Questioning and time

Andreas Haida
The Hebrew University of Jerusalem
andreas.haida@mail.huji.ac.il

Tue Trinh
University of Wisconsin at Milwaukee
tuetrinh@uwm.edu

1 Past tense anomalies

1.1 The core data. This talk provides an account for a set of observations concerning past tense in questions.

Past tense in stative sentences triggers the inference that the expressed state does not hold at the present (henceforth cessation inference).

The deviance of the sentences in (1) and (2) provides evidence for this inference.

(1) #Zwei war eine Primzahl
two was a prime number
'Two was and no longer is a prime number'

(2) #Die Studenten wussten, dass zwei eine Primzahl war
the students knew that two a prime number was
'The students knew that two was and no longer is a prime number'

- As indicated by the English paraphrase, (1) implies that 2 has been prime in the past and is non-prime at the present.
- Likewise, (2) implies that 2 has been prime in the past of the students' belief and is non-prime at the time of their belief.
- The expressed meanings are deviant, presumably because they contradict the common knowledge that every natural number is eternally prime or eternally non-prime (cf. Magri 2009).

The deviance of (1) and (2) contrasts with the non-deviance of (3) and (4), in which the (relevant) past statives come with interrogative force instead of declarative force.

(3) War zwei (nochmal) eine Primzahl?
was two (again) a prime number
'Was two a prime number again?'

(4) Die Studenten wussten, welche Zahl eine Primzahl war
the students knew which number a prime number was
'The students knew which number was a prime number'

- (3) has a reading in which it does not imply that 2 ceased to be a prime number.
- Likewise, (4) has a reading in which it does not imply any number to have been prime at one time and non-prime later.

(4) requires contextual support for the non-deviant reading to come out, for instance, the context in (5).

(5) Math test context: Students have to tell which number of the pair $\langle 1, 2\rangle$ is prime. After evaluating the results, the teacher utters (4).

We start our discussion by showing what is not involved in explaining the non-deviant reading of (3) and (4).

1.2 Not a reference time phenomenon. The copula sentences in (1) and (2), and (3) and (4) exemplify a certain kind of stative sentences, viz. statives that express analytic truths (henceforth analytic statives).

Ordinary statives can be interpreted relative to a reference time (Klein 1994). That is, past statives can be claims about a contextually given time in the past (below, the time the answerer looked into the room).

(6) Q: What did you notice when you looked into the room?

A: There was a book on the table. It was in Russian.
↛ The book on the table ceased to be in Russian

Analytic statives, in contrast, cannot be claims about a restricted time span: the question in (7–Q) fixes a past reference time, viz. the time after the first stop of the bus; still, the past tense version of the last conjunct of the answer (7–A) triggers the cessation inference that the present tense counterpart of the sentence is false.

(7) Q: Why are you so sure that exactly thirty-three seats were empty after the first stop?
A: Well, the bus I drove that day had forty seats, seven passengers entered the bus at the first stop, and forty minus seven {is | #was} thirty-three.

This means that the deviance of (1) and (2) cannot be obviated by fixing a past reference time, and the non-deviance of (3) and (4) is not a reference time phenomenon.

1.3 Not a sequence of tense effect. The non-deviance of (4) is not a "sequence of tense" (SOT) effect: as the contrast between the past tense version of (8-a) (repeated from (2) above) and its English counterpart in (8-b) shows, German is a language without SOT.

(8) a. #Die Studenten wussten, dass zwei eine Primzahl war
the students knew that two a prime number was
b. The students knew that two was a prime number

Assuming that inferences of **know**-complements are inherited by the matrix sentence, the deviance of (8-a) is due to the inference that 2 was, but has ceased to be, a prime number, which contradicts common knowledge.

Moreover, we find the question induced non-cessation reading even under present tense attitude verbs: in the math test context, the question in (9), asked by one of the students to her classmate, does not imply cessation of the prime number property.

(9) Weißt du, welche Zahl eine Primzahl war?
know you which number a prime number was
'Do you know which number was a prime number?'

