



THE SCIENCE & LOGIC OF VIROLOGY

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DOES SANTA CLAUS EXIST?

As a child, countless things in my environment reaffirm his existence:

- All of the cartoons, movies, songs, pictures and stories
- The decorations
- The half-eaten cookies and milk on Christmas morning
- The pieces of beard found in the fireplace
- The presents under the tree
- The Santa-Claus sleigh tracking app that I watch on Christmas Eve
- The positive and/or negative emotions I feel

All of these things mean Santa Claus actually exists, right?

3 MAJOR BRANCHES OF

SCIENCE:

NATURAL SCIENCE

SOCIAL SCIENCE*

FORMAL SCIENCE*

FORMAL SCIENCE

the study of formal systems, such as those under the branches of logic and mathematics, which use an a priori, as opposed to empirical, methodology.

SOCIAL SCIENCE

sociology, anthropology,
archaeology, economics, human
geography, linguistics,
management science,
communication science, political
science and psychology.

NATURAL SCIENCE

the study of natural phenomena.

Natural science tries to explain and predict nature's phenomena based on empirical evidence. In natural science, a hypothesis must be verified scientifically to be regarded as scientific theory.

THE SCIENTIFIC METHOD

A method of discovering knowledge about the natural world based in making falsifiable predictions (hypotheses), testing them empirically, and developing theories that match known data from repeatable physical experimentation.

HYPOTHESIS

a proposed explanation for a phenomenon.

OBSERVE A NATURAL PHENOMENON

Naturalistic Observation: Observation of a behavior in a natural setting without any attempt to intervene.

-the situation is not manipulated or controlled by the investigator.

-the situation has not been initiated or created by the investigator.

Example: You observe several people getting sick with respiratory symptoms (coughing) in the same space.

FORMULATE A HYPOTHESIS

Example: "I think a particle in the fluids of these people is causing them to become sick."

In order to proceed, you need to show that these particles (the independent variable) exist.

STEPS OF THE SCIENTIFIC METHOD

- Observe a natural phenomenon
- Formulate a hypothesis
 - Alternate Hypothesis (X CAUSES Y)
 - Independent Variable—the presumed cause (X)
 - Dependent Variable— the observed effect (y)
 - Controls Variables— (things that remain constant)
 - Null Hypothesis (X DOESN'T CAUSE Y)
- Test/Experiment
- Analyze the observations and data
- Validate/Invalidate the hypothesis

VARIABLES

Independent Variable (X):

The thing you think is the cause of the observed phenomenon.

In order to proceed with the experiment, the IV needs to exist.

This is what the researcher manipulates and varies.

Dependent Variable (Y):

The effect under study (the observed natural phenomenon).

You must have a DV in order for anything to be scientific.

PROBLEMS WITH VIROLOGY

- Virus not shown to exist in nature
- Assume virus is in the fluids
- Assume virus has an effect
- Cell culture contains too many confounding variables
- Assume confounding variables don't have an impact on the culture
- The culturing process itself is unnatural
- No proper control experiments

Virology does not adhere to the scientific method.

PSEUDOSCIENCE

- "statements, beliefs, or practices that claim to be both scientific and factual but are incompatible with **the scientific method.**"
- "a collection of beliefs or practices mistakenly regarded as being based on **scientific method.**"
- "a proposition, a finding or a system of explanation that is presented as science but that lacks the rigor essential to **the scientific method.**"

SCIENTIFIC THEORY

"An explanation of an aspect of the natural world and universe that has been repeatedly tested and corroborated in accordance with the scientific method."



**CAN WE DO A SCIENTIFIC
EXPERIMENT ON SANTA CLAUS?**

WHY “VIRUSES” CANNOT BE ISOLATED ACCORDING TO EXPERTS

1. “The virus is too weak to isolate/purify directly from the fluids.”
2. “There’s not enough virus present in the fluids to isolate/purify it.”
3. “A virus needs a host in order to replicate, so that’s why we use the cell culture.”

FORMAL SCIENCE

the study of formal systems, such as those under the branches of logic and mathematics, which use an a priori, as opposed to empirical, methodology.



WHAT ISN'T LOGIC?:
LOGICAL FALLACIES 101

WHAT IS A LOGICAL FALLACY?

- a failure in reasoning which renders an argument invalid.
- flawed, deceptive, or false arguments that can be proven wrong with reasoning.

APPEAL TO AUTHORITY

In an appeal to authority, the arguer claims a perceived authority figure's position to either support a claim, or to support the entirety of the argument.

Example:

"Robert Malone is a vaccinologist, and he says the virus has been isolated, so you're wrong."

BANDWAGON FALLACY

A bandwagon fallacy is one in which the arguer attempts to validate their position by referring to the majority's stance on the position

Example:

"The overwhelming majority of people believe that the virus exists."

