Reasoning and
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Lecture 9

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Reasoning and Formal Modelling for Forensic Science
Lecture 9

Prof. Dr. Benedikt Löwe

2nd Semester 2010/11

Argumentation Schemes.

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Premiss 1. ...

Premiss 2. ...

Conclusion. ...

Critical Questions: ...

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The four possible situations.

1. The situation confirms that the critical question doesn't raise a relevant issue.
2. The situation raises an issue with our representation of the argument or reconstruction of what actually happened.
3. The situation does not answer a question, and more clarification is needed.
4. The situation confirms that there is a problem with the argument.

In cases 1. and 4., Argumentation Theory has served its purpose. We either have a corroboration or a refutation of the argument.

Case 3. requires further investigation. The information we have at hand is not enough to answer the critical question.

The interesting case is Case 2. in which we need to go back to our formal representation of the situation.

Argument Schemes covered in the last two lectures.

Argument from Position to Know.
Argument from Expert Opinion.
Argument from Popular Opinion.
Argument from Popular Practice.
Argument from Example.
Argument from Cause to Effect.
Argument from Abduction.

Important note of caution.

We should keep in mind that argumentation schemes represent human argumentation patterns. Not all of them are good argumentation practice, and some are more dangerous than others.

Arguing for inconsistency.

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Arguing for inconsistency.

A. It is well known that the CEOs of major international companies are all very self-absorbed and selfish people.

B. Yes, most of them are.

Arguing for inconsistency.

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A. It is well known that the CEOs of major international companies are all very self-absorbed and selfish people.

B. Yes, most of them are.

A. But isn't Bill Gates one of the paradigmatic cases of CEOs of major international companies? In some sense, the prototype of all leaders of companies?

B. Sure he is.

Arguing for inconsistency.

A. It is well known that the CEOs of major international companies are all very self-absorbed and selfish people.

B. Yes, most of them are.

A. But isn't Bill Gates one of the paradigmatic cases of CEOs of major international companies? In some sense, the prototype of all leaders of companies?

B. Sure he is.

A. But Bill Gates has created the *Bill and Melinda Gates Foundation* and is battling malaria throughout the world. He has used a large part of his personal wealth for causes like this. That is certainly not selfish.

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Arguing for inconsistency.

A. It is well known that the CEOs of major international companies are all very self-absorbed and selfish people.

B. Yes, most of them are.

A. But isn't Bill Gates one of the paradigmatic cases of CEOs of major international companies? In some sense, the prototype of all leaders of companies?

B. Sure he is.

A. But Bill Gates has created the *Bill and Melinda Gates Foundation* and is battling malaria throughout the world. He has used a large part of his personal wealth for causes like this. That is certainly not selfish.

B. No, it isn't. And if the prototypical CEO is not selfish, then maybe the average CEO isn't so bad after all, following the example of Bill Gates.

Argument from Definition.

Argument from Definition.

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Premise 1. a fits definition D.

Premise 2. For all x, if x fits definition D, then x has property G.

Conclusion. Therefore, a has property G.

Argument from Definition.

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Premise 1. a fits definition D.

Premise 2. For all x, if x fits definition D, then x has property G.

Conclusion. Therefore, a has property G.

CQ1 What evidence is there that D is an adequate definition, in light of other possible definitions that might exclude a's having G?

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Argument from Definition.

Premise 1. a fits definition D.

Premise 2. For all x, if x fits definition D, then x has property G.

Conclusion. Therefore, a has property G.

CQ1 What evidence is there that D is an adequate definition, in light of other possible definitions that might exclude a's having G?

CQ2 Is the verbal classification in *Premise 2* based on a stipulative or biased definition that is subject to doubt?

Argument from Vagueness.

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Argument from Vagueness.

Premise 1. If an argument α occurs in a context that requires a certain level of precision but some property F that occurs in α is defined in a way that is too vague to meet these requirements, then α ought to be rejected.

Premise 2. α occurs in a context that requires a certain level of precision.

Premise 3. Some property F that occurs in α is too vague to meet the requirements of *Premise 2*.

Conclusion. Therefore, α ought to be rejected.

