

# *Logic & Fallacies*

## **Introduction**

There's a lot of debate on the net. Unfortunately, much of it is of very low quality. The aim of this document is to explain the basics of logical reasoning, and hopefully improve the overall quality of debate.

The Concise Oxford English Dictionary defines logic as "the science of reasoning, proof, thinking, or inference". Logic will let you analyze an argument or a piece of reasoning, and work out whether it is likely to be correct or not. You don't need to know logic to argue, of course; but if you know even a little, you'll find it easier to spot invalid arguments.

There are many kinds of logic, such as fuzzy logic and constructive logic; they have different rules, and different strengths and weaknesses. This document discusses simple Boolean logic, because it's commonplace and relatively easy to understand. When people talk about something being 'logical', they usually mean the type of logic described here.

## **What logic isn't**

It's worth mentioning a couple of things which logic is not.

Firstly, **logical reasoning is not an absolute law which governs the universe**. Many times in the past, people have concluded that because something is logically impossible (given the science of the day), it must be impossible, period. It was also believed at one time that Euclidean geometry was a universal law; it is, after all, logically consistent. Again, we now know that the rules of Euclidean geometry are not universal.

Secondly, **logic is not a set of rules which govern human behavior**. Humans may have logically conflicting goals. For example:

- John wishes to speak to whoever is in charge.
- The person in charge is Steve.
- Therefore John wishes to speak to Steve.

Unfortunately, John may have a conflicting goal of avoiding Steve, meaning that the reasoned answer may be inapplicable to real life.

This document only explains how to use logic; you must decide whether logic is the right tool for the job. There are other ways to communicate, discuss and debate.

## **Arguments**

An argument is, to quote the Monty Python sketch, "a connected series of statements to establish a definite proposition".

Many types of argument exist; we will discuss the *deductive argument*. Deductive arguments are generally viewed as the most precise and the most persuasive; they provide conclusive proof of their conclusion, and are either *valid* or *invalid*.

Deductive arguments have three stages: premises, inference, and conclusion. However, before we can consider those stages in detail, we must discuss the building blocks of a deductive argument: propositions.

## Propositions

A *proposition* is a statement which is either true or false. The proposition is the meaning of the statement, not the precise arrangement of words used to convey that meaning. For example, "There exists an even prime number greater than two" is a proposition. (A false one, in this case.) "An even prime number greater than two exists" is the same proposition, reworded.

Unfortunately, it's very easy to unintentionally change the meaning of a statement by rephrasing it. It's generally safer to consider the wording of a proposition as significant. It's possible to use formal linguistics to analyze and re-phrase a statement without changing its meaning; but how to do so is outside the scope of this document.

## Premises

A deductive argument always requires a number of core assumptions. These are called *premises*, and are the assumptions the argument is built on; or to look at it another way, the reasons for accepting the argument. Premises are only premises in the context of a particular argument; they might be conclusions in other arguments, for example.

You should always state the premises of the argument explicitly; this is the principle of [audiatur et altera pars](#). Failing to state your assumptions is often viewed as suspicious, and will likely reduce the acceptance of your argument.

The premises of an argument are often introduced with words such as "Assume...", "Since...", "Obviously..." and "Because...". It's a good idea to get your opponent to agree with the premises of your argument before proceeding any further.

The word "obviously" is also often viewed with suspicion. It occasionally gets used to persuade people to accept false statements, rather than admit that they don't understand why something is 'obvious'. So don't be afraid to question statements which people tell you are 'obvious' -- when you've heard the explanation you can always say something like "You're right, now that I think about it that way, it *is* obvious."

## Inference

Once the premises have been agreed, the argument proceeds via a step-by-step process called *inference*.

In inference, you start with one or more propositions which have been accepted; you then use those propositions to arrive at a new proposition. If the inference is valid, that proposition should also be accepted. You can use the new proposition for inference later on.

So initially, you can only infer things from the premises of the argument. But as the argument proceeds, the number of statements available for inference increases.

There are various kinds of valid inference - and also some invalid kinds, which we'll look at later in this document. Inference steps are often identified by phrases like "therefore..." or "...implies that..."

## Conclusion

Hopefully you will arrive at a proposition which is the conclusion of the argument - the result you are trying to prove. The conclusion is the result of the final step of inference. It's only a conclusion in the context of a particular argument; it could be a premise or assumption in another argument.

