

Pragmatic Strengthening: Contrariety and Disjunctive Syllogism

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‘I know what you’re thinking about,’ said Tweedledum; ‘but it isn’t so, nohow.’

‘Contrariwise’, continued Tweedledee, ‘if it was so, it might be; and if it were so, it would be; but as it isn’t, it ain’t. That’s logic.’

—Lewis Carroll, *Through the Looking-Glass*

- (1) Aristotle’s varieties of opposition (*Categories* 11b17ff., *Metaphysics* 1022b23ff.)

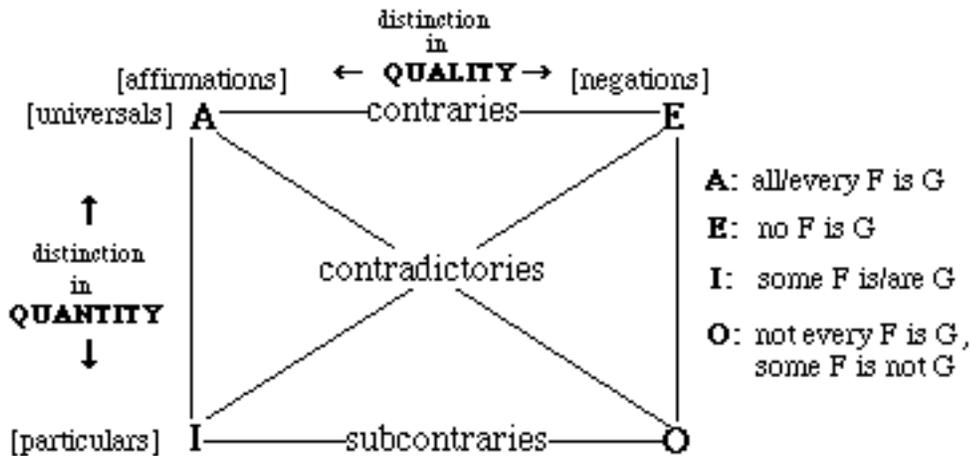
CONTRARIETY (between two CONTRARIES), e.g. *X is good* vs. *X is bad*

CONTRADICTION (AFFIRMATIVE to NEGATIVE), e.g. *X is wise* vs. *X is not wise*

CORRELATION (between two RELATIVES), e.g. *X is double of Y* vs. *Y is half of X*

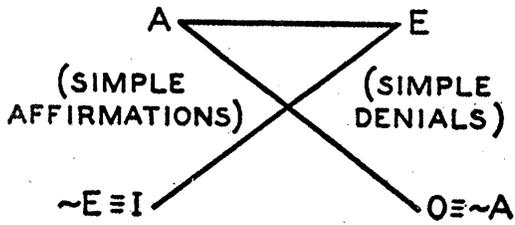
PRIVATION (PRIVATIVE to POSITIVE), e.g. *X is blind* vs. *X is sighted*

- (2) The post-Aristotelian Square of Opposition (Boethius/Apuleius)



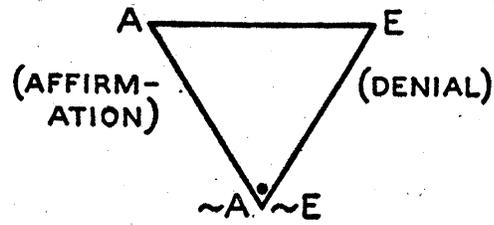
- (3)a. Corresponding **A** and **E** statements are CONTRARIES; they cannot be simultaneously true (though they may be simultaneously false).
- b. Corresponding **A** and **O** (and **I** and **E**) statements are CONTRADICTORIES; members of each pair cannot be true OR false simultaneously.
- c. An **I** statement is the SUBALTERN of its corresponding **A** statement (and **O** of **E**); a subaltern is unilaterally entailed by its corresponding superaltern.
- d. Corresponding **I** and **O** statements are SUBCONTRARIES and cannot be simultaneously false (though they may be simultaneously true).

☞ But the Square, like its triangular and hexagonal reshapings, is misleadingly symmetric, while nature abounds in both horizontal and vertical asymmetry



Four Types of Simple Proposition

(a)



“Neither A nor E”
(Joint Affirmation-Denial : I and O)

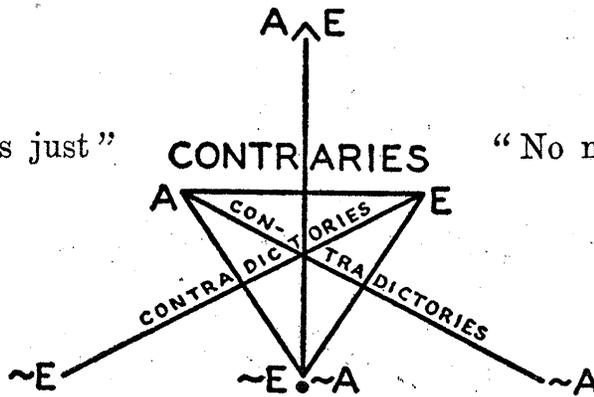
(b)

(Jacoby 1950: 38)

“Either A or E.”

“Every man is just”

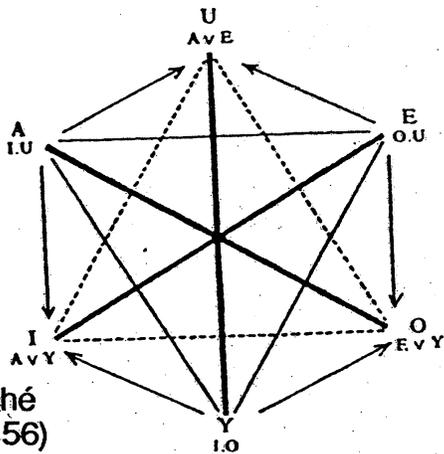
“No man is just.”



“Some man is just.” “Neither E nor A.” “Not every man is just.”
 (“Some, but not all, men are just.”)

(Jacoby 1950: 44)

The Blanché star



(Blanché 1969: 56)

(For related symmetric geometries, see papers in Béziau & Payette, in press.)

(4) A guiding principle, **MAXCONTRARY**:

Contrariety tends to be maximized in natural language.
Subcontrariety tends to be minimized in natural language.

