English and have tried to provide adequate accounts for the properties and distribution of NOs.

We assume that NO construction involve predicational NO constructions and PG constructions. They exhibit complete distinction with respect to structural properties and licensing mechanisms, as proposed in Aoun and Clark (1984) and Browning (1987).

Predicational NO constructions are licensed under non-thematic

predication (Browning 1987), while θ -role assignments license thematic predication holding between simple predicates and their subjects (Williams 1986). Complex predicates containing predicational NOs are licensed by the agreement chains holding between their Specs and their subjects.

On the assumption that predicational Nos are ungoverned since predicational NO structures are not complements but adjuncts to the matrix verbs, Contreras (1989) argues that predicational Nos behave like PRO and are licensed by Control Theory.

We argue that the interpretation of the operator PRO is not relevant to the licensing of predicational NOs. First, Chomsky's (1980) Control Theory is relevant only to the argument PRO, not the operator PRO, so arbitrary reference should be possible but it is not. The operator PRO must be identified by the NPs in argument position.

Secondly, since NOs share almost none of the referential properties of the argument PRO, such an analysis of the operator PRO would require a major revision in Control Theory.

Thirdly, we don't regard all predicational NO clauses as adjuncts.

- (1) a. * John is easy.
 b. This problem is easy.

If the subject of 'easy' is a person as in (1a), the predicate 'easy' has to be followed by a predicational clause as a complement, which is not the case in (1b). Therefore, one might counter-argue that (1a) shows that predicational NO clauses are not adjuncts.

There are some pieces of evidences for this. First, Levin argues that such NOs occur exclusively in structures of predication. Clauses headed by NOs must be in a predication relation with some other element in order to be licensed.

Second, the assumption is supported by Aoun and Clark (1984), where it is assumed that predication structures are involved in constructions such as tough clauses.

Third, we can integrate thematic predication and nonthematic predication, to solve problem with Browning's assumptions. For example, non-thematic predication does not occur within thematic predication. Or we can revise the Theta-Role Assignment Constraint. Thus, we can restrict predication to deal with Problematic predication structures.

In conclusion, under NO analysis, predicational NOs in English must be licensed under predication, and the NOs in typical PG constructions and

there PGs must be licensed under ECP, together with the mechanism of Contreras' (1989) Modified Strong Binding Condition. The licensing mechanism for subject-internal PGs have to be explored.

Notes

1. This fact was originally pointed out by Ross (1967).
2. An opaque domain : according to Chomsky (1981, pp. 157-158), the subject of an infinitive is the one transparent position for PRO. The subject of a tensed sentence and the c-command domain of the subject of any category are two opaque domains.
3. This means that a controller of a PRO is its nearest NP. Y.S. Kim (1989) argues that the Minimal Distance Principle results from c-command and θ -hierarchy.
4. Chomsky (1982) proposes the following algorithm for the functional determination of empty categories :
 - i) An EC is a variable if it is in an A-position and is locally A' bound.
 - ii) An EC in an A-position that is not a variable is an anaphor.
 - iii) An EC that is not a variable is a pronominal if it is free or locally A-bound by an antecedent with an independent θ -role.
5. This means that every operator must bind a variable.
6. CED(Condition on Extraction Domain : Huang 1982) : A phrase A may be extracted out of a domain B only if B is properly governed.

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