

## Question embedding without *wh*-interrogatives: A unified account\*

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**Abstract** We present a novel analysis of indirect *Q-NP*-questions in Akan (Kwa, Niger-Congo), which come in the form of relativized NPs without *wh*-syntax. We propose a unified analysis of Akan *Q-NPs* (Zimmermann 2018) and their English *wh*-counterparts on which a covert *Q*-operator abstracts over a variable expressed by a REL- or a *wh*-pronoun, respectively. Akan *Q-NPs* are licit because the language has cross-categorical operators which can attach to NP- and clausal constituents alike. The analysis accounts for the varying EXH-strength of such *Q-NPs* in Akan, and it is extendable to other non-Indoeuropean languages with *Q-NPs*. More generally, there seem to be two subtypes of NP/DP-based embedded questions in natural language: English-type *Concealed Questions* with a specificational meaning, and Akan-type *Q-NPs* with a standard Hamblin-question semantics.

**Keywords:** Akan, concealed question, relative clause, *Q*-operator, question embedding, *wh*-interrogative

### 1 Introduction: The puzzle

This paper addresses the following puzzle at the syntax-semantics interface: The West African language Akan (Kwa, Niger-Congo) has matrix *wh*-interrogatives, cf. (1), but no embedded *wh*-interrogatives, cf. (2).

- (1) **Hena na** di-i fufu no?  
who FOC eat-PFV fufu DEF  
'Who ate the fufu?' [matrix *wh*]
- (2) \*Dufie nim (sɛ) [**hena na** di-i fufu no].  
Dufie knows COMP who FOC eat-PFV fufu DEF  
INTENDED: 'Dufie knows who ate the fufu?' [\*embedded *wh*]

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Instead, the only way for expressing embedded questions is by means of a relativized NP with a pronominal or indefinite NP-head (Saah 1994; Zimmermann 2018), cf. (3). We will call such question objects *Q-NPs* in what follows.

- (3) Dufie nim [<sub>NP</sub> **nipa aa** o-di-i fufu no].  
 Dufie knows person REL 3SG-eat-PFV fufu DEF  
 ‘Dufie knows who ate the fufu.’  
 (lit. ‘Dufie knows person that ate the fufu’). [Q-NP]

Crucially, the *Q-NP* strategy is the only strategy across Q-dimensions and predicates, with the sole exception of rogative predicates, such as *bisa* ‘ask’, *hwehwemu* ‘investigate’ and the speech-act verb *ka* ‘tell’. These verbs accept both *wh*-embedding and *Q-NPs*. (4) illustrates the ban on embedded *wh* with the *wh*-item *ɛhe (fa)* ‘where’ with the verb *were firii* ‘forget’ in (4a). The only licit option is the *Q-NP* in (4b):

- (4) a. \*Dufie were firii (sɛ) [**ɛhe (fa) (na)** Kofi di-i fufu no].  
 Dufie forgot COMP where FOC Kofi eat-PFV fufu DEF  
 INTENDED: ‘Dufie forgot where Kofi ate the fufu.’ [\*emb.*wh*]  
 b. Dufie were firii [<sub>NP</sub> **bebi-a** Kofi di-i fufu no].  
 Dufie forgot place-REL Kofi eat-PFV fufu DEF  
 ‘Dufie forgot where Kofi ate fufu.’  
 (lit. ‘Dufie forgot place that/at which Kofi ate the fufu.’) [Q-NP]

The analytical problem is hence the following: Even though Akan *Q-NPs* are nominal objects, they can still denote question meanings like English embedded *wh*-interrogatives. This leads us to the following three research questions:

- Q1** How to compositionally derive question meanings from NP-constituents?  
**Q2** Is it possible to give a unified analysis for embedded *wh*-interrogatives in English and for *Q-NPs* in Akan?  
**Q3** Do Akan *Q-NPs* have the same semantics as English *Concealed Questions* (e.g. *to know the price*), or do they use another semantic mechanism for deriving the question interpretation?

Q1 has been widely discussed in the literature on (English) *Concealed Questions* (*CQs*), such as (5) (see Heim 1979; Romero 2005, 2007b,a; Nathan 2006; Aloni & Roelofsen 2011; Frana 2017, a.o.). However, *CQs* have been mostly discussed in connection with functional NPs without clausal substructure (with the exception of Nathan 2006), unlike what we find in Akan.

- (5) Mary knows [<sub>NP</sub> the temperature of the lake].  
 = ... *what the temperature of the lake is*

Q2 will be answered in the affirmative when we develop our unified analysis in section 3. As for Q3, we will maintain that Akan *Q-NPs* differ semantically from *CQ-DPs* in English. In section 5, we will suggest that there are two different ways for nominal NP/DP-constituents to denote question objects.

The discussion of the Akan data here is of general significance for a better understanding of the syntax-semantics interface in natural language for two reasons: Firstly, Akan differs from Indo-European languages, such as English. In English, *CQs* are considered a marked alternative to embedded *wh*-interrogatives, and hence in need of special interpretive mechanisms (e.g. covert typeshift-operators). In Akan, however, relativized *Q-NPs* are the ONLY way of expressing embedded questions, and they do not come with the interpretive restrictions observed with standard *CQs* in English. This suggests that Akan *Q-NPs* involve a more general interpretation procedure for embedded questions. Secondly, Akan is not the only language to express embedded questions by means of *Q-NPs*. The same has been observed for many other languages from different families, such as Hausa (Zimmermann 2018), Abaza (Arkadiev & Caponigro 2021), Kipsigis (Maria Kouneli p.c.), Atchan (Jarvis 2024), and also French and Spanish (Bombi & Lecavelier in prep.). This widespread phenomenon is in urgent need of formal analysis.