Illustrations:

A. Asymmetries of lexicalization (negative incorporation)

(5) *Histoire d’*O* (Horn 1972, 1989, in press)

	DETERMINERS/ QUANTIFIERS	QUANT. ADVERBS	BINARY QUANTIFIERS	CORRELATIVE CONJUNCTIONS	BINARY CONNECTIVES
A:	all α , everyone	always	both (of them)	both...and	and
I:	some α , someone	sometimes	one (of them)	either...or	or
E:	no α , no one (= $\text{all}\neg/\neg\text{some}$)	never (= $\text{always}\neg$)	neither (of them) (= $\text{both}\neg/\neg\text{either}$)	neither...nor (= $[\text{both}\dots\text{and}]\neg$)	nor (= $\text{and}\neg$)
O:	*nall α , *neveryone (= $\text{some}\neg/\neg\text{all}$)	*nalways (= $\neg\text{always}$)	*noth (of them) (= $\text{either}\neg/\neg\text{both}$)	*noth...nand (= $[\text{either}\dots\text{or}]\neg$)	*nand (= $\text{and}\neg/\neg\text{or}$)

St. Thomas Aquinas: In the case of the universal negative **A** “the word ‘no’ [*nullus*] has been devised [sic!] to signify that the predicate is removed from the universal subject according to the whole of what is contained under it”, but when it comes to the particular negative **O**, we find that

there is no designated word, but ‘not all’ [*non omnis*] can be used. Just as ‘no’ removes universally, for it signifies the same thing as if we were to say ‘not any’ [i.e. ‘not some’], so also ‘not all’ removes particularly inasmuch as it excludes universal affirmation.

(Thomas Aquinas, in *Arist. de Int.*, Lesson X, Oesterle 1962: 82-3)



The relation of mutual quantity implicature holding between the positive and negative subcontraries results in the superfluity of one of the two for lexical realization, while the functional markedness of negation predicts that the unlexicalized subcontrary will be **O** rather than **I**.

B. Incorporation/inflection in English modal auxiliaries

- (6) a. A priest can not marry. [both Catholic **E** ($\neg\Diamond$) and Anglican **O** ($\Diamond\neg$) readings]
- b. A priest {can’t/cannot marry}. [only Catholic **E** ($\neg\Diamond$) reading], no **O** ($\Diamond\neg$) reading]
- (7) A priest can {always/if he wishes/of course} not marry. [forces **O** ($\Diamond\neg$) reading]
- (8) a. You could not work hard and still pass. [either **E** ($\neg\Diamond$) or **O** ($\Diamond\neg$)]
- b. You couldn’t work hard and still pass. [only **E** ($\neg\Diamond$), not **O** ($\Diamond\neg$)]

What of A-class modals, e.g. *must* or *should*?

- (9) a. **You mustn't go.** = *you must [not go]* [E ($\Box\neg$), not O ($\neg\Box$)]
 b. **You shouldn't go.** = *you should [not go]* [basically E ($\Box\neg$)]
 (9') a. **She needn't go.** = *not [she need go]* [only O ($\neg\Box$)]
 b. %Need you go?
 c. He {needs to/*need} go.

- As seen in (9'), *need* is an NPI modal (as are Dutch *hoeven*, Ger. *brauchen*). It's also restricted by semantics (mostly deontic) and style (tends to be upper/formal register)
- In some languages, including Turkish, ASL, and LSF (Langue signée française), we find an opaque E-valued modal negation that is synchronically distinct from both possibility and necessity (cf. Shaffer 2002); its O counterpart (\approx *needn't*) is transparent and non-lexicalized (= 'not' + 'must')

(10) Goossens (1987: 33): OE *motan* could denote permission, ability, or obligation, but:

Hit is halig restendæg; ne most ðu styrigan þine beddinge.

it is holy rest-day not may/can/must thou move thy bed

'This is a holy day; you(sg.) {**may not/can't/mustn't(E)**/***can not (O)**} move your bed'

(cf. Dutch *niet moeten* as instance of **O** > **E** drift)

C. The universal preference for prohibitives (van der Auwera 2006, 2010)

- 325 of 495 surveyed languages (roughly 2/3 of sample) have a dedicated prohibitive marker, typically derived from an imperative or semantically bleached auxiliary
- one common source is a 'not-want' construction (e.g. Chinese, Tagalog, Latin), but always interpreted with [WANT \neg], not [\neg WANT] scope
- another source is a grammaticalization of lexical verbs with negative-incorporated meaning, e.g. 'refuse, abstain (from)', or of a fusion of negation + modal particle
- while prohibitives often derive from $\neg + \Box$ or $\neg +$ imperative (cf. Afrikaans, Chinese, Serbian/Croatian), the resultant meaning, regardless of the character of the modal or the order of operators, is always $\Box\neg$ (equivalently $\neg\Diamond$), i.e. E, not O
- akin to prohibitives are negative purposives, e.g. *lest* (= *so that not*)
- there are no dedicated markers for \neg MUST or ALLOW \neg type structures, i.e. the O duals of the E prohibitives. Unsurprisingly, there's not even a standard name for such a class of elements ("exemptives"?)

Modal adjectives and verbs: more contrary/subcontrary asymmetries

- (11) •distributional constraints on *unnecessary* and *uncertain* as opposed to *impossible*
 •failure of nominalization for O corner (*impossibility* vs. **unnecessity*)
 •asymmetry of cross-linguistic parallels: (**innecessarius*, **innécessaire*)
- (12) What of *optional* (or *facultatif*; cf. Blanché 1969)? What of Ger. *erübrigen* (Löbner 1990)? How can we tell if a modal (root, epistemic, deontic) candidate fits into in the O slot or represents a conjunction of I and O? (i.e. Blanche's Y)

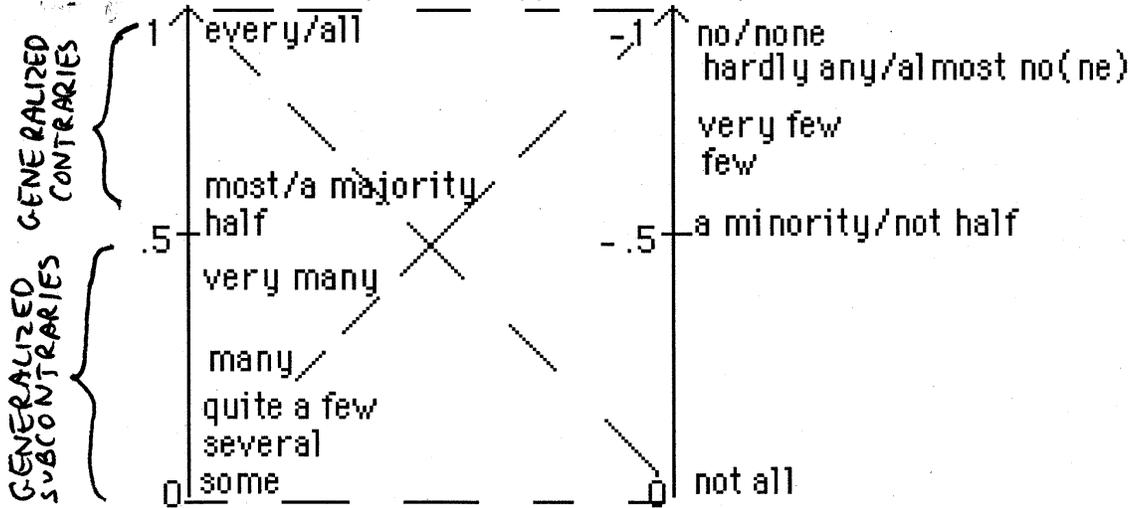
D. Intermediate values and lexicalization

- The asymmetry also extends to "intermediate" values, south of A/E but north of I/O:
 'not many' can be lexicalized (= *few*) but 'many not' can't be, 'not often/usually not' can be lexicalized (= *seldom*, *rarely*) but 'often not/not usually' can't be, and so on.

