

WHAT IS HOMOGENEITY, AND WHY CARE?

Manuel Kríž

Laboratoire de Sciences Cognitives et Psycholinguistique (ENS, EHESS, CNRS)
École Normale Supérieure, PSL Research University

manuel@kriz.fr

Jahrestagung der DGfS
Konstanz, February 2015

Homogeneity...

... and Its Applications

HOMOGENEITY

Predications involving pluralities are sometimes neither clearly true nor clearly false (Fodor 1970, Schwarzschild 1994, Löbner 2000, Gajewski 2005 and others).

- (1) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published the books.
B: Well, half of them...

This disappears when *all* is added (Löbner 2000):

- (2) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published all of the books.
B: No, he didn't.

Usually seen as a presupposition of distributive predicates.

HOMOGENEITY

Predications involving pluralities are sometimes neither clearly true nor clearly false (Fodor 1970, Schwarzschild 1994, Löbner 2000, Gajewski 2005 and others).

- (1) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published the books.
B: Well, half of them...

This disappears when *all* is added (Löbner 2000):

- (2) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published all of the books.
B: No, he didn't.

Usually seen as a presupposition of distributive predicates.

HOMOGENEITY

Predications involving pluralities are sometimes neither clearly true nor clearly false (Fodor 1970, Schwarzschild 1994, Löbner 2000, Gajewski 2005 and others).

- (1) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published the books.
B: Well, half of them...

This disappears when *all* is added (Löbner 2000):

- (2) Context: *Mr. Benfleet published half of the books.*
A: Mr. Benfleet published all of the books.
B: No, he didn't.

Usually seen as a presupposition of distributive predicates.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

NOVEL CLAIMS

- This is not some idiosyncrasy of distributive plural predication, but a fundamental and pervasive feature of natural language predication in general.
- The phenomenon is different from presupposition and implicature; it has some similarities with vagueness, but differences remain.
- It can be elegantly described in a trivalent logic with an algebraic semantics.
- It surfaces in many other constructions and offers a new, unified, and predictive perspective on their properties: bare plurals, embedded questions, conditionals, cleft-sentences, generics, possibly neg-raising.
- It correlates with exception-tolerance across constructions.

HOMOGENEITY IN COMPLEX SENTENCES

What happens when a homogeneous predication is embedded under a quantifier?

- (3) Every publisher published the books proposed to him.

Križ & Chemla 2015: Experimental investigation that uncovers a regular pattern of undefinedness. Example:

- (4) Every publisher published the books.

true if every publisher published all books.

false if at least one publisher published none.

undef. otherwise.

HOMOGENEITY IN COMPLEX SENTENCES

What happens when a homogeneous predication is embedded under a quantifier?

(3) Every publisher published the books proposed to him.

Križ & Chemla 2015: Experimental investigation that uncovers a regular pattern of undefinedness. Example:

(4) Every publisher published the books.

true if every publisher published all books.

false if at least one publisher published none.

undef. otherwise.

HOMOGENEITY AND TRIVALENT LOGIC

- All predicates are subject to the following constraint:
 - (5) **Generalised Homogeneity**
If P is true of a and false of b , then a and b don't overlap (i. e. have no parts in common).
- A notion of parthood and the homogeneity constraint can be generalised across all denotational domains: Predicates (with arbitrary many arguments) and quantifiers also have parts, and quantifiers as properties of predicates have to obey the homogeneity constraint.
- The resulting system captures the homogeneity of predication, its interaction with quantifiers (Križ & Chemla 2015), and its removal by *all* — all based on a single generalised principle.

HOMOGENEITY AND TRIVALENT LOGIC

- All predicates are subject to the following constraint:
 - (5) **Generalised Homogeneity**
If P is true of a and false of b , then a and b don't overlap (i. e. have no parts in common).
- A notion of parthood and the homogeneity constraint can be generalised across all denotational domains: Predicates (with arbitrary many arguments) and quantifiers also have parts, and quantifiers as properties of predicates have to obey the homogeneity constraint.
- The resulting system captures the homogeneity of predication, its interaction with quantifiers (Križ & Chemla 2015), and its removal by *all* — all based on a single generalised principle.

