

Lange 2

Laws and Counterfactuals

(pp. 12–16)

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Counterfactuals

Definition

A counterfactual conditional (“counterfactual” for short) says that if something were true which isn’t, then something else would be true.

Example

If I were to put this chalk in hydrochloric acid, then it would dissolve.

It [is] difficult to say whether counterfactuals purport to state facts, and so have truth values, or whether they are asserted “correctly” or “incorrectly” in some other sense . . . Science presupposes counterfactual conditionals to have a kind of objective correctness or incorrectness (in a given context) . . . In keeping with philosophical modesty, I also assume that counterfactuals have some sort of objective correctness. (p. 10)

Some counterfactuals are correct because a fact is a law.

Examples

- 1 Suppose I carelessly brush against the ceramic handle of a pot on a hot stove. This is correct: **Had the handle been made of copper, it would have been thermally conductive, and so I would have burned myself.**

Reason: It is a law that copper is thermally conductive.

- 2 Suppose a 10kg object is acted upon by no forces. This is correct: **If the object had been acted on by a force of 10 newtons, while continuing to have a mass of 10kg, then it would have accelerated at 1 meter/sec².**

Reason: Newton's second law, $F = ma$.

Some counterfactuals are not correct because a fact is an accident.

Examples

- 1 Suppose all the coins in my pocket today are made of silver. This isn't correct: **If a penny were in my pocket today then it would be made of silver.**

The reason seems to be that "All coins in my pocket today are made of silver" is an accidental generalization, not a law.

- 2 Suppose all moas died before age 50 due to a virus. This isn't correct: **If a moa lived in an environment free of the virus then it would have died before age 50.**

The reason seems to be that "All moas died before age 50" is an accidental generalization, not a law.

A view held by many philosophers

Laws must not only apply to the existing physical world but must also cover physical situations which, though non-existent, are permitted by the laws of nature . . . Mere accidental regularities, however, do not extend to physically non-existing situations . . . Thus, only true laws support counterfactuals, while accidental regularities do not. (Friedel Weinert)

Lange argues that this is wrong. Accidental regularities can extend to physically non-existing situations and support counterfactuals.

Examples of accidents supporting counterfactuals

- 1 All persons of entirely Native American ancestry have blood type of O or A. This is an accident, not a law. (The explanation for it is that all Native Americans are descended from a small band that crossed from Siberia to Alaska and none of them had the allele for blood type B.) But:

If an additional person of entirely Native American ancestry were born today, that person's blood type would be O or A.

- 2 Suppose a pear tree has 50 pears on it and they are all ripe. This is an accident, not a law. (The explanation for it is that all the pears were exposed to roughly the same conditions.) But:

If there was another pear on the tree, it would be ripe too.

Definition

The **range of invariance** of a statement is the set of counterfactual suppositions for which the statement would be true.

We've seen that the range of invariance of an accident is not always empty.

Hypothesis

The range of invariance of an accident is always a subset of the range of invariance of a law.

Counterexample to the hypothesis

Suppose a table has several pieces of wire on it and these are all made of copper. This is correct:

Had copper been electrically insulating, then all of the wires on the table would have been useless (for conducting electricity).

So if copper had been electrically insulating:

- The wires on the table would still be made of copper.
- The law that copper conducts electricity would be false.

So “copper is electrically insulating” is:

- In the range of invariance of “the wires on the table are made of copper” (an accident).
- Not in the range of invariance of “copper conducts electricity” (a law).

So the range of invariance of the accident is not a subset of the range of invariance of the law.

View Lange defends in chapters 2 and 3 (p. 16)

- *The laws collectively possess uniquely a maximal range of invariance.*
- *This explains why there is a sense of necessity (“physical necessity”) associated with the laws but none associated with any accident.*

Questions

- ① What is a counterfactual conditional?
- ② Give an example of:
 - (a) A counterfactual conditional that is correct because a fact is a law.
 - (b) A counterfactual conditional that is incorrect because a fact is an accident.
- ③ “Only true laws support counterfactuals, while accidental regularities do not.” Is this correct? Justify your answer.
- ④ What is the range of invariance of a statement? Is an accident's range of invariance always a subset of a law's range of invariance? Justify your answer to the latter question.