- We can superimpose quantitative scales (Horn 1972, following Grice 1989) on the traditional square to form an ARITHMETICIZED SQUARE (Horn 1989: 236-38; 2001: xxxiv).

Two terms in a quantitative opposition will occupy different positions on a single scale, while two terms in a qualitative opposition will occupy analogous positions (weak, intermediate, or strong) on parallel scales. Plotting each scalar value according to its lower bound in the usual way and assigning positive and negative arithmetic values to those positions, we obtain:

(13) **The arithmeticized square of opposition** (for quantifiers/determiners)



(14) **Quantity scales** (displayed in $\langle W, S \rangle$ format!) and the notion of tolerance

- | | |
|---|---|
| \langle some, many, most, all \rangle | \langle not all, few/not many, no/none \rangle |
| \langle sometimes, often, usually, always \rangle | \langle not always, rarely/seldom, never \rangle |
| \langle (either...) or, (both...) and \rangle | \langle not both, neither...nor \rangle |
| \langle possible, likely, certain \rangle | \langle not certain, unlikely, impossible \rangle |
| \langle can/may, should/ought to, must \rangle | \langle needn't, shouldn't, can't/mustn't \rangle |

- $\langle Q, Q^{-} \rangle$ are contraries if $Q > .5$ and subcontraries if $Q \leq .5$.
- If $Q \leq .5$, the conjunction $Q... \text{ and } Q^{-}...$ is **consistent**, and Q is **TOLERANT** (Löbner 1987). [\rightarrow GENERALIZED SUBCONTRARIETY]
- If $Q > .5$, the conjunction $Q... \text{ and } Q^{-}...$ is **inconsistent**, and Q is **INTOLERANT**. [\rightarrow GENERALIZED CONTRARIETY]

- (15) a. **Some** of my friends are linguists and **some** of them aren't.
Many of my friends are linguists and **many** of them aren't.
He **often** goes to church on Sunday and he often doesn't.
It's **possible** that she'll win, and **possible** that she won't.
It's **50-50** that it'll land heads, and **50-50** that it won't.
- b. #**All** of my friends are linguists and **all** of them aren't.
#**Most** of my friends are linguists and **most** of them aren't.
#He **usually** goes to church on Sunday and he **usually** doesn't.
#It's **likely** that it'll land heads, and **likely** that it won't.
#It's **certain** that she'll win, and **certain** that she won't.

(In)tolerance and lexicalization:

- ☞ An intolerant value Q_I may lexically incorporate its (contrary) **inner** negation ($Q_{I\bar{}}$) but does not lexicalize its outer negation ($\neg Q_I$).
- ☞ A **tolerant** value Q_T may incorporate its **outer** negation ($\neg Q_T$) but bars lexicalization of its inner negation ($Q_{T\bar{}}$).

➤ Negation is lexicalized under causatives but not outside them

(16) a. [CAUSE [E]], i.e. ‘cause to become/make not {possible/legal/moral}’

ban	enjoin	interdict	proscribe
bar	exclude	preclude	refuse
deter	forbid	prevent	veto
disallow	inhibit	prohibit	withhold

b. [CAUSE O]: ‘cause to become/make not {necessary/obligatory}’,
‘{possible/legal/moral} not...’

excuse	exempt
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➤ When an ambiguous (E vs. O) form is lexicalized, only the contrary E reading emerges, while the weaker contradictory O reading disappears

(17) a. It’s {not probable/not likely} that a fair coin will land heads.

(ambiguous; true on outer [contradictory] reading of negation)

b. It’s {improbable/unlikely} that a fair coin will land heads. [cf. *impossible* = $\neg\Diamond$]

(unambiguously inner [contrary] negation, hence false)

(18) a. It’s not likely that Federer will win and not likely that he won’t.

(allows tolerant reading with outer negation; outcome is 50-50)

b. #It’s unlikely that Federer will win and unlikely that he won’t.

(allows only intolerant, hence anomalous reading)

(19) a. It’s not {advisable/desirable} that you go there alone. (ambiguous)

b. It’s {inadvisable/undesirable} that you go there alone. (only a warning not to)

E. Further clues to the presence of MaxContrary (cf. also Jaspers 2005)

(20) a. E readings for O forms (*nealles* ‘none, not’, Du. *nimmer*, Lat. *neque*, Russ. *nel’zja*)

b. O \nrightarrow E drift for frozen forms (*not at all*, Fr. *pas du tout*)

c. Opacity of E (but not O) forms (*no, nary a*; Ger. *nie*; Fr. *personne, rien, jamais*)

d. Difficulty of negating A modals without subsequent drift, e.g.

You are to leave the room. (A)

You are not to leave the room. (E)

e. Invariant E readings available for complex adjectives < {negation, possibility}

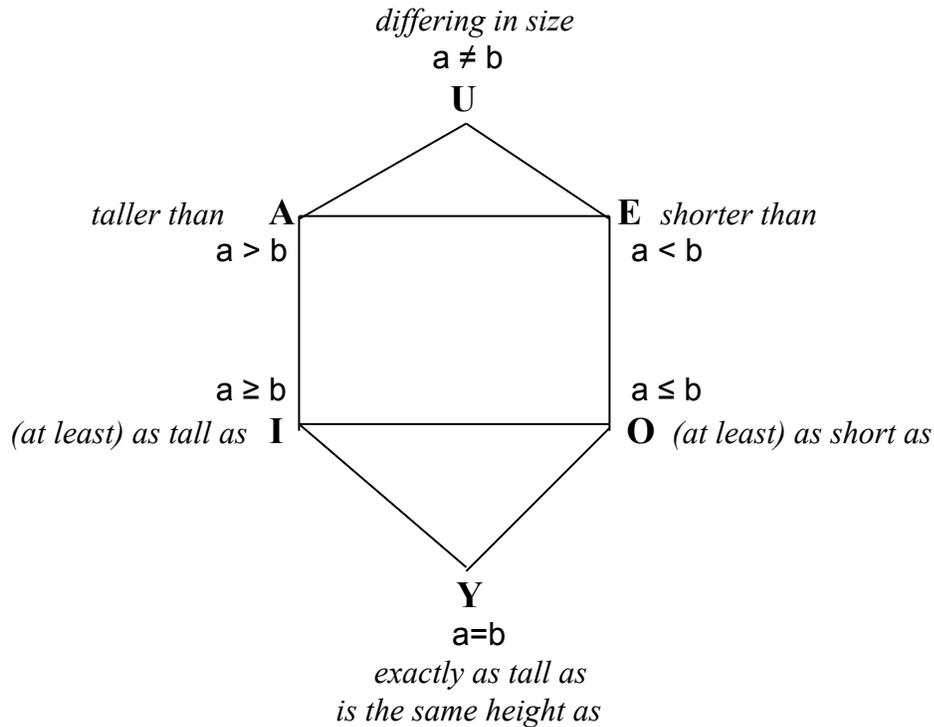
e.g. [un-[V [-able]]] = ‘incapable of being Ved’ (E)
≠ ‘capable of not being Ved’ (O)

f. Adverbs incorporating semantics of I (*tall enough to*) or of E (*too short to*)
but not those of O