To anticipate the analysis to come, we assume that the relative NP-heads in Akan *Q-NPs* are constituted by indefinite NPs or pronouns expressing a restricted variable. Drawing on recent analyses of the Akan determiner system (Owusu 2022; Philipp 2023), we assume that operator elements (**Q**, DEF, EXH) can apply cross-categorially to NPs and clauses in Akan. (6) shows the parallel syntax of Akan *Q-NPs* and embedded *wh*-interrogatives. The Q-operator abstracts over the restricted pronominal/NP-variable inside the Akan *Q-NP* in (6a) and yields the same standard question meaning as for the embedded *wh*-clause in (6b) in a unified Baker (1970)-style analysis, cf. (7):

- (6) a. Kwame nim [<sub>NP</sub>  $\text{ɔmo}_1$  aa  $\text{ɔmo}$ -huu Kofi] **1** **Q**<sub>1</sub>].  
 Kwame know 3PL REL 3PL-saw Kofi  
 ‘Kwame knows *persons/ones who* saw Kofi (= *who* saw Kofi).’ [Akan]  
 b. Kwame knows [**Q**<sub>1</sub> [<sub>CP</sub> **who**<sub>1</sub> saw Kofi]]. [English]
- (7)  $\lambda p. \exists x [p = \lambda w. x \text{ saw Kofi in } w]$

Section 2 introduces the relevant data on *Q-NPs* in Akan. Section 3 will then present our unified analysis of *Q-NPs* and embedded *wh*-questions in more detail. Section 4 discusses additional predictions and questions. Section 5 discusses differences between *Q-NPs* and run-of-the-mill *Concealed Questions* with functional nouns and no clausal substructure. The upshot of the discussion will be that natural language has at least two systematic ways of deriving question meanings from nominal

constituents at the syntax-semantics interface.

## 2 Akan *Q-NPs*: Formal and semantic properties

Akan (Kwa, Niger-Congo) is mainly spoken in southern Ghana by about 10 million native speakers. It subdivides into three major dialect groups. Our data come from original fieldwork and an experiment conducted with 28 speakers of the Asante Twi dialect. This section introduces the major formal and semantic properties of Akan *Q-NPs*. We will look at properties of the (pronominal) NP-head, at the embedding predicates, and at the exhaustive strength of *Q-NP*-meanings.

### 2.1 Properties of the (pronominal) NP-head

Akan *Q-NPs* always involve a pronominal head, as in (8), or a lexical NP, as in (9), often accompanied by the optional INDEF-marker *ko*, cf. (10). It is possible that the NP *mmerɛ* in (9) has been grammaticalized as a pronoun in the temporal domain.

- (8) Me-n-nim [NP **ɔmo aa** / **ne-a** di-i fufu].  
 1SG-NEG-know 3PL REL / person.SG-REL eat-PFV fufu  
 ‘I don’t know who<sub>pl/sg</sub> ate fufu.’ [Pronominal head]
- (9) Me-n-nim [NP **mmerɛ aa** Kofi di-i fufu].  
 1SG-NEG-know time REL Kofi eat-PFV fufu  
 ‘I don’t know when Kofi ate fufu.’ [Lexical NP]
- (10) Me-n-nim [NP **krataa (ko) aa** Akua kan-n yɛ].  
 1SG-NEG-know book certain REL Akua read-PFV PFV.OBJ  
 ‘I don’t know which book Akua read.’ [Lexical NP (+INDEF)]

Szarvas, Bade, Bimpeh & Lecavelier (2023) provide experimental evidence that Akan *Q-NPs* are semantically specified for number via the phi-features of their head (at least in the domain of humans). PL-marked *Q-NPs* with *ɔmo aa* ‘3PL REL’ are semantically plural and only accept PL-follow ups, whereas SG-marked *Q-NPs* with *nea* ‘PERSON.SG-REL’ are semantically singular and only allow for SG-follow ups:

- (11) Kofi nim {**ɔmo aa** ɔmo-sraa / **ne-a** ɔ-sraa} wo ɛnora...  
 Kofi knows 3PL REL 3PL-visited person-REL 3SG-visited you yesterday  
 ‘Kofi knows who<sub>PL</sub>/who<sub>SG</sub> visited you yesterday...’
- (12) a. with PL *ɔmo*: # (namely, *Esi*<sub>SG</sub>). / ✓ (namely, *Esi*, *Abena* and *Afiba*<sub>PL</sub>).  
 b. with SG *nea*: ✓ (namely, *Esi*<sub>SG</sub>). / # (namely, *Esi*, *Abena* and *Afiba*<sub>PL</sub>).

## 2.2 Embedding predicates

In Akan, the *Q-NPs* strategy is available with all rogative and responsive predicates, unlike what has been found for English *CQs* (Dor 1992; Nathan 2006). We illustrate this below for the rogative counterparts of English *ask* and *wonder*, cf. (13-14), and for the emotional factive *eni agye afa* ‘be happy’, cf. (15).

- (13) a. Kwame **bisaa** [NP **dee** Akua kan-n yɛ].  
Kwame asked thing.REL Akua read-PFV PFV.OBJ  
‘Kwame asked the thing that (= *what*) Akua read.’ [Akan *Q-NP*]  
b. \*Kwame asked the book that Akua read. [English *CQ*]
- (14) a. Abena **dwen ho** [NP **ne-a** o-di-i nkonim].  
Abena wonders person.SG-REL 3SG-eat-PFV victory  
‘Abena wonders who won.’ [Akan *Q-NP*]  
b. \*Abena wonders [the winner/the person who won]. [English *CQ*]
- (15) Kojo **eni agye afa** [NP **deɛ** Kofi noa yɛ].  
Kojo is.happy thing.REL Kofi cook PFV.OBJ  
‘Kojo is happy about what Kofi cooked.’ [Akan *Q-NP*]

There seem to be no constraints on which predicates can select *Q-NPs* whatsoever.