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Premise 2. α occurs in a context that requires a certain level of precision.

Premise 3. Some property F that occurs in α is too vague to meet the requirements of *Premise 2*.

Conclusion. Therefore, α ought to be rejected.

CQ1 Does the context in which α occurs demand the level of precision claimed?

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Argument from Vagueness.

Premise 1. If an argument α occurs in a context that requires a certain level of precision but some property F that occurs in α is defined in a way that is too vague to meet these requirements, then α ought to be rejected.

Premise 2. α occurs in a context that requires a certain level of precision.

Premise 3. Some property F that occurs in α is too vague to meet the requirements of *Premise 2*.

Conclusion. Therefore, α ought to be rejected.

- CQ1 Does the context in which α occurs demand the level of precision claimed?
- CQ2 Is the property F too vague to meet the requirements of precision?

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Argument from Vagueness.

Premise 1. If an argument α occurs in a context that requires a certain level of precision but some property F that occurs in α is defined in a way that is too vague to meet these requirements, then α ought to be rejected.

Premise 2. α occurs in a context that requires a certain level of precision.

Premise 3. Some property F that occurs in α is too vague to meet the requirements of *Premise 2*.

Conclusion. Therefore, α ought to be rejected.

- CQ1 Does the context in which α occurs demand the level of precision claimed?
- CQ2 Is the property F too vague to meet the requirements of precision?
- CQ3 Why is this degree of vagueness a problem in relation to α?

Argument from Waste.

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Argument from Waste.

Premise 1. If *a* stops trying to realize *A* now, then all of *a*'s previous efforts to realize *A* will be wasted.

Premise 2. If all *a*'s previous attempts are wasted, this is a bad thing.

Conclusion. Therefore, *a* ought to continue trying to realize *A*.

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CQ1 Is bringing about *A* possible?

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Argument from Waste.

Premise 1. If *a* stops trying to realize *A* now, then all of *a*'s previous efforts to realize *A* will be wasted.

Premise 2. If all *a*'s previous attempts are wasted, this is a bad thing.

Conclusion. Therefore, *a* ought to continue trying to realize *A*.

CQ1 Is bringing about *A* possible?

CQ2 Should a reassessment of the costs and benefits of trying to bring about *A* be made?

Analogy (1).

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Analogy (1).

John's parents both have blue eyes, and so do Jim's. John has blue eyes, therefore Jim must have blue eyes.

Analogy (1).

E. Barker. Beardley's theory of analogy. **Informal Logic** 11 (1989): 185–194.

John's parents both have blue eyes, and so do Jim's. John has blue eyes, therefore Jim must have blue eyes.

John's parents both read Greek, and so do Jim's. John likes horseradish, therefore Jim must like horseradish.

Monroe Beardsley (1915–1985)

Analogy (2).

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Dedre Gentner

Structure Mapping Theory.

Ken Forbus

Structure Mapping Engine.

B. Falkenhainer, K. Forbus, and D. Gentner: 1989, The structure-mapping engine: Algorithm and examples. Artificial Intelligence, 20(41): 163.

K. Forbus, D. Gentner, A. B. Markman, and R. W. Ferguson: 1998, Analogy Just Looks Like High Level Perception: Why a Domain-General Approach to Analogical Mapping is Right. Journal of Experimental and Theoretical Artificial Intelligence, 10(2), 231-257.

Argument from Analogy.

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Argument from Analogy.

Premise 1. Generally, case C_1 is similar to case C_2.

Premise 2. A is true in case C_1.

Conclusion. Therefore, A is true in case C_2.

Argument from Analogy.

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Premise 1. Generally, case C_1 is similar to case C_2.

Premise 2. A is true in case C_1.

Conclusion. Therefore, A is true in case C_2.

CQ1 Are there differences between C_1 and C_2 that would
tend to undermine the force of the similarity cited?

Argument from Analogy.

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Premise 1. Generally, case C_1 is similar to case C_2.

Premise 2. A is true in case C_1.

Conclusion. Therefore, A is true in case C_2.

CQ1 Are there differences between C_1 and C_2 that would tend to undermine the force of the similarity cited?

CQ2 Is A true in C_1?