The conclusion is said to be *affirmed* on the basis of the premises, and the inference from them. This is a subtle point which deserves further explanation.

## Implication in detail

Clearly you can build a valid argument from true premises, and arrive at a true conclusion. You can also build a valid argument from false premises, and arrive at a false conclusion.

The tricky part is that you can start with false premises, proceed via valid inference, and reach a *true* conclusion. For example:

- Premise: All fish live in the ocean
- Premise: Sea Otters are fish
- Conclusion: Therefore sea otters live in the ocean

There's one thing you can't do, though: start from true premises, proceed via valid deductive inference, and reach a false conclusion.

We can summarize these results as a "truth table" for implication. The symbol " $\Rightarrow$ " denotes implication; "A" is the premise, "B" the conclusion. "T" and "F" represent true and false respectively.

Truth Table for Implication

Premise	Conclusion	Inference
A	B	$A \Rightarrow B$
false	false	true
false	true	true
true	false	false
true	true	true

- If the premises are false and the inference valid, the conclusion can be true or false. (Lines 1 and 2.)
- If the premises are true and the conclusion false, the inference must be invalid. (Line 3.)
- If the premises are true and the inference valid, the conclusion must be true. (Line 4.)

So *the fact that an argument is valid doesn't necessarily mean that its conclusion holds* -- it may have started from false premises.

If an argument is valid, and in addition it started from true premises, then it is called a *sound* argument. A sound argument must arrive at a true conclusion.

## Example argument

Here's an example of an argument which is valid, and which may or may not be sound:

1. Premise: Every event has a cause
2. Premise: The universe has a beginning
3. Premise: All beginnings involve an event
4. Inference: This implies that the beginning of the universe involved an event
5. Inference: Therefore the beginning of the universe had a cause
6. Conclusion: The universe had a cause

The proposition in line 4 is inferred from lines 2 and 3. Line 1 is then used, with the proposition derived in line 4, to infer a new proposition in line 5. The result of the inference in line 5 is then re-stated (in slightly simplified form) as the conclusion.

## Spotting arguments

Spotting an argument is harder than spotting premises or a conclusion. Lots of people shower their writing with assertions, without ever producing anything you might reasonably call an argument.

Sometimes arguments don't follow the pattern described above. For example, people may state their conclusions first, and then justify them afterwards. This is valid, but it can be a little confusing.

To make the situation worse, some statements look like arguments but aren't. For example:

"If the Bible is accurate, Jesus must either have been insane, an evil liar, or the Son of God."

That's not an argument; it's a conditional statement. It doesn't state the premises necessary to support its conclusion, and even if you add those assertions it suffers from a number of other flaws which are described in more detail in the Atheist Arguments document.

An argument is also not the same as an explanation. Suppose that you are trying to argue that Albert Einstein believed in God, and say:

"Einstein made his famous statement 'God does not play dice' because of his belief in God."

That may look like a relevant argument, but it's not; it's an explanation of Einstein's statement. To see this, remember that a statement of the form "X because Y" can be re-phrased as an equivalent statement, of the form "Y therefore X". Doing so gives us:

"Einstein believed in God, therefore he made his famous statement 'God does not play dice'."

Now it's clear that the statement, which looked like an argument, is actually assuming the result which it is supposed to be proving, in order to explain the Einstein quote.

Furthermore, Einstein did not believe in a personal God concerned with human affairs -- again, see the Atheist Arguments document.

## Further reading

We've outlined the structure of a sound deductive argument, from premises to conclusion. But ultimately, the conclusion of a valid logical argument is only as compelling as the premises you started from. Logic in itself doesn't solve the problem of verifying the basic assertions which support arguments; for that, we need some other tool.

The dominant means of verifying basic assertions is scientific enquiry. However, the philosophy of science and the scientific method are huge topics which are quite beyond the scope of this document.

For a more comprehensive introduction to logic, try Flew's "Thinking Straight". A much more detailed book is Copi's "Introduction to Logic".

## Fallacies

There are a number of common pitfalls to avoid when constructing a deductive argument; they're known as *fallacies*. In everyday English, we refer to many kinds of mistaken beliefs as fallacies; but in logic, the term has a more specific meaning: a fallacy is a technical flaw which makes an argument unsound or invalid.