F. Extension to “non-logical” domains

Extension from the quantificational operators, connectives, and modal operators to other values that can be assigned a logical geometry, manifesting the same asymmetry. Consider, for example, arithmetical (in)equalities, adjectival comparatives, and equatives:

[Hors série]



While the **A**, **E**, and **I** values have an unrestricted distribution (Chris can be *taller than*, *shorter than*, or *as tall as* Robin regardless of their respective heights), the use of the **O** value (e.g. *Chris is as short as Robin* presupposes that Chris and Robin are (relatively) short. Earl may be as tall as Muggsy even if they’re both unusually short for their comparison set, but Shaq can’t be as short as Yao if they’re both 7-footers, given the marked nature of the “negative” adjective.

☞ an implicational universal:

- The existence of a lexicalized **O** form implies the existence of a lexicalized **E** counterpart but not vice versa
- The lexicalized **E** form tends to be more opaque, semantically and distributionally less constrained than lexicalized **O** form (if any)

Virtual contrariety: pragmatic strengthening of negation

The **opposition** of predicates [e.g. *good* vs. *evil*, *white* vs. *black*] has substituted itself unnoticed for the **mere negation**, and the negative statement [*x is not good*, *y is not white*] seems to tell us more than it really does; it is understood as if it applied to the truth of the proposition with the opposite predicate.

(Sigwart 1885: 195)

Sapir on the psychological excluded middle

Three-term sets [*superior/average/inferior*, *good/moderate/bad*, *big/medium/small*, *warm/lukewarm/cool*] do not easily maintain themselves because psychology, with its tendency to simple contrast, contradicts exact knowledge, with its insistence on the norm, the “neither nor”. (Sapir 1944: 133)

- Given our natural preference for binary opposition, the “normed” or middle term is situated in a ZONE OF INDIFFERENCE and tends to be “quasi-scientific rather than popular in character” as well as typically ungradable (*?more average*, *?very lukewarm*).
- Contraries are taken to be mutually exhaustive as well as mutually inconsistent—**contradictories in contrary clothing**. When all options but *p* and *q* are eliminated, we can **assume the disjunction** in (21a), functioning as a virtual instance of (21b), the Law of Excluded Middle, despite the formal contrariety of the former.

- (21) a. $p \vee q$
b. $p \vee \neg p$

- The power of LEM derives in fact from the possibility of establishing just such pragmatic disjunctions between semantic contraries:

We are able, on the ground of our knowledge and of the particular contents of our subjects and predicates, to frame two positive statements, of which we know [as with] contradictory judgments that while both cannot be true together, neither can both be false; and in this case we gain, by denial of either member of the disjunction, a definite, unambiguous affirmation.

(Sigwart 1885: 155)

Political/religious polarization and the assumed disjunction

“He that is not with me is against me.”

—Jesus (*Matthew* 12:30; *Luke* 11:23)



“Keiner oder alle. Alles oder nichts.”

—Bertolt Brecht

—Benito Mussolini

“Either you are with us or you are with the terrorists.”

—George W. Bush, State of the Union, Sept. 20, 2001



Bernard Bosanquet (1848-1923)

“The essence of negation is to invest the contrary with the character of the contradictory.”

(Bosanquet 1888: 306)

(i) ...From ‘he is not good’ we may be able to infer something more than that ‘it is not true that he is good’. (p. 310)

(ii) ...the habitual use of phrases such as *I do not believe it*, which refer grammatically to a fact of my intellectual state but actually serve as negations of something ascribed to reality... Compare our common phrase ‘I don’t think that’—which is really equivalent to ‘I think that ___ not’. (p. 337)

Negation always involves **Contradiction between contraries** and not merely Contrariety...Without contrariety, negation would have nothing that it could mean, but without contradiction, it would not have it itself the power to mean anything. (Bosanquet 1888: 309-10)

Contradictory negatives in contrary clothing (Horn 1989: Chapter 5):

(22) (a) *contrary readings for affixal negation (conventionalized strengthening)*

- He is unfriendly** (stronger than, i.e. unilaterally entails ¬[He is friendly])
- She was unhappy** (stronger than, i.e. unilaterally entails ¬[She was happy])
- I disliked the movie** (stronger than, i.e. unilaterally entails ¬[I liked the movie])

(cf. Jespersen 1917: 144, Horn 1989: §5.1 for more on such induced contrariety)

(b) *litotes/understatement in simple denials (online pragmatic strengthening)*

- He’s not happy with it** (pragmatically stronger than ¬[He’s happy with it])
- I don’t like ouzo** (pragmatically stronger than ¬[I like ouzo])
- I’m not optimistic that ϕ** (pragmatically stronger than ¬[I’m optimistic that ϕ])

(c) *“neg-raising” effects (short-circuited R-based implicature)*

- I don’t believe it’ll rain** (\approx I believe it won’t rain)
- I don’t want you to go** (\approx I want you not to go)
- It’s not likely they’ll win** (\approx It’s likely they won’t)

In each case, the negation of an unmarked, weak intolerant positive scalar value R-implicates a stronger (contrary) negation, based on a pragmatically motivated assumed disjunction: **In a context licensing the pragmatic assumption $p \vee q$, to assert $\neg p$ is to implicate q .** (This implicature may undergo subsequent conventionalization.)

Neg-raising:

a tendency first identified by Saint Anselm (1033-1109) through his recognition of the ordinary interpretation of *non debere* (*peccare*) ['a man *non-debet* sin'] as *debere non* (*peccare*) ['a man *debet* not-sin']:

.1: (*N*). We also say 'oughtn't to sin' when we mean 'ought not-to-sin'. For in a right view not everybody is sinning when what he does is not what he *ought* to. 'Ought' means the same as 'it is a duty', so 'ought not' really means 'it isn't a duty'. Now a man does not always do wrong when he does what it is not his duty to do. Thus, a man has no duty to marry, for he may lawfully remain a virgin. It follows that it isn't that he *ought* to marry, and yet if he does marry he does nothing wrong. Hence when a man does what he oughtn't to do, he does not always sin—if 'He oughtn't' is taken as 'It isn't that he ought'—and yet no one denies that a man ought to marry. So he ought to and yet it is not that he ought to.