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Argument from Analogy.

Premise 1. Generally, case C_1 is similar to case C_2.

Premise 2. A is true in case C_1.

Conclusion. Therefore, A is true in case C_2.

CQ1 Are there differences between C_1 and C_2 that would tend to undermine the force of the similarity cited?

CQ2 Is A true in C_1?

CQ3 Is there some case C_3 similar to C_1, but in which A is false?

Argument from Composition.

Argument from Composition.

Premise. All the parts of X have property Y?

Conclusion. Therefore, X has property Y.

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Argument from Composition.

Premise. All the parts of X have property Y?

Conclusion. Therefore, X has property Y.

CQ1 Is property Y compositionally hereditary with respect to aggregate X?

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Argument from Composition.

Premise. All the parts of X have property Y?

Conclusion. Therefore, X has property Y.

CQ1 Is property Y compositionally hereditary with respect to aggregate X?

Examples.

▶ Every brick of my grandmother's house is red.
Therefore, she lives in a red house.

Argument from Composition.

Premise. All the parts of X have property Y?

Conclusion. Therefore, X has property Y.

CQ1 Is property Y compositionally hereditary with respect to aggregate X?

Examples.

- Every brick of my grandmother's house is red. Therefore, she lives in a red house.
- I bought a necklace of pearls yesterday. It has twelve beautiful pearls, and each of them is worth $ 1,000. Therefore, the price of the necklace was $ 1,000.

Practical Inference.

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Practical Inference.

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Premise 1. I have a goal G.

Premise 2. Carrying out action A is a means to realize G.

Conclusion. Therefore, I ought to carry out action A.

Practical Inference.

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Premise 1. I have a goal *G*.

Premise 2. Carrying out action *A* is a means to realize *G*.

Conclusion. Therefore, I ought to carry out action *A*.

CQ1 What other goals that I have that might conflict with *G* should be considered?

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Practical Inference.

Premise 1. I have a goal G.

Premise 2. Carrying out action A is a means to realize G.

Conclusion. Therefore, I ought to carry out action A.

CQ1 What other goals that I have that might conflict with G should be considered?

CQ2 What alternative actions could bring about G and should be considered?

Practical Inference.

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Premise 1. I have a goal G.

Premise 2. Carrying out action A is a means to realize G.

Conclusion. Therefore, I ought to carry out action A.

- CQ1 What other goals that I have that might conflict with G should be considered?
- CQ2 What alternative actions could bring about G and should be considered?
- CQ3 Among A and the alternative actions, which is the most efficient?

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Practical Inference.

Premise 1. I have a goal G.

Premise 2. Carrying out action A is a means to realize G.

Conclusion. Therefore, I ought to carry out action A.

CQ1 What other goals that I have that might conflict with G should be considered?

CQ2 What alternative actions could bring about G and should be considered?

CQ3 Among A and the alternative actions, which is the most efficient?

CQ4 What grounds are there for arguing that it is possible to perform A?

Practical Inference.

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Premise 1. I have a goal G.

Premise 2. Carrying out action A is a means to realize G.

Conclusion. Therefore, I ought to carry out action A.

- CQ1 What other goals that I have that might conflict with G should be considered?
- CQ2 What alternative actions could bring about G and should be considered?
- CQ3 Among A and the alternative actions, which is the most efficient?
- CQ4 What grounds are there for arguing that it is possible to perform A?
- CQ5 What other consequences does A have that should be considered?

Argument from Ignorance.

Argument from Ignorance.

Premise 1. If A were true, then A would be known.

Premise 2. A is not known.

Conclusion. Therefore, A is not true.

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Argument from Ignorance.

Premise 1. If *A* were true, then *A* would be known.

Premise 2. *A* is not known.

Conclusion. Therefore, *A* is not true.

CQ1 How far along has the search for evidence progressed?

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Argument from Ignorance.

Premise 1. If *A* were true, then *A* would be known.
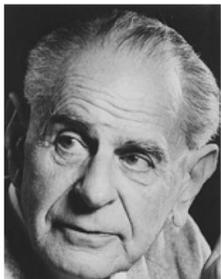
Premise 2. *A* is not known.