(Note that you can criticize more than just the soundness of an argument. Arguments are almost always presented with some specific purpose in mind -- and the intent of the argument may also be worthy of criticism.)

Arguments which contain fallacies are described as *fallacious*. They often appear valid and convincing; sometimes only close inspection reveals the logical flaw.

Below is a list of some common fallacies, and also some rhetorical devices often used in debate. The list isn't intended to be exhaustive; the hope is that if you learn to recognize some of the more common fallacies, you'll be able to avoid being fooled by them.

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## Accent

Accent is a form of fallacy through shifting meaning. In this case, the meaning is changed by altering which parts of a statement are emphasized. For example:

"We should not speak **ill** of our friends"

and

"We should not speak ill of our **friends**"

Be particularly wary of this fallacy on the net, where it's easy to misread the emphasis of what's written.

## Ad hoc

As mentioned earlier, there is a difference between [argument and explanation](#). If we're interested in establishing A, and B is offered as evidence, the statement "A because B" is an argument. If we're trying to establish the truth of B, then "A because B" is not an argument, it's an explanation.

The Ad Hoc fallacy is to give an after-the-fact explanation which doesn't apply to other situations. Often this ad hoc explanation will be dressed up to look like an argument. For

example, if we assume that God treats all people equally, then the following is an ad hoc explanation:

"I was healed from cancer."

"Praise the Lord, then. He is your healer."

"So, will He heal others who have cancer?"

"Er... The ways of God are mysterious."

### **Affirmation of the consequent**

This fallacy is an argument of the form "A implies B, B is true, therefore A is true". To understand why it is a fallacy, examine the [truth table for implication](#) given earlier. Here's an example:

"If the universe had been created by a supernatural being, we would see order and organization everywhere. And we do see order, not randomness -- so it's clear that the universe had a creator."

This is the converse of [Denial of the Antecedent](#).

### **Amphiboly**

Amphiboly occurs when the premises used in an argument are ambiguous because of careless or ungrammatical phrasing. For example:

"Premise: Belief in God fills a much-needed gap."

### **Anecdotal evidence**

One of the simplest fallacies is to rely on anecdotal evidence. For example:

"There's abundant proof that God exists and is still performing miracles today. Just last week I read about a girl who was dying of cancer. Her whole family went to church and prayed for her, and she was cured."

It's quite valid to use personal experience to illustrate a point; but such anecdotes don't actually prove anything to anyone. Your friend may say he met Elvis in the supermarket, but those who haven't had the same experience will require more than your friend's anecdotal evidence to convince them.

Anecdotal evidence can seem very compelling, especially if the audience *wants* to believe it. This is part of the explanation for urban legends; stories which are verifiably false have been known to circulate as anecdotes for years.

### **Argumentum ad antiquitatem**

This is the fallacy of asserting that something is right or good simply because it's old, or because "that's the way it's always been." The opposite of [Argumentum ad Novitatem](#).

"For thousands of years Christians have believed in Jesus Christ. Christianity must be true, to have persisted so long even in the face of persecution."

## **Argumentum ad baculum / Appeal to force**

An Appeal to Force happens when someone resorts to force (or the threat of force) to try and push others to accept a conclusion. This fallacy is often used by politicians, and can be summarized as "might makes right". The threat doesn't have to come directly from the person arguing. For example:

"... Thus there is ample proof of the truth of the Bible. All those who refuse to accept that truth will burn in Hell."

"... In any case, I know your phone number and I know where you live. Have I mentioned I am licensed to carry concealed weapons?"

## **Argumentum ad crumenam**

The fallacy of believing that money is a criterion of correctness; that those with more money are more likely to be right. The opposite of [Argumentum ad Lazarum](#). Example:

"[Microsoft](#) software is undoubtedly superior; why else would Bill Gates have got so rich?"

## **Argumentum ad hominem**

Argumentum ad hominem literally means "argument directed at the man"; there are two varieties.

The first is the abusive form. If you refuse to accept a statement, and justify your refusal by criticizing the person who made the statement, then you are guilty of abusive argumentum ad hominem. For example:

"You claim that atheists can be moral -- yet I happen to know that you abandoned your wife and children."

This is a fallacy because the truth of an assertion doesn't depend on the virtues of the person asserting it. A less blatant argumentum ad hominem is to reject a proposition based on the fact that it was also asserted by some other easily criticized person. For example:

"Therefore we should close down the church? Hitler and Stalin would have agreed with you."

