

# How to Identify Good Reasoning

## *Semantic Approach*



Marcello Di Bello

---

*Introduction to Logic*

# A Murder Case

---



- A1 At least one of them is guilty.
- A2 Not all of them are guilty.
- A3 If Mrs White is guilty, then Colonel Mustard helped her (he is guilty too).
- A4 If Miss Scarlet is innocent then so is Colonel Mustard.

# Listing All the Possibilities



innocent	innocent	innocent
innocent	innocent	guilty
innocent	guilty	innocent
innocent	guilty	guilty
guilty	innocent	innocent
guilty	innocent	guilty
guilty	guilty	innocent
guilty	guilty	guilty

# Ruling Out Possibilities



- A1 At least one of them is guilty.
- A2 Not all of them are guilty.
- A3 If Mrs White is guilty, then Colonel Mustard helped her (he is guilty too).
- A4 If Miss Scarlet is innocent then so is Colonel Mustard.

innocent	innocent	innocent
innocent	innocent	guilty
innocent	guilty	innocent
innocent	guilty	guilty
guilty	innocent	innocent
guilty	innocent	guilty
guilty	guilty	innocent
guilty	guilty	guilty

# Good Reasoning

---

✓  $\frac{A_1, A_2, A_3, A_4}{\text{Miss Scarlet is guilty}}$

In **every** situation in which  $A_1, A_2, A_3$  and  $A_4$  are all true, “**Miss Scarlet is guilty**” is true.

✓  $\frac{A_1, A_2, A_3, A_4}{\text{Mrs White is innocent}}$

In **every** situation in which  $A_1, A_2, A_3$  and  $A_4$  are all true, “**Mrs White is innocent**” is true.

# Not So Good

$\times$   $\frac{A_1, A_2, A_3, A_4}{\text{Colonel Mustard is guilty}}$

**There is** a situation in which  $A_1, A_2, A_3$  and  $A_4$  are all true, but “Colonel Mustard is guilty” is false (there is a **counter-example**).

$\times$   $\frac{A_1, A_2, A_3, A_4}{\text{Colonel Mustard is innocent}}$

**There is** a situation in which  $A_1, A_2, A_3$  and  $A_4$  are all true, but “Colonel Mustard is innocent” is false (there is a **counter-example**).

# Two Ways to Identify Good Reasoning

---

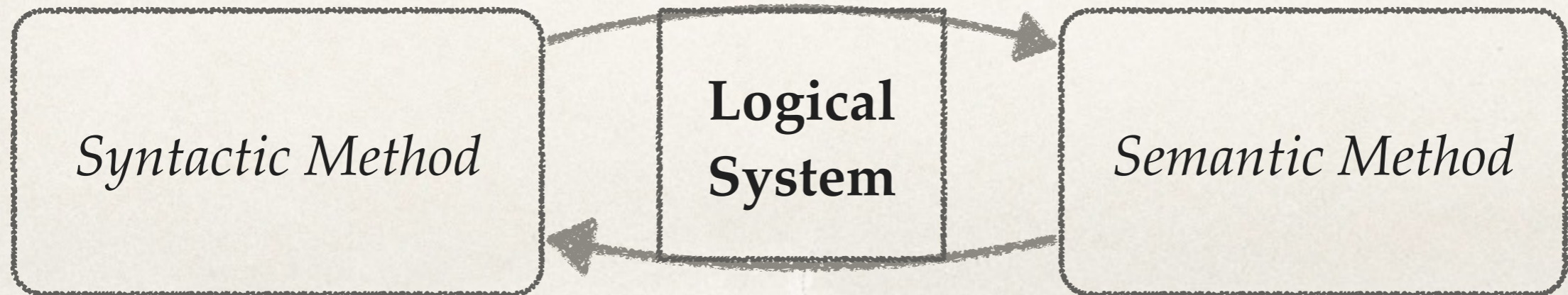
Check whether the proposed reasoning **conforms to a good reasoning pattern.**

List all the possibilities, rule out the possibilities that are excluded by the premises, and check whether **the putative conclusion is true in all the possibilities that are left.**

*Syntactic Method*

**Logical System**

*Semantic Method*



# From Lewis Carroll

---

*There is no box of mine here that I dare open. My writing desk is made of rosewood. All my boxes are painted, except those that are here. There is no box of mine I dare not open, unless it is full of live scorpions. All my rosewood boxes are unpainted. Therefore...*