## 2.3 Exhaustivity

The exhaustive strength of question interpretations is an important feature of the semantics of English embedded *wh*-interrogatives. As first observed in Heim (1994) and Beck & Rullmann (1999), these come with different exhaustivity levels (cf. also Groenendijk & Stokhof 1984; Klinedinst & Rothschild 2011; Theiler 2014; Uegaki 2015; Theiler, Roelofsen & Aloni 2018, i.a., for relevant discussion). (16a) and (16b) illustrate the Intermediate EXH- (IE) and Strong EXH-readings (SE) of (16):

- (16) CONTEXT: *At a party that A, B, C, D and E attended, only A and B danced.*  
John **knows** [who danced].
- a. Intermediate-Exhaustivity reading is true iff John knows that A and B danced; and he doesn’t have false beliefs about C, D and E.  
= *complete knowledge of positive true answer space*
- b. Strong-Exhaustivity reading is true iff John knows that A and B danced, and he knows that C, D and E didn’t dance.  
= *complete knowledge of entire answer space*

Elicitation-based investigations show that Akan *Q-NPs* exhibit the same variability in exhaustive strength, depending on the selecting predicate. For instance, the speech-

act predicate *tea mu ka* ‘to shout’ allows for IE-readings, as demonstrated by the felicity of the follow-up in (17). Since this follow-up violates the conditions imposed by SE, the felicity of (17) shows that it also has a weaker IE-reading. In contrast, the *Q-NP* with *nim* ‘to know’ appears incompatible with the same follow-up in (18), suggesting that only the SE-reading is available with this predicate. Once again, this parallels introspective assessments of *wh*-interrogatives under *know* in the early literature (Groenendijk & Stokhof 1984).

- (17) a. Maame Akosua **tea mu kaa** [ɔmo aa ɔmo-tae anoma]...  
 Mama Akosua shouted 3PL REL 3PL-ran.after bird  
 ‘Mama Akosua **shouted** who<sub>PL</sub> ran after a bird...’
- b. nanso w-antea mu anka se Yaw ne Akua antae anoma.  
 but 3SG-NEG.shouted COMP Yaw and Akua NEG.ran.after bird  
 ‘but she didn’t shout that Yaw and Akua didn’t run after a bird.’
- (18) a. Maame Akosua **nim** [ɔmo aa ɔmotae anoma]...  
 Mama Akosua knows 3PL REL 3PL-ran.after bird  
 ‘Mama Akosua **knows** who<sub>PL</sub> ran after a bird...’
- b. #nanso o-n-nim se Yaw ne Akua antae anoma.  
 but 3SG-NEG-know COMP Yaw and Akua NEG.ran.after bird  
 #‘but she doesn’t know that Yaw and Akua didn’t run after a bird.’

Subsequent research on embedded English *wh*-interrogatives then showed that contrasting introspective judgements for SE- and IE-readings are difficult to elicit, in particular for the verb *to know*, which led to a range of experimental investigations. These investigations showed that *wh*-interrogatives allow for both SE- and IE-readings under *to know* in English, French, and German (Cremers & Chemla 2016; Cremers, Tieu & Chemla 2017; Fricke, Destruel, Zimmermann & Onea 2023).

These findings were confirmed for Akan in a 2x2 acceptability experiment in Lecavelier, Antwi, Jovovic & Laryea (in prep.), a replication of Fricke, Bombi, Zimmermann & Onea (2019) on German. The experiment crosses the factors PREDICATE with levels *nim* ‘know’ vs *tea mu ka* ‘shout’ and FOLLOW-UP with levels *SE-violating* vs *unrelated* (= compatible with SE). The linking hypothesis was that *Q-NPs* that are acceptable with the *SE-violating* condition allow for a weaker interpretation than SE; see the discussion of (17) and (18) above. Participants were exposed to target sentences in story contexts and had to judge if the follow-ups were acceptable. Target items were designed and recorded by Akan speakers and displayed as audio stimuli, following the recommendation in Bombi & de Vaughn-Geiss (2018). Participants had to choose between the binary judgements ‘Good’ or ‘Not good’ in view of Szarvas et al. (2023)’s findings that Akan speakers tend not to make full use of scales. (19) shows the English translation of a sample item with the

two verbs and SE-violating and not-SE-violating follow-up, respectively:

- (19) Mama Akosua **knew/shouted whop<sub>L</sub>** broke a mirror...
- a. ... but she didn't know/shout that Kofi **didn't break a mirror**.
  - b. ... but she didn't know/shout that Kofi **broke a bowl**.

The results show that Akan speakers readily accept SE-violating follow-ups with the predicate *tea mu ka* 'shout' (~85% acceptance), but less so with *nim* 'know' (<60% acceptance). Acceptance of items in the condition *unrelated* was at >90% percent. An analysis with Generalized Linear Mixed Models (package *lme4* on R) showed (i.) a significant effect of the interaction PREDICATE/FOLLOW-UP; (ii.) a significant effect of PREDICATE; and (iii.) no significant effect of FOLLOW-UP.

Further analysis showed that the individual participants had consistent judgments on SE-violations with *nim* 'know': 89% of them rated at least 5/6 items of the condition SE-VIOLATING/KNOW consistently. However, participants showed inter-speaker variability in the form of a bimodal distribution: whereas 11 out of the 28 speakers rejected *Q-NPs* under *nim* 'know' with SE-violating contexts, the other 17 speakers accepted them (see Lecavelier et al. in prep. for details of the experimental procedure and statistical analysis).

Summing up, the acceptability of SE-violating follow-ups with *tea mu ka* 'shout' implies that Akan *Q-NPs* allow for the weaker IE-interpretation. The fact that SE-violating follow-ups were not accepted to the same degree with *nim* 'know' shows that the EXH-strength of Akan *Q-NPs* depends on the selecting predicate, same as with their embedded *wh*-interrogative counterparts in English. Finally, the fact that a total of 17/28 participants accepted *nim* 'know' with SE-violating follow-ups implies that question-denoting expressions with Akan *nim* 'know' show the same SE/IE-ambiguity as *wh*-interrogatives embedded under English *know* (cf. Cremers & Chemla 2016 on English *know*).