A second form of argumentum ad hominem is to try and persuade someone to accept a statement you make, by referring to that person's particular circumstances. For example:

"Therefore it is perfectly acceptable to kill animals for food. I hope you won't argue otherwise, given that you're quite happy to wear leather shoes."

This is known as circumstantial argumentum ad hominem. The fallacy can also be used as an excuse to reject a particular conclusion. For example:

"Of course you'd argue that positive discrimination is a bad thing. You're white."

This particular form of Argumentum ad Hominem, when you allege that someone is rationalizing a conclusion for selfish reasons, is also known as "poisoning the well".

It's not always invalid to refer to the circumstances of an individual who is making a claim. If someone is a known perjurer or liar, that fact will reduce their credibility as a witness. It won't,



however, prove that their testimony is false in this case. It also won't alter the soundness of any logical arguments they may make.

### **Argumentum ad ignorantiam**

Argumentum ad ignorantiam means "argument from ignorance". The fallacy occurs when it's argued that something must be true, simply because it hasn't been proved false. Or, equivalently, when it is argued that something must be false because it hasn't been proved true. (Note that this isn't the same as *assuming* something is false until it has been proved true. In law, for example, you're generally assumed innocent until proven guilty.) Here are a couple of examples:

"Of course the Bible is true. Nobody can prove otherwise."

"Of course telepathy and other psychic phenomena do not exist. Nobody has shown any proof that they are real."

In scientific investigation, if it is known that an event would produce certain evidence of its having occurred, the absence of such evidence can validly be used to infer that the event didn't occur. It does not prove it with certainty, however.

For example:

"A flood as described in the Bible would require an enormous volume of water to be present on the earth. The earth doesn't have a tenth as much water, even if we count that which is frozen into ice at the poles. Therefore no such flood occurred."

It is, of course, possible that some unknown process occurred to remove the water. Good science would then demand a plausible testable theory to explain how it vanished.

Of course, the history of science is full of logically valid bad predictions. In 1893, the Royal Academy of Science were convinced by Sir Robert Ball that communication with the planet Mars was a physical impossibility, because it would require a flag as large as Ireland, which it would be impossible to wave.

[ [Fortean Times](#) Number 82.]

See also [Shifting the Burden of Proof](#).

### **Argumentum ad lazarum**

The fallacy of assuming that someone poor is sounder or more virtuous than someone who's wealthier. This fallacy is the opposite of the [Argumentum ad Crumenam](#). For example:

"Monks are more likely to possess insight into the meaning of life, as they have given up the distractions of wealth."

### **Argumentum ad logicam**

This is the "fallacy fallacy" of arguing that a proposition is false because it has been presented as the conclusion of a fallacious argument. Remember always that fallacious arguments can arrive at true conclusions.

"Take the fraction 16/64. Now, cancelling a six on top and a six on the bottom, we get that  $16/64 = 1/4$ ."

"Wait a second! You can't just cancel the six!"

"Oh, so you're telling us 16/64 is not equal to 1/4, are you?"

### **Argumentum ad misericordiam**

This is the Appeal to Pity, also known as Special Pleading. The fallacy is committed when someone appeals to pity for the sake of getting a conclusion accepted. For example:

"I did not murder my mother and father with an axe! Please don't find me guilty; I'm suffering enough through being an orphan."

### **Argumentum ad nauseam**

This is the incorrect belief that an assertion is more likely to be true, or is more likely to be accepted as true, the more often it is heard. So an Argumentum ad Nauseam is one that employs constant repetition in asserting something; saying the same thing over and over again until you're sick of hearing it.

On Usenet, your argument is often less likely to be heard if you repeat it over and over again, as people will tend to put you in their kill files.

### **Argumentum ad novitatem**

This is the opposite of the [Argumentum ad Antiquitatem](#); it's the fallacy of asserting that something is better or more correct simply because it is new, or newer than something else.

"BeOS is a far better choice of operating system than OpenStep, as it has a much newer design."

### **Argumentum ad numerum**

This fallacy is closely related to the [argumentum ad populum](#). It consists of asserting that the more people who support or believe a proposition, the more likely it is that that proposition is correct. For example:

"The vast majority of people in this country believe that capital punishment has a noticeable deterrent effect. To suggest that it doesn't in the face of so much evidence is ridiculous."