1.4 Not a uniform phenomenon. It is not simply the case that questions in German don't trigger cessation inferences: (10) is deviant, as it implies that two is no longer prime or no longer not prime.

(10) #Die Studenten wussten, ob zwei eine Primzahl war
the students knew whether two a prime number was
'The students knew whether two was a prime number'

This means that the non-deviance of (3) and (4) (repeated below) have different sources.

(11) War zwei (nochmal) eine Primzahl?
was two again a prime number
'Was two a prime number again?'

(12) Die Studenten wussten, welche Zahl eine Primzahl war
the students knew which number a prime number was
'The students knew which number was a prime number'

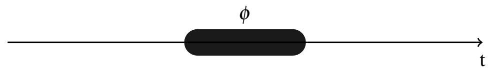
2 Tense semantics

Following Musan (1995); Altshuler & Schwarzschild (2013) (henceforth A&S), we assume cessation inferences to be caused by a scalar implicature (henceforth cessation implicature).

2.1 Deriving cessation implicatures. Following A&S, we assume the Temporal Profile of Statives:

(13) <u>The Temporal Profile of Statives (TPS)</u>
For any tenseless stative clause ϕ and world w, if ϕ is true in w at moment m, then there is a moment m' preceding m at which ϕ is true in w and there is a moment m'' following m at which ϕ is true in w.

This means that every (convex) interval $\{m : \phi$ is true in w at moment $m\}$ is open on both sides:



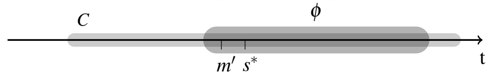
The tense operators PAST and PRESENT denote the following functions:

(14) a. $[\![\text{PAST}]\!] = [\lambda C \lambda p \lambda t \lambda w. \exists t'(t' \prec t \wedge t' \in C \wedge p(t')(w) = 1)]$
b. $[\![\text{PRESENT}]\!] = [\lambda C \lambda p \lambda t \lambda w. \exists t'(t' = t \wedge t' \in C \wedge p(t')(w) = 1)]$

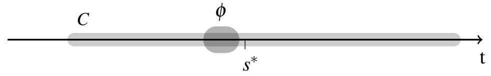
- C is a domain restriction representing the reference time.
- In syntax, tense is thus adjoined to a syntactic variable that is assigned the value C by the context.

It follows from these assumptions that for any (left-open) C that includes the speech time s^*, $[\![\text{PRESENT}]\!](C)([\![\phi]\!])(s^*)$ will asymmetrically entail $[\![\text{PAST}]\!](C)([\![\phi]\!])(s^*)$ in a non-trivial way:

Present:



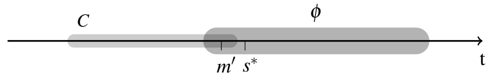
Past:



- Given the TPS, if $[\![\text{PRESENT}]\!](C)([\![\phi]\!])(s^*)$ is true (in the world of evaluation) then ϕ is true at a moment m' preceding s^*; hence $[\![\text{PAST}]\!](C)([\![\phi]\!])(s^*)$ is also true, since m' validates the existential formula in this proposition.
- Conversely, assuming continuity of time, if $[\![\text{PAST}]\!](C)([\![\phi]\!])(s^*)$ is true then the TPS can always be satisfied without ϕ being true at s^*.

Thus, if a speaker conveys $[\![\text{PAST}]\!](C)([\![\phi]\!])(s^*)$ she implicates that the stronger alternative $[\![\text{PRESENT}]\!](C)([\![\phi]\!])(s^*)$ is false.

2.2 Reference time effects. If a domain restriction C doesn't include the speech time s^*, $[\![\text{PRESENT}]\!](C)([\![\phi]\!])(s^*)$ is trivially false, since there is no moment m such that $m = s^*$ and $m \in C$:



Consequently, if $s^* \notin C$ the cessation implicature of $[\![\text{PAST}]\!](C)([\![\phi]\!])(s^*)$, viz. that $[\![\text{PRESENT}]\!](C)([\![\phi]\!])(s^*)$ is false at the world of evaluation, is trivially true, i.e. vacuous.

