

# 18 Mar 2025 - Language and Logic - Week 05

Recap:

→ Logical complications of 'if'

→ Hidden implicature

$$P \rightarrow Q \quad \overset{\text{implicature}}{\approx} \quad \neg P \rightarrow \neg Q$$

hidden biconditional

$$P \rightarrow Q \equiv \neg Q \rightarrow \neg P$$

antecedent      consequent

→ Constraints on the derivation of hidden biconditional

Example 5

Example 7 : → implicature cannot be cancelled.  
P entails Q.

→ Counterfactual conditionals  
not real  
in alternative universe

→ Biconditional interpretation

→ Unconditional interpretation

## Negation

The logic of negation

$\neg P \equiv P$  is false

$P \equiv \neg P$  is false

Negation before sub constituents

He ate tomatoes, not the pizza

Negation operates on propositions.  
worthy of being negated

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Other Logical Complication

1

2: It's not warm, it is downright hot

3:

negation does not seem to change the truth value of the proposition it negates warm

entails

But each one makes perfect sense.

P = it is warm

Q = it is downright hot

$\neg P$  and Q  
↓ entails  
P

$\neg P$  and P  $\Rightarrow \Leftarrow$

It seems that the negation then operates on the implicature of P.

$\neg P = \neg$  (It is only warm)  
↓  
hidden

## De Morgan's Law

$$\neg (P \vee Q) \iff \neg P \wedge \neg Q$$

Joy does not like pizza or ice-cream

① Joy does not like pizza and Joy does not like ice-cream.

② Joy is anything but kind or gentle } → another way to express negation

## Complications

→ I rarely drink juice or lassi with my dinner

↗

I rarely drink juice with my dinner

and I rarely drink lassi with my dinner

## Explanation

see slides  
(frequency)

→ juice examples

19 Mar 2025

On the mental representation of conjunction and disjunction

→ A series of experiments

Why is it difficult?

— Search space ↑  
more branches to search

memory  
in human  
brain

3 6 0 8

↓  
how many no. can you  
remember, if no. is remove  
from a flash

## Complexity Matters

- Different possibilities give rise to different mental model

model of a scenario  
↑

Even in conditionals → participants represent in terms of conjunctions

$A \rightarrow B$

$A \wedge B$

makes job easier

(complexity metric)

Conditional: If this person works on weekends,  
then it supports scientific research.



$A \rightarrow B$   
 $A \sim B$  } can be evaluated in a  
single mental model.

The hidden force of the Bi-conditional  $\rightarrow$  very popular  
Wason highly repeated

2<sup>nd</sup> experiment → less abstraction  
interpreted as unconditional

Biconditional → usual, under some constraints/forces  
↓  
one entails other  
↙  
can be nullified  
by, culture and  
habits, language

Conclusion → processing in brain may be  
influenced from outside

# More Trouble with Conditionals

Why are conditionals more complex?

↳ truth table

3 / 4

↙  
3 mental models

Perplexing results

??

P

Q

$P \rightarrow Q$

T

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