"All I'm saying is that thousands of people believe in pyramid power, so there must be something to it."

### **Argumentum ad populum**

This is known as Appealing to the Gallery, or Appealing to the People. You commit this fallacy if you attempt to win acceptance of an assertion by appealing to a large group of people. This form of fallacy is often characterized by emotive language. For example:

"Pornography must be banned. It is violence against women."

"For thousands of years people have believed in Jesus and the Bible. This belief has had a great impact on their lives. What more evidence do you need that Jesus was the Son of God? Are you trying to tell those people that they are all mistaken fools?"

### **Argumentum ad verecundiam**

The Appeal to Authority uses admiration of a famous person to try and win support for an assertion. For example:

" Isaac Newton was a genius and he believed in God."

This line of argument isn't always completely bogus; for example, it may be relevant to refer to a widely-regarded authority in a particular field, if you're discussing that subject. For example, we can distinguish quite clearly between:

"Hawking has concluded that black holes give off radiation"

and

" Penrose has concluded that it is impossible to build an intelligent computer"

Hawking is a physicist, and so we can reasonably expect his opinions on black hole radiation to be informed. Penrose is a mathematician, so it is questionable whether he is well-qualified to speak on the subject of machine intelligence.

### **Audiatur et altera pars**

Often, people will argue from assumptions which they don't bother to state. The principle of Audiatur et Altera Pars is that all of the premises of an argument should be stated explicitly. It's not strictly a fallacy to fail to state all of your assumptions; however, it's often viewed with suspicion.

### **Bifurcation**

Also referred to as the "black and white" fallacy, bifurcation occurs if someone presents a situation as having only two alternatives, where in fact other alternatives exist or can exist. For example:

"Either man was created, as the Bible tells us, or he evolved from inanimate chemicals by pure random chance, as scientists tell us. The latter is incredibly unlikely, so..."

### **Circulus in demonstrando**

This fallacy occurs if you assume as a premise the conclusion which you wish to reach. Often, the proposition is rephrased so that the fallacy appears to be a valid argument. For example:

"Homosexuals must not be allowed to hold government office. Hence any government official who is revealed to be a homosexual will lose his job. Therefore homosexuals will do anything to hide their secret, and will be open to blackmail. Therefore homosexuals cannot be allowed to hold government office."

Note that the argument is entirely circular; the premise is the same as the conclusion. An argument like the above has actually been cited as the reason for the British Secret Services' official ban on homosexual employees. Another example is the classic:

"We know that God exists because the Bible tells us so. And we know that the Bible is true because it is the word of God."

Circular arguments are surprisingly common, unfortunately. If you've already reached a particular conclusion once, it's easy to accidentally make it an assertion when explaining your reasoning to someone else.

### **Complex question / Fallacy of interrogation / Fallacy of presupposition**

This is the interrogative form of [Begging the Question](#). One example is the classic loaded question:

"Have you stopped beating your wife?"

The question presupposes a definite answer to another question which has not even been asked. This trick is often used by lawyers in cross-examination, when they ask questions like:

"Where did you hide the money you stole?"

Similarly, politicians often ask loaded questions such as:

"How long will this EU interference in our affairs be allowed to continue?"

or

"Does the Chancellor plan two more years of ruinous privatization?"

Another form of this fallacy is to ask for an explanation of something which is untrue or not yet established.

### **Fallacies of composition**

The Fallacy of Composition is to conclude that a property shared by a number of individual items, is also shared by a collection of those items; or that a property of the parts of an object, must also be a property of the whole thing. Examples:

"The bicycle is made entirely of low mass components, and is therefore very lightweight."

"A car uses less petrochemicals and causes less pollution than a bus. Therefore cars are less environmentally damaging than buses."

### **Converse accident / Hasty generalization**

This fallacy is the reverse of the [Fallacy of Accident](#). It occurs when you form a general rule by examining only a few specific cases which aren't representative of all possible cases. For example:

"Jim Bakker was an insincere Christian. Therefore all Christians are insincere."

### **Converting a conditional**

This fallacy is an argument of the form "If A then B, therefore if B then A".

"If educational standards are lowered, the quality of argument seen on the Internet worsens. So if we see the level of debate on the net get worse over the next few years, we'll know that our educational standards are still falling."

This fallacy is similar to the [Affirmation of the Consequent](#), but phrased as a conditional statement.