Dicimus etiam nos 'non debere peccare' pro 'debere non peccare'. Non enim omnis, qui facit quid non debet, peccat, si proprie consideretur. Sicut namque debere idem est quod debitorem esse, ita non debere non est aliud quam debitorem non esse. Non autem semper peccat homo, quando facit quod non est debitor facere. Siquidem vir non est debitor ducere uxorem, quia licet ei servare virginitatem. Unde sequitur, quia non debet eam ducere, et tamen, si ducit eam, non peccat. Non ergo semper peccat vir, quando facit quod non debet, si proprie intelligitur 'non debere'. Nemo tamen negat virum debere ducere uxorem. Debet igitur et non debet.

St. Anselm's Lambeth fragment 36.3

—dual text from Henry 1967: 193; see also Hopkins 1972: 231

For Henry, Anselm's take on modal/negative scope interaction is complicated by the **quirks of Latin usage**. He has become conscious of the fact that, according to that usage, '*non debet*', the logical sense of which is '**It isn't that he ought**', is normally used not to mean exactly what it says, but rather in the sense more correctly expressed by '*debet non*' ('**he ought not**'). The result is that when one wishes to convey the first sense (i.e. 'It isn't that he ought') the necessary form of words is lacking; nevertheless, as Anselm says, we want to be able to say of a man making a decision about marriage that it isn't that he ought to marry (i.e. *non debet*...), but without conveying the 'ought not' sense of the Latin form.

(Henry 1967: 193, §6.412, **emphasis added**)

...the familiar quirk of English whereby '*x* does not believe that *p*' is equated to '*x* believes that not *p*' rather than to 'it is not the case that *x* believes that *p*' (Quine 1960: 145-6, on '**this idiosyncratic complication**')

[T]he phrase ‘a does not believe that p’ has a **peculiarity**...in that it is often used as if it were equivalent to ‘a believes that -p’. (Hintikka 1962: 15)

‘I do not believe that p’ **can be unfortunately ambiguous** between *disbelief* [$B_a\text{-}p$] and *not belief* [$\text{-}B_a p$]. (Deutscher 1965: 55)

In fact, rather than constituting a quirk of English or Latin usage, “neg-raising”—the lower-clause understanding of negation over *believe*- and *ought*-type predicates (and others)—is distributed widely across languages and operators; cf. Prince 1976; Horn 1978, 1989; Horn & Bayer 1984; and more recent treatments in Klooster 2003, Sailer 2006, and Gajewski 2007.

Horn & Bayer 1984; Horn 1989, Chapter 5:
The NR understanding is always **stronger** than the contradictory (outer) negation, in that it applies to a proper subset of the situations to which the contradictory applies (is true in a proper subset of the worlds in which the contradictory is true). Thus NR is always a strengthening inference: the literal interpretation is true but too weak, and the addressee recovers a short-circuited conversational implicature to ‘fill in’ the stronger proposition.

But not just *any* potential contrary will do...

- (23) a. It's not likely the economy will recover.
outer neg reading = \neg (LIKELY...) [contradictory]
inner neg reading = LIKELY...(\neg ...) [contrary]
- b. It's not possible the economy will recover.
outer neg reading = \neg (POSSIBLE...) [contradictory]
inner neg reading = POSSIBLE...(\neg ...) [subcontrary]
- c. It's not certain the economy will recover.
outer neg reading = \neg (CERTAIN...) [contradictory]
inner neg reading = CERTAIN...(\neg ...) [contrary (*why unavailable?*)]

In general, neg-raising licensors are positive WEAK INTOLERANT operators ranging over verbs of opinion, perception, intention, volition, and judgment, as well as epistemic and deontic modalities (cf. Kalepky 1891, Horn 1978), including...

believe, suppose but not *know, doubt, disbelieve*
want, suggest but not *insist, forbid, prohibit*
advisable, desirable but not *obligatory, forbidden*
should, ought to, better (“I don’t think you should VP”) but not *have to, must, can*
likely, probable but not *certain, impossible*
most but not *all, many, some, few*
usually but not *always, often, sometimes, rarely*

☞ strong deontic values often allow neg-raising effects: *Il ne faut pas que tu meures* (lit., $\neg \square$ [you die] > ‘you mustn’t die’); cf. Tobler 1882 on “*unlogisch*” placement of contrary (= E) negation outside *falloir* (as with *devoir* ‘should’ and Ger. *wollen, sollen*), evicting or blocking the transparent O reading. Similarly with negated causatives:

(24) Il caffè non mi fa dormire. ‘Coffee doesn’t {make/let} me sleep’

- In Italian, Japanese, Turkish, Amharic, Czech, Biblical Hebrew, Jacaltec, etc., the negation of a strong causative (lit., ‘not make’) may or must strengthen to yield contrary (= ‘not let’, ‘make not’ = **E**) force
- The reverse drift, in which a ‘not let’ (**E**) causative is understood as ‘let not’ or ‘not make’ (**O**), seems never to occur.

Neg-raising, disjunctive syllogism, and the assumed disjunction

(Bartsch 1973)

- (25) Peter glaubt nicht, daß Hans kommt. ‘P doesn’t believe that H is coming’
 a. Peter glaubt, daß Hans nicht kommt. ‘P believes that H is not coming’
 b. Es ist nicht so, daß Peter glaubt, daß Hans kommt. ‘NOT [P believes that H is coming]’
- (26) a. *a* glaubt, daß nicht-*p*. ‘a believes that not-*p*’
 b. *a* glaubt nicht, daß *p*. ‘a does not believe that *p*’

- There is a **semantic entailment** from (26a) to (26b).
- In the opposite direction, there is (in certain *pragmatische Verwendungsbedingungen*) a **pragmatic implication** from (26b) to (26a).
- This implication can be derived via the assumption that the subject can be assumed to have given some thought to the truth of *p* and come to some conclusion about it.
- In the context of (25) or other propositional attitudes (*think, want*) that express the subject’s cognitive or psychological stance toward the complement, we can assume that a disjunction holds—*a believes that p* or *a believes that ¬p*—rather than that *a* hasn’t thought about *p* or is neutral as whether *p* or *¬p*.
- Thus “neg-raising” is not a rule of grammar or semantic interpretation but a *pragmatische Implikation*; (26a,b) are semantically distinct but can express the same information relative to a given *Sprechsituation*.