HOMOGENEITY AND TRIVALENT LOGIC

- All predicates are subject to the following constraint:
 - (5) **Generalised Homogeneity**
If P is true of a and false of b , then a and b don't overlap (i. e. have no parts in common).
- A notion of parthood and the homogeneity constraint can be generalised across all denotational domains: Predicates (with arbitrary many arguments) and quantifiers also have parts, and quantifiers as properties of predicates have to obey the homogeneity constraint.
- The resulting system captures the homogeneity of predication, its interaction with quantifiers (Križ & Chemla 2015), and its removal by *all* — all based on a single generalised principle.

HOMOGENEITY AND TRIVALENT LOGIC

- All predicates are subject to the following constraint:
 - (5) **Generalised Homogeneity**
If P is true of a and false of b , then a and b don't overlap (i. e. have no parts in common).
- A notion of parthood and the homogeneity constraint can be generalised across all denotational domains: Predicates (with arbitrary many arguments) and quantifiers also have parts, and quantifiers as properties of predicates have to obey the homogeneity constraint.
- The resulting system captures the homogeneity of predication, its interaction with quantifiers (Križ & Chemla 2015), and its removal by *all* — all based on a single generalised principle.

NON-MAXIMALITY

- Plural predication is also famous for tolerating some exceptions (*non-maximality*; Brisson 1998, Lasersohn 1999, Malamud 2012). This, too, disappears when *all* is added:
 - (6) Context: *All the professors smiled except the perpetually dour Prof. Smith, who is known to never smile anyway.*
 - a. The professors smiled.
 - b. #All the professors smiled.
- Explicable if there is a pragmatic principle that allows us to use a literally undefined sentence under certain conditions, but never a literally false sentence (Križ 2015a).
- Homogeneity and exception tolerance correlate across constructions.

NON-MAXIMALITY

- Plural predication is also famous for tolerating some exceptions (*non-maximality*; Brisson 1998, Lasersohn 1999, Malamud 2012). This, too, disappears when *all* is added:
 - (6) Context: *All the professors smiled except the perpetually dour Prof. Smith, who is known to never smile anyway.*
 - a. The professors smiled.
 - b. #All the professors smiled.
- Explicable if there is a pragmatic principle that allows us to use a literally undefined sentence under certain conditions, but never a literally false sentence (Križ 2015a).
- Homogeneity and exception tolerance correlate across constructions.

NON-MAXIMALITY

- Plural predication is also famous for tolerating some exceptions (*non-maximality*; Brisson 1998, Lasersohn 1999, Malamud 2012). This, too, disappears when *all* is added:
 - (6) Context: *All the professors smiled except the perpetually dour Prof. Smith, who is known to never smile anyway.*
 - a. The professors smiled.
 - b. #All the professors smiled.
- Explicable if there is a pragmatic principle that allows us to use a literally undefined sentence under certain conditions, but never a literally false sentence (Križ 2015a).
- Homogeneity and exception tolerance correlate across constructions.

Homogeneity...

... and Its Applications

CLEFTS

Exhaustivity in clefts can be analysed as a reflex of homogeneity (Büring & Križ 2013, Križ 2016):

- (7) Context: *Nina invited both the boys and the girls.*
#It was the boys that Nina invited.

The undefinedness of (7) in such a situation follows from two assumptions:

1. Clefts are identity statements.
2. Identity follows homogeneity in the same way as other binary relations in natural language (independently motivated).

CLEFTS

Exhaustivity in clefts can be analysed as a reflex of homogeneity (Büiring & Križ 2013, Križ 2016):

- (7) Context: *Nina invited both the boys and the girls.*
#It was the boys that Nina invited.

The undefinedness of (7) in such a situation follows from two assumptions:

1. Clefts are identity statements.
2. Identity follows homogeneity in the same way as other binary relations in natural language (independently motivated).

CONDITIONALS

Conditionals show a similar effect to plural predications, known as the *conditional excluded middle* (Stalnaker 1981, von Stechow 1999):

(8) If Nina comes, Adam will be happy.

undef. if given Nina's coming, Adam may or may not be happy.