### **Cum hoc ergo propter hoc**

This fallacy is similar to [post hoc ergo propter hoc](#). The fallacy is to assert that because two events occur together, they must be causally related. It's a fallacy because it ignores other factors that may be the cause(s) of the events.

"Literacy rates have steadily declined since the advent of television. Clearly television viewing impedes learning."

This fallacy is a special case of the more general [non causa pro causa](#).

### **Denial of the antecedent**

This fallacy is an argument of the form "A implies B, A is false, therefore B is false". The [truth table for implication](#) makes it clear why this is a fallacy.

Note that this fallacy is different from [Non Causa Pro Causa](#). That has the form "A implies B, A is false, therefore B is false", where A does *not* in fact imply B at all. Here, the problem isn't that the implication is invalid; rather it's that the falseness of A doesn't allow us to deduce anything about B.

"If the God of the Bible appeared to me, personally, that would certainly prove that Christianity was true. But God has never appeared to me, so the Bible must be a work of fiction."

This is the converse of the fallacy of [Affirmation of the Consequent](#).

### **The fallacy of accident / Sweeping generalization / Dicto simpliciter**

A sweeping generalization occurs when a general rule is applied to a particular situation, but the features of that particular situation mean the rule is inapplicable. It's the error made when you go from the general to the specific. For example:

"Christians generally dislike atheists. You are a Christian, so you must dislike atheists."

This fallacy is often committed by people who try to decide moral and legal questions by mechanically applying general rules.

### **Fallacy of division**

The fallacy of division is the opposite of the [Fallacy of Composition](#). It consists of assuming that a property of some thing must apply to its parts; or that a property of a collection of items is shared by each item.

"You are studying at a rich college. Therefore you must be rich."

"Ants can destroy a tree. Therefore this ant can destroy a tree."

## **Equivocation / Fallacy of four terms**

Equivocation occurs when a key word is used with two or more different meanings in the same argument. For example:

"What could be more affordable than free software? But to make sure that it remains free, that users can do what they like with it, we must place a license on it to make sure that will always be freely redistributable."

One way to avoid this fallacy is to choose your terminology carefully before beginning the argument, and avoid words like "free" which have many meanings.

## **The extended analogy**

The fallacy of the Extended Analogy often occurs when some suggested general rule is being argued over. The fallacy is to assume that mentioning two different situations, in an argument about a general rule, constitutes a claim that those situations are analogous to each other. Here's real example from an online debate about anti-cryptography legislation:

"I believe it is always wrong to oppose the law by breaking it."

"Such a position is odious: it implies that you would not have supported Martin Luther King."

"Are you saying that cryptography legislation is as important as the struggle for Black liberation? How dare you!"

## **Ignoratio elenchi / Irrelevant conclusion**

The fallacy of Irrelevant Conclusion consists of claiming that an argument supports a particular conclusion when it is actually logically nothing to do with that conclusion.

For example, a Christian may begin by saying that he will argue that the teachings of Christianity are undoubtedly true. If he then argues at length that Christianity is of great help to many people, no matter how well he argues he will not have shown that Christian teachings are true.

Sadly, these kinds of irrelevant arguments are often successful, because they make people to view the supposed conclusion in a more favorable light.

## **The Natural Law fallacy / Appeal to Nature**

The Appeal to Nature is a common fallacy in political arguments. One version consists of drawing an analogy between a particular conclusion, and some aspect of the natural world -- and then stating that the conclusion is inevitable, because the natural world is similar:

"The natural world is characterized by competition; animals struggle against each other for ownership of limited natural resources. Capitalism, the competitive struggle for ownership of capital, is simply an inevitable part of human nature. It's how the natural world works."

Another form of appeal to nature is to argue that because human beings are products of the natural world, we must mimic behavior seen in the natural world, and that to do otherwise is 'unnatural':

"Of course homosexuality is unnatural. When's the last time you saw two animals of the same sex mating?"

Robert Anton Wilson deals with this form of fallacy at length in his book "Natural Law" ". A recent example of "Appeal to Nature" taken to extremes is the "Unabomber Manifesto".

### **The "No True Scotsman..." fallacy**

Suppose I assert that no Scotsman puts sugar on his porridge. You counter this by pointing out that your friend Angus likes sugar with his porridge. I then say "Ah, yes, but no *true* Scotsman puts sugar on his porridge.