To conclude, the interpretation of Akan *Q-NPs* is fully parallel to that of their European *wh*-counterparts when it comes to exhaustive strength. This conclusion is further corroborated by the fact that Akan *Q-NPs* also allow for non-exhaustive (and even for non-factive) interpretations with other selecting predicates, such as *gye too mu* 'to agree' in (20), again same as in English (Beck & Rullmann 1999):

- (20) CONTEXT: *The teacher said that some students failed the exam, without specifying how many, nor which. Kofi and Kojo both think that Kwame and Yaw failed the test. In reality, Yaw and Akua failed the test.*

Kofi ne Kojo **gye too mu** [ɔmo aa ɔmo-anye ade wɔ nsɔhwɛ no mu]  
 Kofi and Kojo agreed on 3PL REL 3PL-failed thing at exam the in  
 'Kofi and Kojo agreed on who failed the exam.'

The findings on the flexible exhaustivity readings of Akan *Q-NPs* have direct consequences for their formal analysis. In particular, the existence of non-SE-interpretations rules out the majority of analyses proposed for English *Concealed Questions (CQs)*. These are typically treated as denoting specificational questions. Their analysis often builds on *individual concepts (IC)* (Romero 2005, 2007b; Frana 2017, i.a.), with a partition semantics for questions (Groenendijk & Stokhof 1984), thereby predicting SE-readings only (cf. Zimmermann 2018 for discussion of this point). The semantic analysis of (21a) from Romero (2007b) in (21b) is representative for this type of analysis.

- (21) a. [The price of milk] is known to John. (Romero (2007b):ex.44)  
 b.  $\lambda w. \forall w' \in DOX_J(w): \iota x[\text{price}(x, \text{milk}, w')] = \iota x[\text{price}(x, \text{milk}, w)]$

Notable exceptions to this are the analysis in Nathan (2006) in terms of maximality, thereby deriving intermediate-exhaustive interpretations, and in Romero (2007a), which replaces the equation sign with subpart-operators, thereby allowing for weakly exhaustive and non-exhaustive interpretations of *CQs*.

## 2.4 Interim Conclusion

We have seen that Akan *Q-NPs* always involve a pronominal head or a lexical NP with the (optional) indefinite marker *ko*. They are available under all rogative and responsive predicates, same as English embedded *wh*-interrogatives, but unlike English *CQs*. And they allow for weaker EXH-readings than SE, depending on the selecting predicate, again same as their English *wh*-counterparts. This raises the question of how to account for the parallel behavior of English embedded *wh*-interrogatives and Akan *Q-NPs* in a unified analysis.

## 3 A unified analysis of *Q-NPs* and embedded *wh*

As mentioned in the previous section, the vast majority of analyses of *Concealed DP-Questions* involves individual concepts and a partition semantics that gives rise to strongly exhaustive readings only. In view of the fact that Akan *Q-NPs* allow for weaker EXH-readings, a *CQ*-type of analysis is not appropriate for the Akan strategy for expressing embedded questions. Instead, we will follow Beck & Rullmann (1999) on embedded *wh*-interrogatives and analyze *Q-NPs* as denoting the Hamblin-set of possible answers (Hamblin 1973).



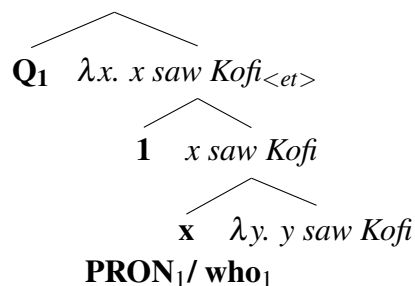
### 3.1 Formal analysis

The analysis proceeds in two steps. We will first derive a Hamblin-question meaning  $Q$  consisting of all possible answers from the relative  $Q$ -NP. The derivation of  $Q$  is brought about by a covert  $Q$ -operator (Baker 1970). In a second step, we will then derive the different EXH-levels of  $Q$ -NPs from lexical differences in the embedding predicates (Heim 1994; Beck & Rullmann 1999; Theiler 2014; Theiler et al. 2018). In order to derive the  $Q$ -meaning from a relativized NP two assumptions are crucial.

- i. Unlike in English,  $Q$ -operators in Akan are cross-categorical and can attach to clauses and NPs alike. Notice that this is a SYNTACTIC difference!
- ii. The pronominal/indefinite relative head provides a restricted variable bound by the  $Q$ -operator, on a par with *wh*-pronouns (cf. Baker 1970; Reinhart 1997).

The unified structure for *wh*-interrogatives and  $Q$ -NPs is sketched with informal meaning specifications in (22). The difference between the two construction types lies in whether the variable  $x$  is provided by a coindexed pronoun/indefinite NP, as in Akan, or by the coindexed *wh*-pronoun *who*, as in English:

(22)



Given this schematic structure, we can now derive the meanings of Akan  $Q$ -NPs and English embedded *wh*-interrogatives in a unified manner. Their syntactic structure is specified in (23a) and (23b), respectively. Notice that Akan is head-final in the nominal and in the clausal domain, another syntactic difference from English.

