

Lecture 32

Lange on Previous Accounts of Laws

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Natural Laws in Scientific Practice



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We are accustomed to thinking of the universe as governed by various “laws of nature” and of science as aiming to discover these laws. What is it that science thereby aims to discover? What is it for there to be a certain “law of nature”? (3)

Laws as general facts

Hypothesis

“Law” means a general (or universal) fact.

Examples that fit this hypothesis (11)

- All bodies attract one another with a force proportional to the product of their masses and inversely proportional to the square of the distance between them. **General and a law.**
- There is a mountain on Venus at 38 degrees 20 minutes north, 63 degrees 14 minutes west. **Not general and not a law.**

Popper's counterexample (12)

Moas are extinct birds that lived in New Zealand. They were like ostriches or emus (see dust jacket of Lange's book). Suppose their biology would allow them to live to 60 under good conditions but they all died before 50 due to viruses or other causes. Then

All moas die before age 50

would be a fact, and general; but it would not be a law.

Reichenbach's counterexample (11)

All solid gold cubes are smaller than one cubic mile.

Probably true, and general, but not a law even if true.

So there can be a general fact that is not a law.
Hence "law" does not mean a general fact.

Laws and 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.

Some counterfactuals are correct because a fact is a law.

Examples (12)

- 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 not a law.

Examples (12)

- 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" isn't 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" isn't a law.

View of many philosophers (13)

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 [i.e., non-law] 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 non-laws supporting counterfactuals (13)

- 1 All persons of entirely Native American ancestry have blood type of O or A. This isn't 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 isn't 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.

- 1 Does the term “law of nature” mean a general fact? Justify your answer.
- 2 What is a counterfactual conditional?
- 3 Give an example of (a) a counterfactual that is correct because a fact is a law, and (b) a counterfactual that is incorrect because a fact isn't a law.
- 4 “Only true laws support counterfactuals, while accidental regularities do not.” Is this correct? Justify your answer.



Marc Lange.

Natural Laws in Scientific Practice.

Oxford University Press, 2000.

Limited access at [Amazon Online Reader](#).

Numbers in parentheses are page numbers of this book.