2.3 Analytic statives and tense. We take the cessation implicature of past analytic statives to show that they allow for temporal specification and a notion of truth at a moment of time. Hence, since they are statives, they have the TPS.

Thus, past analytic statives always trigger cessation implicatures

- because they have the TPS
- and since implicature computation is contextually blind (Magri 2009).

To account for the fact that the cessation implicature of past analytic statives cannot be trivialized by excluding the speech time s^* from C, we add the following condition:

(15) <u>Condition in domain restrictions</u>
If a domain restriction is necessarily vacuous, it must be trivial.

- In all worlds, tenseless analytic statives are eternally true or eternally false.
- Hence, the domain restriction C of a past analytic stative ϕ is necessarily vacuous; i.e. varying the extension of C cannot alter the extension of ϕ.
- By (15), C must hence be trivial, i.e. C must include all moments, among them s^*.

Thus, past analytic statives always trigger a cessation implicature, which is always non-trivial. Consequently, past analytic statives are always deviant.

3 Questions semantics

We adopt the following rather standard assumptions about questions (cf. Stenius 1967; Ross 1970; Karttunen 1977; Heim 1994; Krifka 2001):

(i) The semantic value of a question is the set of its possible answers (Hamblin 1958).
(ii) To ask a question is to state a request, and to know a question is to know the true answers to it.
(iii) A question q is parsed as as [ANS q] as the complement of **know**, and as [QUEST q] as a matrix clause.

The function of ANS is to map Q to the conjunction of all true members of Q.

For QUEST, we furthermore assume that it is (syntactically) decomposed into an imperative operator MAKE and a 'I know the answer' component (cf. Sauerland & Yatsushiro 2017):

(16) MAKE [I-KNOW [ANS q]]

Thus, QUEST maps a set of possible answers Q to the proposition that the speaker requests that the hearer make known all the true members of Q.

4 Explanation of the data

We assume that scalar implicatures are derived in grammar by a syntactically represented exhaustification operator, exh (Chierchia 2004; Fox 2007; Chierchia et al. 2012).

Moreover, we follow Romoli (2012) in the assumption that the "presuppositions" of soft triggers are in fact entailments or scalar implicatures.

For instance, factive predicates entail their factive meaning component and trigger a scalar implicature relative to it:

(17) a. $[\![\textbf{know}]\!](\phi)(x) \Rightarrow \text{Bel}_x(\phi) \wedge \phi$
b. S $\in$ Alt(NP **knows** S)
c. **not** S $\in$ Alt(**not**[NP **knows** S]), hence exh_A[**not** [NP **knows** S]] $\Rightarrow$ S

4.1 The deviant examples. We assume that (1) and (2) are parsed as given in (18-a) and (18-b), respectively.

(18) a. exh_{A_1} [zwei war eine Primzahl]
b. exh_{A_2} [die Studenten [wussten [dass zwei eine Primzahl war]]]

Furthermore, we assume the alternative sets in (19) (where we omit the prejacent). Note that A_2 is the union of the alternatives of **wussten** and the scalar alternatives of its complement (Romoli 2012).

(19) a. $\text{A}_1 = \{$zwei ist eine Primzahl$\}$
b. $\text{A}_2 = \left\{\begin{array}{l}\text{die Studenten [wussten [dass zwei eine Primzahl ist]]}\\ \text{dass zwei eine Primzahl war}\\ \text{dass zwei eine Primzahl ist}\end{array}\right\}$

By the assumptions in §2.3, the LFs in (18) entail that 2 has been prime in the past and is non-prime at the present. This explains the deviance of (1) and (2).

For (20) (repeated from above), we assume the parse in (21-a), following the assumptions in §3, and the alternative set in (21-b), in accordance with (19-b).

(20) #Die Studenten wussten, ob zwei eine Primzahl war
the students knew whether two a prime number was
'The students knew whether two was a prime number'

(21) a. $\text{exh}_{A'_2}$ [die Studenten [wussten [ANS [ob zwei eine Primzahl war]]]]

b. $A'_2 = \left\{ \begin{array}{l} \text{die Studenten [wussten [ANS [ob zwei eine Primzahl war]]]} \\ \text{ANS [ob zwei eine Primzahl war]} \\ \text{ANS [ob zwei eine Primzahl ist]} \end{array} \right\}$

Thus, because of the fact in (22), the deviance of (10) follows in the same way as the deviance of (2).