Conclusion. Therefore, *A* is not true.

CQ1 How far along has the search for evidence progressed?

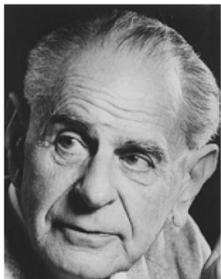CQ2 Which side has the burden of proof in the dialogue?

Falsification vs Verification.

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Falsification vs Verification.

Sir Karl Popper (1902–1994)

Falsification vs Verification.

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Sir Karl Popper (1902–1994)

Theory of Falsification.

Falsification vs Verification.
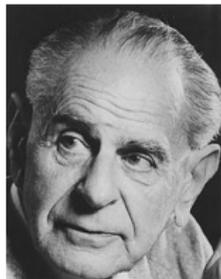
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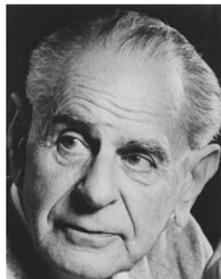for Forensic
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Sir Karl Popper (1902–1994)

Theory of Falsification.

- ▶ Universal statements cannot be verified, but falsified.

Falsification vs Verification.

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Sir Karl Popper (1902–1994)

Theory of Falsification.

▶ Universal statements cannot be verified, but falsified.

▶ The strength of a scientific theory does not come from the instances of verification, but from the fact that it survived many attempts of falsification (that had a realistic chance).

Falsification vs Verification.

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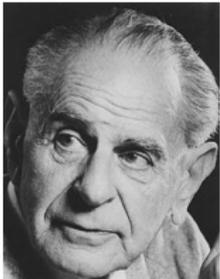for Forensic
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Sir Karl Popper (1902–1994)

Theory of Falsification.

▶ Universal statements cannot be verified, but falsified.

▶ The strength of a scientific theory does not come from the instances of verification, but from the fact that it survived many attempts of falsification (that had a realistic chance).

▶ Falsifiability as dividing line between scientific and non-scientific theories.

Argument from Correlation to Cause.

Argument from Correlation to Cause.

Premise. There is a positive correlation between A and B.

Conclusion. Therefore, A causes B.

Argument from Correlation to Cause.

Premise. There is a positive correlation between A and B.

Conclusion. Therefore, A causes B.

CQ1 Is there really a correlation between A and B?

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Argument from Correlation to Cause.

Premise. There is a positive correlation between *A* and *B*.

Conclusion. Therefore, *A* causes *B*.

CQ1 Is there really a correlation between *A* and *B*?

CQ2 Is there any reason to think that the correlation is any more than a coincidence?

Argument from Correlation to Cause.

Premise. There is a positive correlation between A and B.

Conclusion. Therefore, A causes B.

CQ1 Is there really a correlation between A and B?

CQ2 Is there any reason to think that the correlation is any more than a coincidence?

CQ3 Could there be some C that causes both A and B.

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Argument from Correlation to Cause.

Premise. There is a positive correlation between *A* and *B*.

Conclusion. Therefore, *A* causes *B*.

CQ1 Is there really a correlation between *A* and *B*?

CQ2 Is there any reason to think that the correlation is any more than a coincidence?

CQ3 Could there be some *C* that causes both *A* and *B*.

Remark. Note that the premise is symmetrical, but the conclusion is asymmetrical. How do we decide whether to conclude "*A* causes *B*" or "*B* causes *A*"?

Argument from Commitment.

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Argument from Commitment.

Premise 1. It was shown that *a* is committed to *A*.

Premise 2. Generally, when someone is committed to *A*, then he is also committed to *B*.

Conclusion. Therefore, *a* is committed to *B*.

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Argument from Commitment.

Premise 1. It was shown that *a* is committed to *A*.

Premise 2. Generally, when someone is committed to *A*, then he is also committed to *B*.

Conclusion. Therefore, *a* is committed to *B*.

CQ1 What evidence supports the claim that *a* is committed to *A*? Does there exist evidence indicating that *a* might not be committed to *A*?

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Argument from Commitment.

Premise 1. It was shown that *a* is committed to *A*.