This follows immediately if conditionals involve pluralities of possible worlds/situations (Schlenker 2004, Klinedinst 2007). Conditionals allow us to ignore remote, irrelevant possibilities when evaluating them. This behaves like non-maximality and disappears with homogeneity-removing adverbs like *certainly*.

CONDITIONALS

Conditionals show a similar effect to plural predications, known as the *conditional excluded middle* (Stalnaker 1981, von Stechow 1999):

- (8) If Nina comes, Adam will be happy.
undef. if given Nina's coming, Adam may or may not be happy.

This follows immediately if conditionals involve pluralities of possible worlds/situations (Schlenker 2004, Kluge 2007). Conditionals allow us to ignore remote, irrelevant possibilities when evaluating them. This behaves like non-maximality and disappears with homogeneity-removing adverbs like *certainly*.

CONDITIONALS

Conditionals show a similar effect to plural predications, known as the *conditional excluded middle* (Stalnaker 1981, von Stechow 1999):

(8) If Nina comes, Adam will be happy.

undef. if given Nina's coming, Adam may or may not be happy.

This follows immediately if conditionals involve pluralities of possible worlds/situations (Schlenker 2004, Klinedinst 2007). Conditionals allow us to ignore remote, irrelevant possibilities when evaluating them. This behaves like non-maximality and disappears with homogeneity-removing adverbs like *certainly*.

CONDITIONALS

Conditionals show a similar effect to plural predications, known as the *conditional excluded middle* (Stalnaker 1981, von Stechow 1999):

(8) If Nina comes, Adam will be happy.

undef. if given Nina's coming, Adam may or may not be happy.

This follows immediately if conditionals involve pluralities of possible worlds/situations (Schlenker 2004, Klinedinst 2007). Conditionals allow us to ignore remote, irrelevant possibilities when evaluating them. This behaves like non-maximality and disappears with homogeneity-removing adverbs like *certainly*.

BARE PLURALS

- (9) a. Mary saw zebras. \rightsquigarrow Mary saw > 1 one zebra.
b. Mary didn't see zebras. \rightsquigarrow Mary saw no zebra.
- With minimal extra assumptions, the trivalent view predicts that (9a) and (9b) are both undefined when Mary saw exactly one zebra.
 - This makes detailed predictions about the behaviour of bare plurals in various embedded contexts. Non-maximality can account for context-dependence.
 - The predictions differ very subtly from the best existing theories. Experimental tests have not (yet) been performed.

BARE PLURALS

- (9) a. Mary saw zebras. \rightsquigarrow Mary saw > 1 one zebra.
b. Mary didn't see zebras. \rightsquigarrow Mary saw no zebra.
- With minimal extra assumptions, the trivalent view predicts that (9a) and (9b) are both undefined when Mary saw exactly one zebra.
 - This makes detailed predictions about the behaviour of bare plurals in various embedded contexts. Non-maximality can account for context-dependence.
 - The predictions differ very subtly from the best existing theories. Experimental tests have not (yet) been performed.

BARE PLURALS

- (9) a. Mary saw zebras. \rightsquigarrow Mary saw > 1 one zebra.
b. Mary didn't see zebras. \rightsquigarrow Mary saw no zebra.
- With minimal extra assumptions, the trivalent view predicts that (9a) and (9b) are both undefined when Mary saw exactly one zebra.
 - This makes detailed predictions about the behaviour of bare plurals in various embedded contexts. Non-maximality can account for context-dependence.
 - The predictions differ very subtly from the best existing theories. Experimental tests have not (yet) been performed.

EMBEDDED QUESTIONS

Embedded questions also show homogeneity-like behaviour in that a universal changes into an existential under negation:

- (10) a. Agatha knows who came to the party.
 \rightsquigarrow Agatha is **fully informed** about the guests.
- b. Agatha doesn't know who came to the party.
 \rightsquigarrow Agatha has **no idea** about the guests.

This (and some other facts about embedded questions) can be explained as a consequence of the homogeneity of plural predication under the trivalent view (Križ 2015b).

GENERICIS

Generics show “flipping” effects...