- (23) a. Kwame nim [[<sub>NP</sub>  $\mathfrak{m}\mathfrak{o}_1$  aa  $\mathfrak{m}\mathfrak{o}$ -huu Kofi]  $\mathbf{1}$   $\text{Q}_1$ ].  
 Kwame know 3PL REL 3PL-saw Kofi  
 ‘Kwame knows who saw Kofi.’ [ $Q$ -NP]
- b. Kwame knows [ $\text{Q}_1$   $\mathbf{1}$  [<sub>CP</sub>  $\text{who}_1$  saw Kofi]]. [*wh*-interrogative]

(24) shows the semantic analysis of the Akan  $Q$ -NP in (23a), and (25) shows the semantic derivation for its SG-counterpart with *ne-a*. The underlined part in (24c) and (25c) is the meaning of the  $Q$ -operator. (26) then shows the same for the embedded

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English *wh*-interrogative in (23b):

- (24) Kwame nim [[**ɔmo**<sub>1</sub> aa ɔmo-huu Kofi] **1 Q**<sub>1</sub>]. [Akan *Q-NP<sub>PL</sub>*]  
 a. [[ [**ɔmo**<sub>PL,1</sub> aa ɔmo-huu Kofi] **1 Q**<sub>1</sub>]]<sup>g</sup> =  
 b. [[Q]] (λx. [[**ɔmo**<sub>1</sub> aa ɔmo-huu Kofi]]<sup>g[1→x]</sup>) =  
 c. λP<et>.λp<st>.∃x[p = λw.P(x) in w](λx:HUM(x)∧¬AT(x). x saw Kofi)  
 d. = λp<st>. ∃x<sub>HUM(x)∧¬AT(x)</sub>[p = λw. x saw Kofi in w]
- (25) Kwame nim [[**ne**<sub>SG,1-a</sub> ɔ-huu Kofi] **1 Q**<sub>1</sub>]. [Akan *Q-NP<sub>SG</sub>*]  
 a. [[ [**ne**<sub>PL,1-a</sub> ɔ-huu Kofi] **1 Q**<sub>1</sub>]]<sup>g</sup> =  
 b. [[Q]] (λx. [[**nea**<sub>1</sub> ɔ-huu Kofi]]<sup>g[1→x]</sup>) =  
 c. λP<et>.λp<st>. ∃x [p = λw.P(x) in w](λx:HUM(x)∧AT(x). x saw Kofi)  
 d. = λp<st>. ∃x<sub>HUM(x)∧AT(x)</sub>[p = λw. x saw Kofi in w]
- (26) Kwame knows [**Q**<sub>1</sub> **1** [who<sub>1</sub> saw Kofi]].  
 [[**Q**<sub>1</sub> **1** **who**<sub>1</sub> saw Kofi ]]<sup>g</sup> = λp<st>. ∃x<sub>HUM(x)</sub> [p = λw. x saw Kofi in w]

As desired, the overall meaning of the embedded question objects are identical modulo some differences in the presuppositional content that projects from the phi-features of the embedded Akan pronominals (HUM&PL, HUM&SG) and the number-neutral *wh*-expression *who* (HUM).

### 3.2 Cross-categorial operators in Akan

Our analysis does not posit any cross-linguistic semantic difference between English and Akan. What sets Akan apart is a greater flexibility in the syntactic distribution of its semantic operators. Closer scrutiny shows that cross-categorial operators form an integral part of Akan grammar. First, observe that the covert *Q-NP*-operator has a covert counterpart at the clausal level in Akan, which is realized by rising intonation.

- (27) Kofi dii fufu !?  
 Kofi ate fufu Q  
 ‘Did Kofi eat fufu?’

Secondly, the familiarity DEF-operator *nó* (Arkoh & Matthewson 2013) also occurs on NPs and clauses alike (cf. e.g. Bombi, Grubic, Renans & Duah 2019; Owusu 2022). Clausal *nó* marks the propositional content of the clause as familiar or given in the sense that it has been previously discussed.

- (28) [Kofi a-nya a-kɔ hu Dr. Abrefa] **nó**.  
 Kofi PERF-get CONS-go see Dr. Abrefa] DEF  
 ‘Kofi has *indeed/actually* gone to see Dr. Abrefa.’

Finally, Philipp (2023) also postulates a cross-categorial occurrence on NPs and clauses for the emphatic scale-sensitive operator *-ara*. This way, she can account for universal and FCI/NPI-readings of the Akan universal quantifier *biara* ‘every, any’ (cf. also Zimmermann 2008, 2009 on Hausa, Chadic). The existence of other cross-categorial operators in Akan provides support for our analysis of Akan *Q-NPs* as featuring an adnominal Q-operator.

### 3.3 Deriving variability in EXH-strength

We derive the variability in EXH-strength from meaning differences in the selecting lexical predicates, all of which select for a Hamblin Q-set (Heim 1994; Beck & Rullmann 1999). For instance, the basic semantic interpretation of *nim* ‘know’ plus Q is the IE-interpretation, which can be derived in different ways (Uegaki 2015; Theiler et al. 2018; Onea & Zimmermann 2024). (29) is an implementation from Onea & Zimmermann (2024), which does not treat *knowledge* as a primitive epistemic attitude, but as a speaker judgment of identity between the attitude holder’s subjective belief state and the objective true state of affairs:

$$(29) \quad [[\textit{to know}]]^w = \lambda Q_{w \in \cup Q} . \lambda x . \textit{MAX}_{ANS}^{SUBJ}(x, Q, w) = \textit{MAX}_{ANS}^{OBJ}(Q, w) \\ \approx \textit{‘x knows p’ is true in w iff the maximal subjective answer that x can give to Q in w is identical to the maximal objectively true answer.}$$

The SE-reading is derived from this IE-reading as a pragmatic (default) inference. It is triggered by the fact that listeners normally defer authority on the correctness of internal attitudinal states to the attitude holders (Davidson 1984; but see Uegaki 2015 for a different pragmatic derivation of SE). The next section will discuss some further predictions, possible extensions, and some open questions for our analysis.