(22) $[\![$ANS **[ob zwei eine Primzahl {war | ist}]**$]\!] =$
$= [\![$**dass zwei eine Primzahl{war|ist}**$]\!]$

4.2 The non-deviant examples – (embedded) wh-questions. To explain the contrast between (10)/(20) and (23) (repeated from above), we note that the latter example contains a **which**-question.

(23) Die Studenten wussten, welche Zahl eine Primzahl war
the students knew which number a prime number was
'The students knew which number was a prime number'

Importantly, **which**-phrases can range over the members of a conceptual cover (Aloni 2001).

Conceptual covers are "methods of identification." Technically, they are sets C of individual concepts f such that in each world w each individual d (of the discourse domain D) is the instantiation of one and only one individual concept in that world (i.e. $\forall w \forall d \in D \exists ! f \in C : f(w) = d$).

That is, the embedded **wh**-question in (23) can have the following denotation, where $g(\text{C})$ is a conceptual cover:

(24) $[\![$**welche$_C$ Zahl eine Primzahl war**$]\!]^g =$
$= \{p \mid \exists f \in g(\text{C}).p = [\lambda w. f(w) \text{ was prime in } w]\}$

In our math test context (students have to tell which number of the pair $\langle 1,2 \rangle$ is prime), the discourse domain is the set in (25-a), and we assume that the set C_D in (25-b) is a contextually available conceptual cover of this domain.

(25) a. $D = \{1,2\}$

b. $C_D = \left\{ \begin{array}{l} [\lambda w. \text{the odd number on the test sheet in } w] \\ [\lambda w. \text{the even number on the test sheet in } w] \end{array} \right\}$

Thus, if $g(\text{C}) = C_D$, the **wh**-question of (23) denotes the following set.

(26) $[\![$**welche$_C$ Zahl eine Primzahl war**$]\!]^g =$
$= \left\{ \begin{array}{l} [\lambda w. \text{the odd number on the test sheet in } w \text{ was prime in } w] \\ [\lambda w. \text{the even number on the test sheet in } w \text{ was prime in } w] \end{array} \right\}$

We note in this connection that the sentences that express the propositions in (26) do not trigger a deviant cessation implicature:

(27) The {odd | even} number on the test sheet was prime

Furthermore, we note that variants of (23) and (27) that don't allow for an interpretation relative to a conceptual cover have a deviant cessation implicature, see (28).

(28) a. #The students know which number of one and two was prime
b. #(The students know that) the smallest even natural number was prime

Finally, the sentences that allow for an interpretation relative to a conceptual cover do have a cessation implicature, viz. the implicature that the test sheet ceased to exist (in the immediate utterance situation). This is evidenced by the oddness of the past tense variants of the sentences in (29-a) and (29-b) in the context of the leading sentence.

(29) Take a look at the math test sheet here.
a. The odd number (on the sheet) {is | #was} prime
b. Do you know which number (on the sheet) {is | #was} prime?

This "lifetime effect" follows from the assumption that [x is on the sheet at time t] is a soft trigger for the proposition that the sheet exists at time t (cf. Musan (1995)).

4.3 The non-deviant examples – (unembedded) "remind me" questions. According to what we said in §3, (30) (repeated from the beginning) is parsed as given in (31).

(30) War zwei (nochmal) eine Primzahl?
was two again a prime number
'Was two a prime number again?'

(31) exh_A [MAKE [I-KNOW [ANS [Q [zwei eine Primzahl war]]]]]

We assume that MAKE like its overt counterpart is a soft trigger for the meaning component that its complement proposition is not true at the time of the request (i.e. at s^*).

That is, MAKE entails the negation of it complement and has [**not** S] as an alternative:

(32) a. $[\![\text{MAKE}]\!](\phi) \Rightarrow \neg\phi$
b. **not** S $\in$ Alt(MAKE S)

For complements that contain a scalar item, we assume again that the alternative set includes the (negation of the) scalar alternatives.