Premise 2. Generally, when someone is committed to *A*, then he is also committed to *B*.

Conclusion. Therefore, *a* is committed to *B*.

CQ1 What evidence supports the claim that *a* is committed to *A*? Does there exist evidence indicating that *a* might not be committed to *A*?

CQ2 Is it possible that this case is an exception to the rule that commitment to *A* implies commitment to *B*?

Argument from Distress.

Argument from Distress.

Premise 1. x is in distress.

Premise 2. Bringing about A, it will help to relieve the distress.

Conclusion. Therefore, we should bring about A.

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Argument from Distress.

Premise 1. x is in distress.

Premise 2. Bringing about A, it will help to relieve the distress.

Conclusion. Therefore, we should bring about A.

CQ1 Is x really in distress?

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Argument from Distress.

Premise 1. x is in distress.

Premise 2. Bringing about A, it will help to relieve the distress.

Conclusion. Therefore, we should bring about A.

CQ1 Is x really in distress?

CQ2 Will A help relieve the distress?

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Argument from Distress.

Premise 1. x is in distress.

Premise 2. Bringing about A, it will help to relieve the distress.

Conclusion. Therefore, we should bring about A.

CQ1 Is x really in distress?

CQ2 Will A help relieve the distress?

CQ3 It is possible to bring about A?

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Argument from Distress.

Premise 1. x is in distress.

Premise 2. Bringing about A, it will help to relieve the distress.

Conclusion. Therefore, we should bring about A.

CQ1 Is x really in distress?

CQ2 Will A help relieve the distress?

CQ3 It is possible to bring about A?

CQ4 Would negative side effects of A be too great?

Argument *ad hominem*.

Argument *ad hominem*.

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Premise a has a bad character.

Conclusion. Therefore, *a*'s argument should not be accepted.

Argument *ad hominem*.

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Premise a has a bad character.

Conclusion. Therefore, *a*'s argument should not be accepted.

CQ1 How well supported is the allegation about *a*'s character?

Argument *ad hominem*.

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Premise a has a bad character.

Conclusion. Therefore, *a*'s argument should not be accepted.

CQ1 How well supported is the allegation about *a*'s character?

CQ2 Is the issue of character relevant for the dialogue in which the argument was used?

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Argument *ad hominem*.

Premise a has a bad character.

Conclusion. Therefore, *a*'s argument should not be accepted.

CQ1 How well supported is the allegation about *a*'s character?

CQ2 Is the issue of character relevant for the dialogue in which the argument was used?

CQ3 Is the conclusion that the argument should be rejected or rather that *a*'s weight as a supporter of the conclusion of the argument should be reduced?

Argument from Bias.

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Argument from Bias.

Premise 1. If x is biased, he is less likely to have taken
evidence on both sides into account in arriving at conclusion
A.

Premise 2. a is biased.

Conclusion. Therefore, a is less likely to have taken evidence
on both sides into account.

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Argument from Bias.

Premise 1. If x is biased, he is less likely to have taken evidence on both sides into account in arriving at conclusion A.

Premise 2. a is biased.

Conclusion. Therefore, a is less likely to have taken evidence on both sides into account.

CQ1 What evidence has been given that a is biased?

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Argument from Bias.

Premise 1. If x is biased, he is less likely to have taken evidence on both sides into account in arriving at conclusion A.

Premise 2. a is biased.

Conclusion. Therefore, a is less likely to have taken evidence on both sides into account.

CQ1 What evidence has been given that a is biased?

CQ2 What type of dialogue is a involved in?

Slippery Slope Argument.

Slippery Slope Argument.

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Premise 1. A_0 is proposed.

Premise 2. For each $i \in \{0, ..., n-1\}$, bringing about A_i plausibly leads to A_{i+1}.

Premise 3. A_n is a bad outcome.

Conclusion. Therefore, A_0 should not be brought about.

Slippery Slope Argument.

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- CQ1 What intervening propositions in the sequence are given?
- CQ2 What steps are needed to fill in the sequence to A_n to make it plausible.
- CQ3 What is the weakest link in the chain where specific critical questions should be asked about the argument that A_i plausibly leads to A_{i+1}?