## 4 Predictions, extensions, open questions

### 4.1 Predictions and Extensions

The first prediction is that the free (restricted) variable provided by pronominal or indefinite relative heads should be bindable by other operators than Q in the nominal domain. This prediction is borne out. (30) shows that  $\lambda$ -abstracted REL-NPs can combine with the adnominal DEF-operator *nó* to yield a free relative interpretation. The underlying structure is shown in (30b). Replacing the DEF-operator *nó* with covert Q once again yields a *Q-NP*, cf. (31):

Question embedding without *wh*-interrogatives

- (30) a. Kofi **dii** [DP[NP **dee** Kojo noayε] **no**].  
 Kofi ate thing.REL Kojo cooked DEF  
 ‘Kofi ate what Kojo cooked.’ [Free relative]
- b. [DP [NP **de**<sub>1</sub> a Kojo noayε] **1 no**<sub>1</sub>]
- (31) Kofi **nim** [[NP **dee**<sub>1</sub> Kojo noayε] **1 (Q<sub>1</sub>)**].  
 Kofi know thing.REL Kojo cooked Q  
 ‘Kofi knows what Kojo cooked.’ [Q-NP]

Secondly, our analysis accounts for the occurrence of the indefinite marker *ko* on content NPs in the REL-head (Zimmermann 2018).

- (32) a. Me-n-nim [NP **krataa (ko)** **aa** Akua kan-n yε]  
 1SG-NEG-know book **certain** REL Akua read-PFV PFV.OBJ  
 ‘I don’t know which book Akua read.’
- b. [ [ [kraata (**ko**<sub>1</sub>)] [REL Akua read ] ] **1 Q<sub>1</sub>** ]

Such cases constitute bona fide instances of NP-restricted variables à la Heim (1982), where the INDEF-marker *ko* explicitly marks the presence of a restricted (choice function) variable to be bound by Q.

Finally, our analysis directly extends to other languages such as Hausa (Chadic), which can express embedded questions either with *Q-NPs* or with *wh*-interrogatives, cf. (33), without a discernible difference in meaning (Newman 2000: 502).

- (33) a. Musa yaa san [wàa (nèe) ya tàfi Kano].  
 Musa 3SG.M.PFV know who.SG FOC 3SG.M.PFV go Kano  
 ‘Musa knows who went to Kano.’ [wh-interrogative]
- b. Musa yaa san [wa-n-dà ya tàfi Kano].  
 Musa 3SG.M.PFV know one.SG-DEF.M-REL 3SG.M.PFV go Kano  
 ‘Musa knows who went to Kano.’  
 (literally: ‘Musa knows the one that went to Kano.’) [Q-NP]

The analysis may also extend to *Q-NPs* in Abaza (North Caucasian), as discussed in Arkadiev & Caponigro (2021).

#### 4.2 Comparison to Arkadiev & Caponigro (2021) on Abaza

To our knowledge, the only other formal semantic analysis of *Q-NPs* in a non-Indo-European language is in Arkadiev & Caponigro (2021). Same as in our analysis, Arkadiev & Caponigro’s (2021) analysis involves  $\lambda$ -binding of a variable in the relativized NP, thereby yielding an  $\langle et \rangle$ -predicate. This predicate combines with a MAX-operator, whose output is intensionalized to yield an individual concept of type  $\langle se \rangle$  (see e.g. Romero 2007b; Frana 2017). Application of the MAX-operator

gives back the maximal set of individuals with the questioned property in a given situation, thereby giving at least an IE-reading to the embedded question (see also Nathan 2006, where MAX ranges over propositions instead of individuals).

Whatever the case for Abaza, we contend that Akan *Q-NPs* require a different treatment on at least two grounds. Firstly, as shown in subsection 2.3, Akan *Q-NPs* allow for non-exhaustive interpretations. This is the case, for instance, with the selecting verb *gye tomm* ‘agree’ in (20) above. This fact can only be captured in our weaker Hamblin semantics from (24) and (25) above. Secondly, as will be shown in the final section 5, Akan *Q-NPs* do not exhibit the typical semantic restrictions observed with English CQs (Dor 1992; Nathan 2006), which are commonly attributed to an underlying specificational semantics involving individual concepts (<se>). We will leave for another occasion a closer comparison of our and Arkadiev & Caponigro’s (2021) analysis in their applicability to Abaza.

### 4.3 Two open questions

Given the parallel treatment of *wh*-interrogatives and relativized *Q-NPs*, our unified analysis leaves the following two questions unanswered: (i.) Why are there no embedded *wh*-interrogatives in Akan, in other words why are (2) and (4a) ungrammatical? And (ii.), why are there no non-*wh* matrix questions with pronouns or indefinites in Akan, nor in English? The second question is motivated by (34), which only allows for a declarative interpretation. If the interpretive procedure with covert clausal and matrix Qs from section 3 were fully general, (34) should also allow for a question interpretation. So how can we keep our analysis from overgenerating?

- (34) **Obi** hu-u me  
 person see-PFV 1SG.OBJ  
 ‘Somebody/some person saw me.’  
 NOT: \*‘Who saw me?’

In response to the first question, we tentatively suggest that this has to do with the fact that Akan has a *say*-based complementizer system, and that all clause-embedding predicates, including rogative predicates (which are licit with embedded *wh*-interrogatives), must co-occur with the *say*-complementizer *se*. For rogative predicates, this is not a problem, as the embedded *wh*-interrogative in a sentence such as *Mary bisaa se hena na ohuu Kofi* ‘Mary wonders who saw Kofi’ from Saah (1994) takes on a reportative reading focusing on the propositional form of the question: *Mary wonders about the question who saw Kofi*. It appears that the obligatory *say*-complementizer has a flattening effect in that it can only output propositions (or singleton sets of propositions), and not sets of (sets of) propositions. Now, the meaning of the responsive clause-embedding predicate *nim* ‘know’ in (29)

requires a set of alternatives to give rise to a proper embedded question interpretation. This, however, is impossible in the presence of obligatory *sε*, so that embedded *wh*-interrogatives are blocked under responsive Q-selecting predicates.<sup>1</sup>

As for the second question, we would like to put forward that matrix questions must be explicitly clause-typed to indicate their special speech-act potential as questions (Cheng 1997). In the absence of overt Q-operators or special intonation (typically absent with *wh*-questions in tone languages), this would trigger the obligatory use of a designated *wh*-pronoun series, which mark their clause as a question next to introducing the restricted variable to be bound by Q.<sup>2</sup>

#### 4.4 Taking Stock

Looking back at our research questions from section 1 we have shown how to derive question meanings from NP-constituents in a compositional fashion: A covert Q-operator derives a Hamblin-set of answers from a relativized NP containing a variable. This allows for a unified analysis of embedded *wh*-interrogatives in English and *Q-NPs* in Akan. In the next and final section, we will elaborate more on the third question: Do Akan *Q-NPs* have the same semantics as English *CQs* (e.g. *know the price*), or do they involve a different semantic mechanism?