(27) Bartsch's inference schema in DS[Disjunctive Syllogism]-normal form

- (i) $F(a, p) \vee F(a, \neg p)$ the “assumed disjunction”
 (ii) $\neg F(a, p)$ the proposition actually asserted
 (iii) $F(a, \neg p)$ the proposition conveyed, via DISJUNCTIVE SYLLOGISM
 (a.k.a. MODUS TOLLENDO PONENS)

But it’s unclear how this “solution” to NR could handle variation within and across languages as to just which NR candidates actually induce contrariety.

In particular: When is the disjunction in (27i) actually assumed?

How are we to handle variation within and across languages?

—cf. Horn (1978) and (1989, Ch. 5) for problems and related discussion, e.g.:

- Ger. *hoffen* neg-raises but not Eng. *hope* (except after *never* + infinitive)
 - Lat. *sperare* ‘hope’ neg-raised but Fr. *espérer* doesn’t (while *souhaiter* ‘wish’ does)
 - *want* does but *desire* doesn’t; Heb. *xogev* ‘think’ does but *maamin* ‘believe’ doesn’t
 - *guess* neg-raises in Southern U.S. English but not in other U.S. or U.K. varieties
- But Bartsch’s model of neg-raising as pragmatic strengthening via disjunctive syllogism turns out to function as an excellent template for several other linguistic phenomena where assumed disjunctions are invoked to massage contradictories into virtual contraries, including...

α) **The homogeneity effect:** strengthening of an apparent sentential negation with a (mass or definite) plural subject into a contrary, scoping under the (explicit or implicit) quantification in subject and object terms

Fodor (1970: 158-68) on “**all or none**” presupposition for plural definites:

- (28) a. John had hoped to have (all) the pictures. (*simple definite is odd if he had some*)
b. I didn't see #(all) the boys, but I did see some of them.
c. —Are #(all) the boys we met orphans?
—No, some of them are.

Generics as well as definite plurals manifest all-or-none (Fodor 1970: 163-4):

- (29) a. Women enjoy/do not enjoy washing dishes; Do women enjoy washing dishes?
b. All women enjoy/do not enjoy washing dishes; Do all women enjoy washing dishes?
(26a), unlike (26b), “leaves no room for disagreements about different women”)

➤ But if there is an “all-or-none” presupposition, it's one that can be overridden:

Almost all the new media of that day [17th c. France] were working, in essence, for kinglouis.gov. Even later, **full-fledged totalitarian societies didn't burn books. They burned some books**, while keeping the printing presses running off such quantities that by the mid-fifties Stalin was said to have more books in print than Agatha Christie.

—Adam Gopnik, *New Yorker*, Feb. 14 & 21, 2011, p. 125, on information control

Fodor's *all-or-none* with implicit quantification in bare and definite plurals (and mass DPs) resurfaces as the GENERIC EXCLUDED MIDDLE of von Stechow (1997)—

When a kind is denied to have a generic property P_k , then any of its individuals cannot have the corresponding individual-level property P_i .

(von Stechow 1997: 31)

and the HOMOGENEITY or UNIFORMITY PRESUPPOSITION of Löbner (1985 & seq.), based on the interpretation of negative responses to questions like

- (30) a. Do mammals lay eggs?
b. Are the children asleep?

If the predicate P is false for the NP, its negation not- P is true for the NP.

later reformulated as the PRESUPPOSITION OF INDIVISIBILITY:

Whenever a predicate is applied to one of its arguments, it is true or false of the argument as a whole. (Löbner 2000: 239)

Along similar lines, consider the invocation of a 'BLACK AND WHITE' EFFECT to account for neg-raising in Klooster (2003):

In a discourse where judgements and intentions are relevant, but reserving or deferring them are not, verbs of the considered type are easily interpreted as dichotomous. (Klooster 2003: 4)

—resulting in an equivalence tentatively advanced (although later withdrawn) for NR predicates: $\neg P(x,p)$ iff $P(x,\neg p)$ (Klooster's (12)).

On Gajewski's (2007) neo-Bartschian approach to NR, the problem of lexical exceptions (non-neg-raising attitude predicates) is taken to indicate that excluded middle for NR must be treated as a "soft" presupposition.

But is excluded middle/homogeneity/indivisibility really a presupposition at all?

Krifka 1996: pragmatic strengthening predicts homogeneity effect

- (31) a. The windows are made of security glass.
 b. $\forall x[x \subseteq \text{THE WINDOWS} \rightarrow \text{MADE OF SECURITY GLASS}(x)]$ (*preferred interp.*)
 c. $\exists x[x \subseteq \text{THE WINDOWS} \wedge \text{MADE OF SECURITY GLASS}(x)]$
- (32) a. The windows are not made of security glass.
 b. $\neg \exists x[x \subseteq \text{THE WINDOWS} \wedge \text{MADE OF SECURITY GLASS}(x)]$ (*preferred interp.*)
 c. $\neg \forall x[x \subseteq \text{THE WINDOWS} \rightarrow \text{MADE OF SECURITY GLASS}(x)]$

"In predications on sum individuals, **the logically stronger interpretation is preferred**" (Krifka 1996: 12). To predict this:

- (33) If a predicate P applies to a sum individual x, grammar does not fix whether the predication is universal ($\forall y [y \subseteq x \rightarrow P(y)]$) or rather existential ($\exists y [y \subseteq x \wedge P(y)]$), except if there is explicit information that enforces one or the other interpretation. [= Krifka 1996: (38)]
- (34) If grammar allows for a stronger or weaker interpretation of a structure, choose the one that results in the stronger interpretation of the sentence, if consistent with general background assumptions! [= Krifka 1996: (39)]

Krifka (1996: 13) suggests that (34) might be assimilated to the R-BASED IMPLICATURES of Horn (1984, 1989) that license a speaker to underspecify the force of her utterance while counting on the hearer to recover, in Krifka's formulation, "the strongest possible interpretation that is consistent with the background knowledge."

Bypassed here: The extension of this approach to the principle of Conditional Excluded Middle (cf. Stalnaker 1981, von Stechow 1997, Williams 2010 for discussion and references), based on the viability of the assumed disjunction $(A > C) \vee (A > \neg C)$

β) The strengthening of a weak/primary quantity (scalar) implicature

Given a scale $\langle W, S \rangle$, a speaker *a* uttering "...W..." is taken to Q-implicate $\neg B_a(\dots S \dots)$

to the corresponding strong/secondary implicature:

Given a scale $\langle W, S \rangle$, a speaker *a* uttering "...W..." is taken to Q-implicate $B_a \neg(\dots S \dots)$.