This is an example of an [ad hoc](#) change being used to shore up an assertion, combined with an attempt to [shift the meaning of the words](#) used original assertion; you might call it a combination of fallacies.

### **Non causa pro causa**

The fallacy of Non Causa Pro Causa occurs when something is identified as the cause of an event, but it has not actually been *shown* to be the cause. For example:

"I took an aspirin and prayed to God, and my headache disappeared. So God cured me of the headache."

This is known as a false cause fallacy. Two specific forms of non causa pro causa fallacy are the [cum hoc ergo propter hoc](#) and [post hoc ergo propter hoc](#) fallacies.

### **Non sequitur**

A non sequitur is an argument where the conclusion is drawn from premises which aren't logically connected with it. For example:

"Since Egyptians did so much excavation to construct the pyramids, they were well versed in paleontology."

(Non sequiturs are an important ingredient in a lot of humor. They're still fallacies, though.)

### **Petitio principii / Begging the question**

This fallacy occurs when the premises are at least as questionable as the conclusion reached. For example:

"Aliens are abducting innocent victims every week. The government must know what is going on. Therefore the government is in league with the aliens."

### **Plurium interrogationum / Many questions**

This fallacy occurs when someone demands a simple (or simplistic) answer to a complex question.

"Are higher taxes an impediment to business or not? Yes or no?"

## **Post hoc ergo propter hoc**

The fallacy of Post Hoc Ergo Propter Hoc occurs when something is assumed to be the cause of an event merely because it happened before that event. For example:

"The Soviet Union collapsed after instituting state atheism. Therefore we must avoid atheism for the same reasons."

This is another type of [false cause fallacy](#).

## **Red herring**

This fallacy is committed when someone introduces irrelevant material to the issue being discussed, so that everyone's attention is diverted away from the points made, towards a different conclusion.

"You may claim that the death penalty is an ineffective deterrent against crime -- but what about the victims of crime? How do you think surviving family members feel when they see the man who murdered their son kept in prison at their expense? Is it right that they should pay for their son's murderer to be fed and housed?"

## **Reification / Hypostatization**

Reification occurs when an abstract concept is treated as a concrete thing.

"I noticed you described him as 'evil'. Where does this 'evil' exist within the brain? You can't show it to me, so I claim it doesn't exist, and no man is 'evil'."

## **Shifting the burden of proof**

The burden of proof is always on the person asserting something. Shifting the burden of proof, a special case of [Argumentum ad Ignorantiam](#), is the fallacy of putting the burden of proof on the person who denies or questions the assertion. The source of the fallacy is the assumption that something is true unless proven otherwise.

For further discussion of this idea, see the "[Introduction to Atheism](#)" document.

"OK, so if you don't think the grey aliens have gained control of the US government, can you prove it?"

## **The slippery slope argument**

This argument states that should one event occur, so will other harmful events. There is no proof made that the harmful events are caused by the first event. For example:

"If we legalize [marijuana](#), then more people would start to take crack and heroin, and we'd have to legalize those too. Before long we'd have a nation full of drug-addicts on welfare. Therefore we cannot legalize marijuana."



## **Straw man**

The straw man fallacy is when you misrepresent someone else's position so that it can be attacked more easily, knock down that misrepresented position, then conclude that the original position has been demolished. It's a fallacy because it fails to deal with the actual arguments that have been made.

"To be an atheist, you have to believe with absolute certainty that there is no God. In order to convince yourself with absolute certainty, you must examine all the Universe and all the places where God could possibly be. Since you obviously haven't, your position is indefensible."

## **Tu quoque**

This is the famous "you too" fallacy. It occurs if you argue that an action is acceptable because your opponent has performed it. For instance:

"You're just being randomly abusive."

"So? You've been abusive too."

This is a personal attack, and is therefore a special case of [Argumentum ad Hominem](#).

## **Fallacy of the Undistributed Middle / "A is based on B" fallacies / "...is a type of..." fallacies**

These fallacies occur if you attempt to argue that things are in some way similar, but you don't actually specify in what way they are similar. Examples:

"Isn't history based upon faith? If so, then isn't the Bible also a form of history?"

"Islam is based on faith, Christianity is based on faith, so isn't Islam a form of Christianity?"

"Cats are a form of animal based on carbon chemistry, dogs are a form of animal based on carbon chemistry, so aren't dogs a form of cat?"