### 5 Two types of NP/DP-based question meanings

Our analysis in section 3 treats Akan *Q-NPs* and English *wh*-interrogatives on a par, while contrasting both construction types from *CQ-DPs*. We thereby opted for option 1 below over option 2, on which *Q-NPs* are just another instantiation of *CQs*:

- Option 1. English embedded *wh*-interrogatives and Akan *Q-NPs* vs CQ-DPs  
*(as involving Individual Concepts)*
- Option 2. English embedded *wh*-interrogatives vs Akan *Q-NPs* and CQ-DPs  
*(as both involving Individual Concepts)*

<sup>1</sup> Notice that *sε* does show up with declarative propositions in embedded polar questions, such as (i). This can be accounted for if the embedded polar Q-operator takes scope over *sε*:

- (i) a. Mary n-nim sε [Max kann *War & Peace*].  
 Mary NEG-know COMP Max read *War & Peace*  
 ‘Mary doesn’t know whether Max read *War & Peace*.’  
 b. nim [Q<sub>POL</sub> [sε [TP Max kann WP] ] ]

<sup>2</sup> A technical variant of this would be to say that clausal (matrix) Q differs from adnominal Q in that it must select for, or is constrained to abstract over the content of *wh/FOC*-marked constituents.

In what follows, we will provide more evidence for option 1 over option 2 by pointing out some semantic differences between *Q-NPs* and *CQ-DPs*. This will lead us to the overall conclusion that natural language provides at least two ways of deriving embedded questions from NP/DP-constituents.

### 5.1 Semantic properties of *Q-NPs* vs *CQs*

The literature offers the following four diagnostics for *CQ-DPs* (cf. e.g. Heim 1979; Nathan 2006):

- (35) a. Constraints on embedding predicates  $\implies$  *inconclusive diagnostic*  
 b. EXH-readings: Akan *Q-NPs*  $\neq$  English *CQs*  
 (on standard IC-analysis)  
 c. Specificational readings: Akan *Q-NPs*  $\neq$  English *CQs*  
 d. Heim's Ambiguity  $\implies$  *inconclusive diagnostic*

Cross-linguistic investigations have shown that the diagnostic in (35a) does not hold to the same extent for *CQs* in other European languages, such as French (Bombi & Lecavelier in prep.). For this reason, it is not a reliable diagnostic for *CQs*. The diagnostic in (35d) is also inconclusive for Akan due to the syntactic structure involved.<sup>3</sup> We will therefore focus on the diagnostics in (35b) and (35c) instead.

As for (35b), recall from the discussion in 2.3 that the partition-semantics of standard analyses of *CQs* (Romero 2005; Frana 2017) predicts them to come with SE-readings only, contrary to what we have found for Akan *Q-NPs*. At the very least, then, the variable EXH-interpretation of Akan *Q-NPs* show that they do not behave like *CQ-DPs* on standard analyses.

Akan *Q-NPs* also differ from English *CQ-DPs* on the third diagnostic in (35c). English *CQ-DPs* are said to come with a specificational reading only. This is shown in (36b), where the *CQ-DP* is infelicitous in the presence of a follow-up triggering a non-specificational (i.e., predicational) question interpretation (Greenberg 1977). Its *wh*-interrogative counterpart in (36a) is felicitous in the same context:

- (36) a. I will tell you [**who murdered John**]: Someone without a heart!  
 [*wh*-interrogative]

<sup>3</sup> The reason for this is that this diagnostic checks for a reading that is only available with relativized NPs. Since we cannot rule out the possibility that relativized NPs are structurally ambiguous between a construal as *Q-NP* or as a free relative, the availability of an A-reading may be tied to the *CQ*-interpretation obtainable with free relative clauses. We find the same problem with English *what*-clauses, which also allow for both readings of Heim's ambiguity, and where the A-reading must be tied to a construal as a free relative (see also Bombi & Lecavelier in prep. for additional discussion of Romance data). In light of this, we will focus on phenomena that are only observed with proper *wh*-interrogatives, and which provide conclusive evidence that a construction type is NOT a *CQ*.

Question embedding without *wh*-interrogatives

- b. #I will tell you [**John's murderer**]: Someone without a heart! [CQ]

Crucially, Akan *Q-NPs* accept predicational follow-ups, cf. (37), on a par with English *wh*-interrogatives, and unlike *CQ-DPs*.

- (37) Mɛ-ka akyerɛ wo [**ne-a o-kum Yaw**]: ɛyɛ obi aa  
 1SG-tell you person-REL 3SG-killed Yaw COP somebody REL  
 onni akoma!  
 NEG.have heart  
 'I tell you who murdered Yaw: it is someone without a heart!' [*Q-NP*]

This is also shown in (38): The Akan *Q-NP* in (38a) allows for a predicational question interpretation, but the same is not possible for DPs in English, cf. (38b).

- (38) a. Kofi nim [**deɛ Tamale yɛ**]. ɛ-yɛ kurow fɛfɛ bi  
 Kofi knows thing.REL Tamale COP 3SG-COP town beautiful a  
 aa ɛ-wɔ Atifi fam.  
 REL 3SG-be.located North in  
 'Kofi knows what Tamale is. It is a beautiful town in northern Ghana.'  
 b. Kofi knows **Tamale**. ≠ Kofi knows **what Tamale is**.