This is based on the "competence assumption" (Geurts 2010: 52, citing Sauerland 2004 and van Rooij & Schulz 2006): "the speaker knows the relevant facts" and hence "is not undecided about the truth of the stronger alternative", precisely as in Bartsch's model)

(35) **DS-normal form of the relevant strengthening inference:**

- (i) $B_a S \vee B_a \neg S$ the competence assumption
- (ii) “W” speaker *a*’s assertion
- (iii) $\neg B_a S$ the weak Q-implicature, via Maxim of Quantity-1
- (iv) $B_a \neg S$ the strong Q-implicature, via DS/MTP

Cf. Mill (1865)’s proto-Gricean rebuttal to Hamilton (1860)’s analysis of *some* as ‘some only, some but not all’:

No shadow of justification is shown...for adopting into logic a mere sous-entendu of common conversation in its most unprecise form. If I say to any one, “I saw some of your children today”, he might be justified in inferring that I did not see them all, not because the words mean it, but because, if I had seen them all, it is most likely that I should have said so: **though even this cannot be presumed unless it is presupposed that I must have known whether the children I saw were all or not.** (Mill 1865: 442, emphasis added)

δ) The Gricean alternative to a localist account for Chierchia’s problem cases

In uttering (36a) [= (26) in Geurts 2009], why do I implicate not just (36b) but the stronger (36c)? [These are originally from Russell 2006: 363ff.]

- (36) a. George believes that some of his advisors are crooks.
- b. [According to me] it is not the case that George believes that all of his advisors are crooks: $\neg B_g$ (all of *g*’s advisors are crooks)
- c. [According to me] George believes that not all of his advisors are crooks.

•Chierchia 2004, 2006: the predicted global implicature, viz. (36b), is too weak; what is required is a localist analysis on which the “implicature” from *some* to *not all* is delivered not by Gricean assumptions about rationality and cooperation but by stipulating *not all* or *only some* as a default within the computational system.

•Geurts’s response (2009: 68; 2010: 169), following Russell (2006): “We may assume that the competence assumption holds not only for the speaker but for the subject of the belief report”, allowing us to derive the key disjunction:

- (37) B_g (all of George’s advisors are crooks) $\vee B_g \neg$ (all of George’s advisors are crooks)

Then we obtain (36c) from (36b) + (37) [via disjunctive syllogism], essentially as in (35).

Not all propositional attitudes allow easy access to the relevant disjunction, and in those cases the “local implicature” effect will be attenuated. According to Sharvit & Gajewski (2008), *certain* licenses local implicatures, so (38a) implicates (38b).

- (38) a. John is certain that the boss or her assistant have disappeared.
- b. John is certain that the boss or her assistant but not both have disappeared.

But is this correct? Does H really infer that S intends to convey (38b)? What about (38’)?

(38’) The chair is certain that some of our admitted students will accept their offers.

This doesn’t implicate that the chair is certain that not all of them will accept.

Russell (2011): "Semantically weaker propositional attitudes produce stronger (more robust) embedded implicatures", based on probability the relevant disjunction is true.

(39) It's absolutely certain that most of Kennewick Man's descendants are Native Americans.
 = Russell's (5.27), an attested example, which fails to yield any local 'not all' inference.
 Contrast (39'), where an upper-bounding implicature is generated:

(39') It's pretty likely that most of Kennewick Man's descendants are Native Americans.

Thus, "embedded implicature" strengthening effects correlate roughly with the availability of neg-raising readings, but the two are not identical (given the idiosyncrasies of NR).

Word learning, beastly inferences, and disjunctive syllogism



a↑



b↑

When presented a trial with "doll" and "megaphone" as the two objects and told to take the megaphone, the [20-31 month old] children were able to do so—not because they knew the label "megaphone", but because they knew the name of the other object was "doll."

(Vincent-Smith et al. 1974: 192)

DS-normal form of the inference:

- | | | |
|------|--------------------------------------|--|
| (40) | (i) $a \in M \vee b \in M$ | [inference via Theory of Mind] |
| | (ii) $a \in D$ | [Prior knowledge] |
| | <u>(ii') $a \notin M$</u> | [from (ii) by Mutual exclusivity] |
| | (iii) $b \in M$ | [from (i), (ii') by Disjunctive syllogism] |

- **Clark (1987), Markman & Wachtel (1988)**: Classic treatments of children’s tendency to assume that category labels apply uniquely to a given object; if child knows label for object, an unfamiliar label must pick out an unfamiliar object or a subpart (*trachea*) or property (*pewter*) of a familiar one. Cf. also **Bloom 2000**: 65-87) for an excellent survey of late 20th century research on word learning, mutual exclusivity, and the role of Gricean pragmatics and “theory of mind.”
- **Kaminski, Call & Fischer (2004)**: Demonstrates that Rico, a border collie, learned over 200 object labels, inferring the names of new objects by exclusion (disjunctive syllogism), and that the manifestation of such inferential behavior cannot therefore be restricted to species-specific language acquisition. (Cf. **Markman & Abelev 2004** and **Bloom 2004** for other interpretations of Rico’s achievements.)
- **Call (2006)**: Attests successful (non-word) inferential learning by exclusion in great apes (chimpanzees, gorillas, bonobos, orangutans), demonstrated by their ability to select correct (non-empty) food bin after they had witnessed food being discarded from sole alternative bin.
- **Erdőhegyi, Topál, Virányi & Miklósi (2007)**: Extends the results from Rico to 35 pet dogs volunteered for project demonstrating inferential reasoning task involving forced choice task to pick out non-hidden toy. Dogs employed disjunctive reasoning only in absence of social-communicative cues which override perception-based information. Confirms earlier thesis of “**social-dog, causal-ape**” (Bräuer et al. 2006).
- **Aust, Range, Steurer & Huber (2008)**: Investigates ability to reason by exclusion among humans (children and undergraduates), dogs, and pigeons. Such inferential reasoning is confirmed in humans and (most) dogs tested, but the evidence suggests that “the ability to make inferences by exclusion—which requires logical reasoning independent of perceptual features—may be out of a pigeon’s reach” (p. 595).
- **Grassmann, Stracke & Tomasello (2009)**: Based on the experimental behavior of 2-year-olds to novel items, supports the social/pragmatic nature of the general inference strategies (based on common ground and disjunctive reasoning) of which the lexical Contrast and Mutual Exclusivity principles may be seen as special cases.
- **Pilley & Reid (2011)**: Demonstrates that Chaser, a border collie who (in out-Ricoing Rico) has acquired the proper names of 1022 objects learned over a three-year period, as well as her ability to use inferential reasoning by exclusion to learn the names of unfamiliar objects, replicating the findings in the Kaminski et al. (2004) study.