- (11) a. Dogs are intelligent.
 \rightsquigarrow All normal dogs are intelligent.
 b. Dogs aren't intelligent.
 \rightsquigarrow No normal dog is intelligent.

...and are famous for allowing exceptions. (Though maybe not all kinds of exceptions are alike here.)

Adding *all* makes the flipping effect disappear and reduces exception tolerance:

- (12) All dogs are intelligent.

GENERICIS

Generics show “flipping” effects...

- (11) a. Dogs are intelligent.
 \rightsquigarrow All normal dogs are intelligent.
 b. Dogs aren't intelligent.
 \rightsquigarrow No normal dog is intelligent.

...and are famous for allowing exceptions. (Though maybe not all kinds of exceptions are alike here.)

Adding *all* makes the flipping effect disappear and reduces exception tolerance:

- (12) All dogs are intelligent.

NEG-RAISING

A parallel between homogeneity and neg-raising was suggested by Gajewski (2005): A neg-raising verb like *believe* involves a plural predication over possible situations.

- (13) Agatha believes that p .
'In **the** possible situations that are compatible with Agatha's beliefs, p is the case.'

Surprisingly, it turns out that this parallel, though conceptually extremely elegant, is empirically shakier than all the other cases mentioned... The verdict is unclear!

NEG-RAISING

A parallel between homogeneity and neg-raising was suggested by Gajewski (2005): A neg-raising verb like *believe* involves a plural predication over possible situations.

- (13) Agatha believes that p .
'In **the** possible situations that are compatible with Agatha's beliefs, p is the case.'

Surprisingly, it turns out that this parallel, though conceptually extremely elegant, is empirically shakier than all the other cases mentioned... The verdict is unclear!

THANK YOU!

REFERENCES I

- Brisson, Christine. 1998. *Distributivity, Maximality, and Floating Quantifiers*: Rutgers dissertation.
- Büring, Daniel & Manuel Križ. 2013. It's that and that's it! Exhaustivity and homogeneity presuppositions in clefts (and definites). *Semantics & Pragmatics* 6.
- von Stechow, Kai. 1999. NPI licensing, strawson entailment, and context dependency. *Journal of Semantics* 16(2). 97–148.
- Fodor, Janet Dean. 1970. *The linguistic description of opaque contexts*. Cambridge, Mass.: MIT dissertation.
- Gajewski, Jon. 2005. *Neg-raising: Polarity and Presupposition*: MIT dissertation.
- Klinedinst, Nathan. 2007. *Plurality and possibility*: UCLA dissertation.
- Križ, Manuel. 2015a. Homogeneity, non-maximality, and 'all'. *Journal of Semantics* doi:10.1093/jos/ffv006.
- Križ, Manuel. 2015b. Homogeneity, trivalence, and embedded questions. In *Proceedings of the 20th amsterdam colloquium*, .
- Križ, Manuel. 2016. It-clefts, exhaustivity, and definite descriptions. Manuscript, LSCP & University of Vienna.

REFERENCES II

- Križ, Manuel & Emmanuel Chemla. 2015. Two methods to find truth-value gaps and their application to the projection problem of homogeneity. *Natural Language Semantics* doi:10.1007/s11050-015-9114-z.
- Lasersohn, Peter. 1999. Pragmatic halos. *Language* 3(75). 522–551.
- Löbner, Sebastian. 2000. Polarity in natural language: predication, quantification and negation in particular and characterizing sentences. *Linguistics and Philosophy* 23. 213–308.
- Malamud, Sophia. 2012. The meaning of plural definites: A decision-theoretic approach. *Semantics & Pragmatics* 5. 1–58.
- Schlenker, Philippe. 2004. Conditionals as definite descriptions (a referential analysis). *Research on Language and Computation* 2(3). 417–462.
- Schwarzschild, Roger. 1994. Plurals, presuppositions and the sources of distributivity. *Natural Language Semantics* 2(3). 201–248.
- Stalnaker, Robert. 1981. A defense of conditional excluded middle. In Robert Stalnaker, William Harper & Glenn Pearce (eds.), *Ifs: Conditionals, belief, decision, chance and time*, 87–104. Dordrecht: Reidel.