Moreover, since specificational question readings presuppose the existence of an individual with the questioned property, English *CQ-DPs* always trigger an existence presupposition. This is evidenced by the infelicity of the *CQ-DP* in (39a), and the clefted (specificational) *wh*-interrogative in (39b), as opposed to the plain embedded *wh*-interrogative in (39c), which does not trigger an existence presupposition.

- (39) a. #I know [John's purchase]: He bought **nothing**. [CQ-DP]  
 b. #I know [what it is that John bought]: He bought **nothing**. [cleft *wh*]  
 c. I know [what John bought]: He bought **nothing**. [*wh*-interrogative]

Again, Akan *Q-NPs* behave on a par with plain embedded *wh*-interrogatives, and differ from English *CQ-DP* in NOT triggering an existence presupposition, cf. (40):

- (40) Kofi nim [**adeɛ aa** (ɛ-yɛ aa) ɔ-tɔɔ yɛ]. Obaa no  
 Kofi knows thing REL 3SG-COP REL 3SG-bought PFV.OBJ woman DEF  
**an-tɔ hwee**.  
 NEG-bought nothing  
 'Kofi knows what (it is that) she bought. The woman bought nothing.'

Summing up, Akan *Q-NPs* differ semantically from English *CQ-DPs* in their variable EXH-strength, in the fact that they allow for plain predicational question interpretations, and in not triggering existence presuppositions. They share these



semantic properties with embedded *wh*-interrogatives. The semantic parallels to *wh*-interrogatives follow directly on our unified semantic analysis from section 3, on which Akan *Q-NPs* denote Hamblin questions.

## 5.2 Question-denoting NPs/DPs from a cross-linguistic perspective

The fact that Akan *Q-NPs* differ semantically from English *CQ-DPs* in denoting Hamblin questions raises the question of how to analyze question-denoting NPs/DPs in a cross-linguistic perspective. There are two options: (i.) There could be cross-linguistic parametrization, such that languages can either employ the unified question interpretation from (24) and (25) or an *CQ*-analysis (*à la* Romero 2005; Aloni & Roelofsen 2011; Frana 2017). Alternatively (ii.), there is the possibility that all languages have both interpretive procedures at their disposal. In the latter case, the observable semantic differences between *Q-NPs* and *CQs* with functional nouns would simply follow from syntactic and lexical differences that can be captured in the form of the two language-internal parameters in (41):

- (41) a. [+/-] clausal sub-structure  
 b. [+/-] functional NP

We favor the second option based on the fact that Hausa allows for both construals, cf. (33), and that Akan also allows for regular *CQ-DPs* with functional NPs, cf. (42):

- (42) Abena nim **krataa no buoo**.  
 Abena knows book DEF price  
 ‘Abena knows the price of the book.’ [functional noun CQ]

Importantly, the question-interpretation of the DP in (42) cannot be derived by our unified question semantics from section 3. Because of the absence of clausal sub-structure to  $\lambda$ -abstract over, the analysis would fail to yield a Hamblin-set of propositions for (42). A question for future research is whether the semantic question objects denoted by functional nouns in Akan resemble their English *CQ*-counterparts in terms of their specificational interpretation. In the meantime, we conclude that there seem to be two sources for NP/DP-based question denotations in natural language. First, the lexical specification of an NP as [+functional] can give rise to a specificational *CQ*-interpretation. Second, a REL-clausal substructure ([+clause]) can give rise to ordinary Hamblin questions. Moreover, both features can also combine ([+clause, +functional]) in REL-clauses with functional head NPs. Finally, a question interpretation is systematically blocked with only [-]-specifications. (43) to (45) show that all three NP/DP-question subtypes are available in Akan:

Question embedding without *wh*-interrogatives

- (43) Normal *Q-NP* [–functional, +clause]  
Akua nim [ne-a noa-a jollof].  
Akua knows person-REL cook-PFV jollof  
‘Akua knows who cooked jollof.’
- (44) Functional CQ-DP [+functional, –clause]  
Abena nim [krataa no buo].  
Abena knows book DEF price  
‘Abena knows the price of the book.’
- (45) *Q-NP* with functional head [+functional, +clause]  
Yaw nim [buo no aa Kwame nim].  
Yaw knows price DEF REL Kwame knows  
‘Yaw knows the price that Kwame knows.’

The two *CQ*-subtypes in (44) and (45) are also attested in English, cf. (46) and (47), leaving open the question of whether English also has Akan-style *Q-NPs*. Given that the derivation of *Q-NPs* depends on the existence of cross-categorial (adnominal) *Q*, our analysis would suggest that this is not the case.<sup>4</sup>

- (46) Function NP-CQ [+function, –clause]  
James knows [the price of the book].
- (47) *Q-NP* with functional head [+function, +clause]  
Anna knows [the price that James knows].

## 6 Conclusion

We have shown that Akan typically expresses embedded questions in the form of relativized *Q-NPs*. Akan *Q-NPs* come with flexible EXH-levels, they denote Hamblin-sets, and they are not restricted to specificational readings. These properties make Akan *Q-NPs* semantically identical to English embedded *wh*-interrogatives. We have put forward a unified formal analysis of Akan *Q-NPs* and English *wh*-interrogatives that accounts for their identical behavior and makes further correct predictions. Finally, we tentatively concluded that natural language has at least two ways in which DP/NP-objects can denote embedded question meanings, namely *Q-NPs* and CQ-DPs.

<sup>4</sup> English does exhibit some constructions that appear similar to *Q-NPs*, such as ‘I know *the ones* who will come tonight’ or ‘I know *the way* he feels about John’. However, these are not as productively and freely produced as our *Q-NPs*, and we analyze them as bona fide relativized *CQs* with a specificational interpretation and the corresponding *CQ*-specific constraints.

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