BURDEN OF PROOF REVERSAL FALLACY

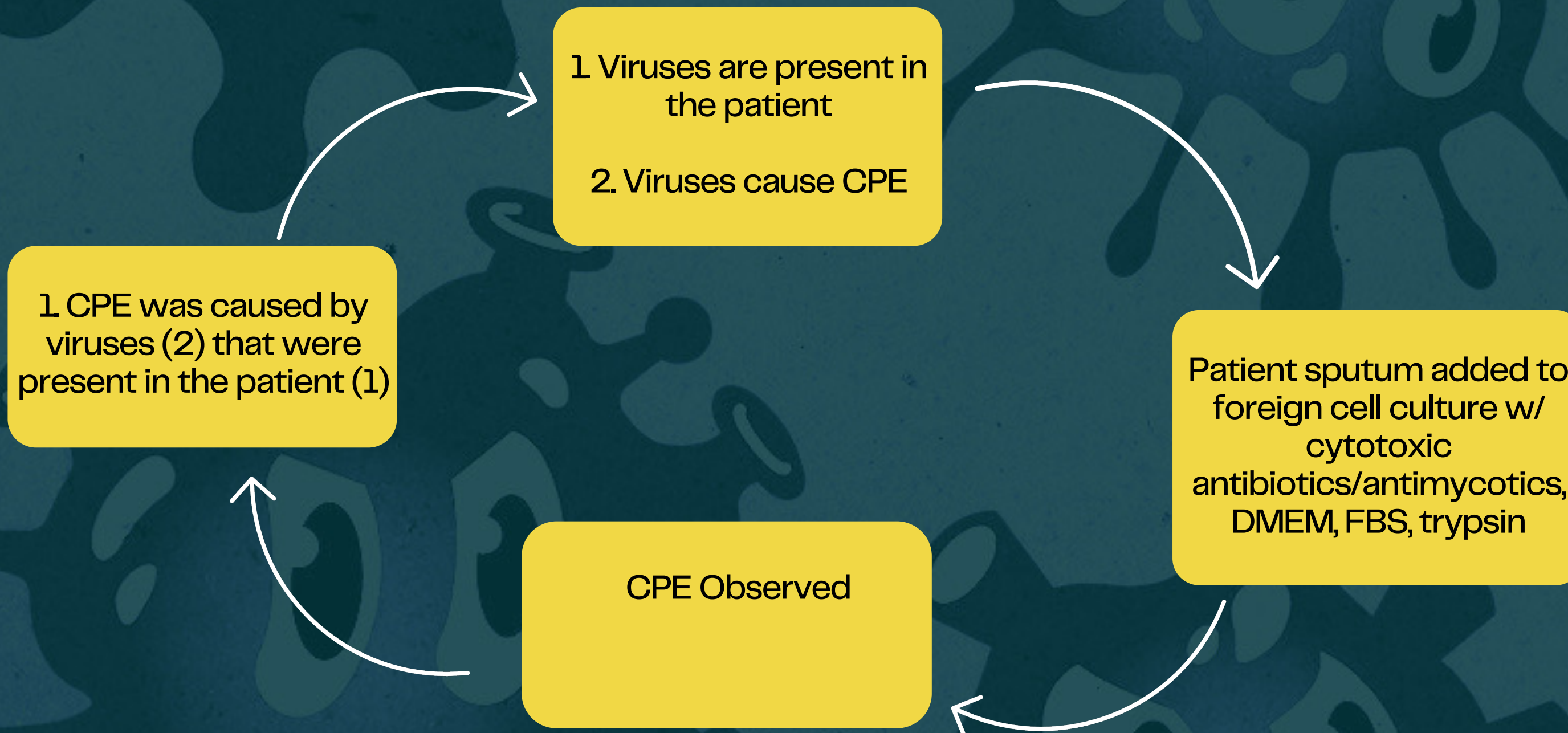
A burden of proof reversal fallacy occurs when the arguer makes a claim that needs justification, then demands that the opponent justifies the opposite of the claim.

Example:

"Well where's your proof that viruses don't exist?"

BEGGING THE QUESTION/CIRCULAR REASONING

A begging the question fallacy occurs when the arguer's conclusion is assumed in one of the premises.



GRAPHIC: CREDIT TO DR. ANDY KAUFMAN

AFFIRMING THE CONSEQUENT

An affirming the consequent fallacy occurs when an arguer claims the antecedent is said to be true because the consequent is true.

Essentially, "if X, then Y. Y, therefore X."

Example:

"I think viruses infect people and make them sick.
I was sick, so I must've been infected by a virus."

RED-HERRING FALLACY

A red-herring fallacy occurs when irrelevant information is presented alongside relevant information, distracting attention from that relevant information.

Example:

Virologists referring to an in-silico genome when you question them on lack of adequate controls and lack of adherence to the scientific method.

HASTY GENERALIZATION FALLACY

making a claim based on evidence that is just too small.

Example:

"Someone in Wuhan got sick and the RNA in his fluids didn't match any reference in-silico genomes. Therefore he has a novel virus and we should shut down the world."

UNFALSIFIABILITY FALLACY

The unfalsifiability fallacy occurs when someone makes a claim that is impossible to prove false.

Example:

Asymptomatic infections, Antibodies, etc.

REIFICATION FALLACY

When an abstraction (abstract belief or hypothetical construct) is treated as if it were a concrete, real event or physical entity.

Example:

Assigning any characteristics or attributes to viruses