

Lange 4
The Relation of Laws to Counterfactuals

(pp. 43–52)

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Subjunctive conditionals

- The *indicative mood* is the verb form used for factual statements about what is, was, or will be the case. E.g., “John is here.”
- The *subjunctive mood* is the verb form used to express hypothetical possibilities. E.g., “If John were here . . .”

Definition

A **subjunctive conditional** is an if-then statement in which the antecedent and consequent are in the subjunctive mood.

Examples

- If John were here, then Mary would be here.
- If Oswald had not shot Kennedy, then somebody else would have.

A subjunctive conditional can be expressed in the form: “If it were the case that p , then it would be the case that q ,” where p and q are indicative sentences.

Examples

- If it were the case that John is here, then it would be the case that Mary is here.
- If it were the case that Oswald did not shoot Kennedy, then it would be the case that somebody else did.

Notation

“ $p > q$ ” represents the subjunctive conditional “If it were the case that p , then it would be the case that q ,” where p and q are indicative sentences. (p. 43)

A **counterfactual conditional** (“counterfactual” for short) is a subjunctive conditional with a false antecedent, i.e., it can be written as “ $p > q$,” where p is false.

If p is true, then $p > q$ is correct iff q is true.

Example

If my car were out of gas, then it would not start.

Suppose my car really is out of gas; then this conditional is correct if my car won't start, incorrect if it will start.

For counterfactuals, correctness is not so straightforward.

Goodman's example (pp. 44-45)

Consider a dry, well-made match that is surrounded by oxygen, never struck, and never lights.

- "If the match were struck, then it would light." (Correct)
- "If the match were struck, then it would not be surrounded by oxygen." (Incorrect)

Both have the form $p > q$, with p and q false. Correctness of counterfactuals isn't determined by the truth value of q .

- 1 Explain what a subjunctive conditional is and give an example. How are counterfactual conditionals related to subjunctive conditionals?
- 2 What does Lange mean by the notation " $p > q$ "?
- 3 If p is true, what determines whether " $p > q$ " is correct, according to Lange?
- 4 If p is false, does the truth value of q determine whether " $p > q$ " is correct? Justify your answer.

The relation of laws and counterfactuals

Lange's "initial proposal":

P1 (p. 47; "P1" is my terminology)

p is a law iff, for all q consistent with the laws, $q > p$ is correct.

Example

Let p = "All the pears on the tree are ripe," and q = "There is an unripe pear on the tree." Then q is consistent with the laws and $q > p$ is not correct, so by P1, p is not a law.

Some logical consequences of the laws are not laws.

Fodor's example (p. 47)

All objects that are emeralds or pendulums are green emeralds or pendulums having a period of $2\pi\sqrt{l/g}$.

P1 (again)

p is a law iff, for all q consistent with the laws, $q > p$ is correct.

Counterexample to P1

Let p be a logical consequence of the laws that is not a law.

- 1 P1 implies that, for all q consistent with the laws, $q > l$ is correct for all laws l .
- 2 So if P1 is correct then, for all q consistent with the laws, $q > p$ is correct, since p is a logical consequence of the laws.
- 3 Since p is not a law, this violates P1.

Definition

p is **physically necessary** iff p is a logical consequence of the laws.

Examples of physical necessities

- All pendulums have a period of $2\pi\sqrt{l/g}$. (A law)
- All objects that are emeralds or pendulums are green emeralds or pendulums having a period of $2\pi\sqrt{l/g}$. (A non-law)

A second proposal:

P2 (Not stated by Lange)

p is **physically necessary** iff, for all q consistent with the laws, $q > p$ is correct.

This avoids the objection to P1.

P2 (again)

p is **physically necessary** iff, for all q consistent with the laws, $q > p$ is correct.

Counterexample to P2

Let $p =$ “Every object accelerated from rest travels at less than the speed of light.” Let $q =$ “ p is not a law.” Then:

- 1 p is physically necessary.
- 2 q is consistent with the laws, since p could be true even if it isn't a law.
- 3 $q > p$ is not correct, for if p were not a law, our particle accelerators probably would have accelerated a particle from rest to the speed of light or more.
- 4 This violates P2.

Definition

A **nomic claim** is a claim about what the laws are.
(Greek: “nomos” = law)

Examples of nomic claims

- It is a law that all emeralds are green.
- It is not a law that all emeralds are green.

Examples of non-nomic claims

- All emeralds are green.
- Some emeralds are not green.

Lange proposes:

P3 ("P3" is my terminology)

If p is non-nomic, then p is physically necessary iff, for all **non-nomic q** consistent with the laws, $q > p$ is correct.

This avoids the counterexample to P2.

Notation

U	the set of all non-nomic claims (p. 50)
Λ	the non-nomic claims that are physically necessary (p. 52)
\in	is an element of

P3 restated using this notation (p.52, last displayed sentence)

If $p \in U$, then $p \in \Lambda$ iff, for all $q \in U$ consistent with Λ , $q > p$ is correct.

Questions

- 5 (a) What does it mean to say that something is physically necessary? (b) Are all laws physically necessary? Justify your answer. (c) Are all physically necessary facts laws? Justify your answer.
- 6 The following are three proposals about the relation between laws and counterfactuals.
- P1. p is a law iff, for all q consistent with the laws, $q > p$ is correct.
- P2. p is physically necessary iff, for all q consistent with the laws, $q > p$ is correct.
- P3. If p is non-nomic, then p is physically necessary iff, for all non-nomic q consistent with the laws, $q > p$ is correct.
- (a) Give a counterexample to P1 that is not a counterexample to P2; explain why it is a counterexample to P1. (b) Give a counterexample to P2 that is not a counterexample to P3; explain why it is a counterexample to P2.
- 7 What does Lange mean by U and \wedge ? State P3 using these symbols.