Rico (1994-2008)



Chaser (2005-)



children



college students



pigeons

Disjunctive inference in proto-Rico dogs

<p>Stoics' 4th indemonstrable syllogism</p> $\begin{array}{l} p \text{ or } q \\ \underline{p} \\ \therefore \text{not-}q \end{array}$	<p>5th indemonstrable syllogism</p> $\begin{array}{l} p \text{ or } q \\ \underline{\text{not-}p} \\ \therefore q \end{array}$
---	---

Is that a gun in your pocket or are you just happy to see me? [after Mae West]

[It's not a gun in your pocket]

[∴ You're happy to see me]

(enthymematic disjunctive syllogism)

but this has become a "Discredited Trope, almost always subverted"

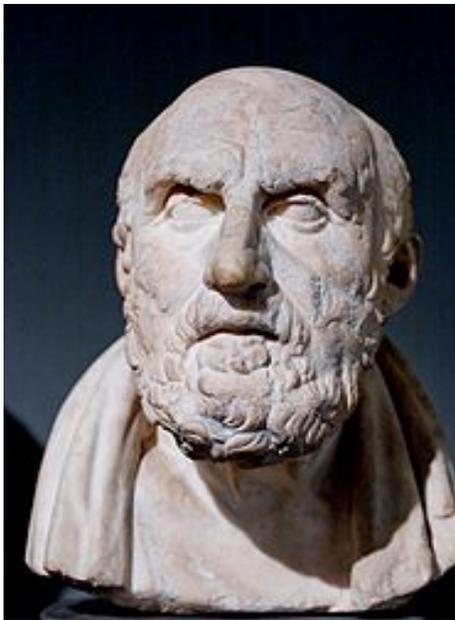
"Yeah. That **is** a gun in my pants. But that doesn't mean I'm not happy to see you..."

"Yes, that (actually) **is** a {gun/chocolate bar/light saber} in my pocket.

But I'm happy to see you too." <http://tvtropes.org/pmwiki/pmwiki.php/Main/OrAreYouJustHappyToSeeMe>

Modus Tollendo Ponens (Disjunctive Syllogism)

$$\begin{array}{l} \phi \vee \varphi \\ \underline{\neg \phi} \\ \therefore \varphi \end{array}$$



Chrysippus of Soli
(279-206 B.C.)

According to Chrysippus, who was certainly no friend of non-rational animals, the dog ...uses repeated applications* of the fifth undemonstrated argument-schema when, arriving at a juncture of three paths, after sniffing at the two down which the quarry did not go, he rushes off on the third without stopping to sniff. For, says this ancient authority, the dog in effect reasons as follows: the animal either went this way or that way or the other; he did not go this way and he did not go that; therefore, he went the other.

—Sextus Empiricus, *Pyrr. Hyp.* I, 69
in Mates (1997: 98)

* (i) $p \text{ or } (q \text{ or } r), \text{not-}p; \therefore (q \text{ or } r)$

(ii) $q \text{ or } r, \text{not-}q; \therefore r$

A hound in following a stag, on coming to a cross-road, tries by scent whether the stag has passed by the first or second road: and if he find that the stag has not passed there, being thus assured, takes to the third road without trying the scent; as though he were reasoning by exclusion, arguing that the stag must have passed by this way, since he did not pass by the others, and there is no other road.

—St. Thomas Aquinas (1225-1274), *Summa Theologica Pars II*, Q. 13, Art. 2

[Aberdein (2007) cites these and related passages from Plutarch, Montaigne, Nash (1567-1601), Coleridge, et al., endorsing canines' ability to draw DS-based inferences]

The Ten Commandments of Contrariety & Pragmatic Strengthening (a.k.a. The Ten Pillars of Contrariwisdom)

- I. Thou shalt not lexically incorporate outer negations of intolerant values (or inner negations of tolerant ones).
- II. Thou shalt strengthen formal **O**-ish values into the **E** range.
- III. Thou shalt interpret formal contradictories as virtual contraries.
- IV. Thou shalt exclude the middle between contraries (when motivated).
- V. Thou shalt raise thy embedded negations (when possible).
- VI. Thy negated bare plural, definite plural, and mass predications shall be made strong.
- VII. Thy weak implicatures shall be made strong (when epistemic considerations permit).
- VIII. Thine “embedded implicatures” shall percolate globally as strong implicatures.
- IX. Thy children and animal companions shall employ disjunctive syllogism for word learning and other adventures.
- X. Thou shalt chase thy rabbits logically and with Stoicism.

Apocrypha: How can we derive the conjunctive upgrade of *or*?

(so-called FREE CHOICE PERMISSION, which actually applies to other kinds of possibility modals [Zimmermann 2000] and to generics [Nickel 2010]; see also Horn 1972, Kamp 1973, Simons 2005, Aloni 2007, Barker 2010 for more on strengthened disjunctions)

- (41) a. You can go to the movies or to the beach. (\leftrightarrow You can go to either.)
 b. A or B or ... Z can whistle. (\leftrightarrow Anyone can whistle.)
 c. They may win or (they may) lose. (\leftrightarrow They may win and they may lose.)
 d. Girls or boys delight Robin. (\leftrightarrow Girls delight Robin and boys delight Robin.)
 e. Lee eats meat or fish. (\leftrightarrow Lee eats meat and Lee eats fish.)
- (42) a. $\diamond(p \vee q) \leftrightarrow \diamond p \wedge \diamond q$ (Lee can eat meat or fish)
 b. $\neg(p \vee q) \leftrightarrow \neg p \wedge \neg q$ (Lee didn't eat meat or fish)
 c. $(p \vee q) \rightarrow r \leftrightarrow (p \rightarrow r) \wedge (q \rightarrow r)$ (If Lee eats meat or fish,...)

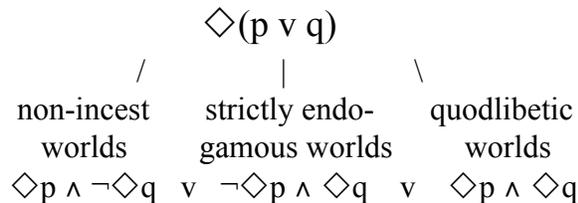
But while (42b,c) define **downward** entailing contexts, (42a) is **upward** entailing (permitting free choice items but not true NPIs, e.g. *ever*, *so much as*, minimizers)

➤ Now consider a scenario in which Lee says to Bill:

- (43) You can marry my sister or your sister
 (a) You can marry one of them: I forget which/I don't know which/Guess which!?
 (b) You can marry either of them: it really doesn't matter which/you're free to choose

(43a) is the standard disjunction-qua-disjunction context; (43b) is the quodlibetic context.

Let $p =$ *you marry my sister*; $q =$ *you marry your sister*



in DS-normal form:

- (44) (i) $[(\diamond p \wedge \neg \diamond q) \vee (\neg \diamond p \wedge \diamond q)] \vee (\diamond p \wedge \diamond q)$
 (ii) $\neg[(\diamond p \wedge \neg \diamond q) \vee (\neg \diamond p \wedge \diamond q)]$ (from the assumption of quodlibeticity)
 (iii) $[\diamond p \wedge \diamond q]$ (DS, from (i) and (ii))

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