Thus, the alternative set A in (31) has the following extension:

(33) $A = \left\{ \begin{array}{l} \text{nicht [I-KNOW [ANS [Q zwei eine Primzahl ist]]]} \\ \text{nicht [ANS [Q zwei eine Primzahl war]]} \\ \text{nicht [ANS [Q zwei eine Primzahl ist]]} \end{array} \right\}$

- **nicht** [I-KNOW [ANS [Q **zwei eine Primzahl ist**]]] is not innocently excludable since its negation contradicts the (entailment of the) prejacent.
- **nicht** [ANS [Q **zwei eine Primzahl war**]] is innocently excludable.
- **nicht** [ANS [Q **zwei eine Primzahl ist**]] is also innocently excludable.

Thus, overall we derive that (31) entails the answer to the present tense counterpart of the embedded question.

(34) $[\![(31)]\!] =$ $[\![$MAKE [I-KNOW [ANS [Q [**zwei eine Primzahl war**]]]]$]\!] \wedge$
$\wedge [\![$ANS [Q **zwei eine Primzahl ist**]$]\!]$

That is, we correctly derive that (30)/(31) doesn't trigger a deviant cessation implicature that 2 has been prime in the past and ceased to be prime at the present.

References

Aloni, Maria. 2001. *Quantification under conceptual covers*. Amsterdam: Universiteit van Amsterdam dissertation. ILLC Dissertation Series 2001-1.

Altshuler, Daniel & Roger Schwarzschild. 2013. Moment of change, cessation implicatures and simultaneous readings. In E. Chemla, V. Homer & G. Winterstein (eds.), *Proceedings of Sinn und Bedeutung 17*, 45–62. Paris: ENS.

Chierchia, Gennaro. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In Adriana Belletti (ed.), *Structures and beyond: The cartography of syntactic structures*, 39–103. Oxford: Oxford University Press.

Chierchia, Gennaro, Danny Fox & Benjamin Spector. 2012. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In Paul Portner, Claudia Maienborn & Klaus von Heusinger (eds.), *Semantics: An international handbook of natural language meaning*, Berlin: Mouton de Gruyter.

Fox, Danny. 2007. Free choice disjunction and the theory of scalar implicatures. In Uli Sauerland & Penka Stateva (eds.), *Presupposition and implicature in compositional semantics*, 71–120. Houndmills: Palgrave-Macmillan.

Hamblin, C. L. 1958. Questions. *The Australasian Journal of Philosophy* 36. 159–168.

Heim, Irene. 1994. Interrogative semantics and Karttunen's semantics for *know*. In R. Buchalla & A. Mittwoch (eds.), *The proceedings of the ninth annual conference and the workshop on discourse of the isreal association for theoretical linguistics*, 128–144. Jerusalem: Academon.

Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1. 3–44.

Klein, Wolfgang. 1994. *Time in language*. London: Routledge.

Krifka, Manfred. 2001. Quantifying into question acts. *Natural Language Semantics* 9. 1–40.

Magri, Giorgio. 2009. A theory of individual-level predicates based on blind mandatory scalar implicatures. *Natural Language Semantics* 17. 245–297.

Musan, Renate. 1995. *On the temporal interpretation of noun phrases*. Cambridge, Mass.: MIT dissertation.

Romoli, Jacopo. 2012. *Soft but strong: Neg-raising, soft triggers, and exhaustification*. Cambridge, Mass.: Harvard University dissertation.

Ross, John Robert. 1970. On declarative sentences. In R. A. Jacobs & P. S. Rosenbaum (eds.), *Readings in english transformational grammar*, 222–272. Waltham, Mass.: Ginn.

Sauerland, Uli & Kazuko Yatsushiro. 2017. Remind-me presuppositions and speech-act decomposition: Evidence from particles in questions. *Linguistic Inquiry* 39. 677–686.

Stenius, E. 1967. Mood and language game. *Synthese* 17. 254–274.