# 2. Causation

## 2.1 Efficient versus final causality

Aristotelians famously distinguish between *efficient* and *final* causes. An efficient cause is that which brings something into existence or changes it in some way. It is also called an "agent" or "agent cause" in Scholastic philosophy. It is, more or less, what is usually meant by "cause" in contemporary philosophy. A final cause is an end, goal, or purpose, "that for the sake of which" something exists or occurs (Aristotle, *Metaphysics*, Book V, Chapter 2). Final causality is sometimes referred to as "teleological causation" in contemporary philosophy.

Where final causality or teleology is concerned, several crucial distinctions need to be kept in mind so that common misunderstandings are avoided. (See Feser 2010 for a detailed discussion.) First, we need to distinguish *intrinsic* finality from *extrinsic* finality. That the parts of a watch are directed toward the end of telling time has nothing to do with the nature of the parts themselves. The time-telling function is imposed on the parts entirely from outside, by the watchmaker and the users of the watch. The finality here is thus extrinsic. By contrast, the tendency of an acorn to grow into an oak is intrinsic to it in the sense that it is just in the nature of an acorn to grow into an oak. Whereas the metal bits of a watch would still be metal bits whether or not they played a role in a timepiece, an acorn would not be an acorn if it did not have a tendency to develop into an oak. (This distinction is very closely connected to the Aristotelian distinction between artifacts and true substances, which will be examined in chapter 3.)

As this indicates, there is also a second distinction to be drawn between an *end or goal* on the one hand, and a thing's *directedness toward* that end or goal on the other. Hence there is a difference between the end of telling time, and the parts of a watch functioning together so as to realize that end; and there is a difference between



the end of becoming an oak, and an acorn's pointing to that end. An end or goal is itself always extrinsic to a thing. Actually telling time is different from the parts of a watch having the function of telling time. Actually being an oak is different from an acorn's having a tendency to become an oak. But the *directedness toward* an end is not always extrinsic. Sometimes it is extrinsic, as in the case of the watch parts, but sometimes it is intrinsic, as in the case of the acorn.

We need to distinguish, third, between the question of *whether* finality exists in a thing and the question of what the *source* of a thing's finality is. These are sometimes conflated. In particular, atheists and theists alike often conflate the question of whether there is finality or directedness toward an end in nature with the question of whether there is a divine intelligent cause of such directedness. These questions, though obviously related, are distinct, and several possible views need to be differentiated. There is, first of all, the view that there is such directedness in nature and that its direct source is the divine intellect. This sort of view can be found in Anaxagoras, Plato (in the *Timaeus*), Newton, and William Paley. Christopher Shields (2007, p. 74) labels it *teleological intentionalism*, and André Ariew (2002, 2007) has called it *Platonic teleology*. They contrast it with *Aristotelian teleology*, according to which there is directedness toward an end in natural objects, but that it is the nature of those objects that is the source of this directedness. An acorn is directed toward becoming an oak simply because that is what it is to be an acorn, not because a divine intelligence so directs it.

The view is called "Aristotelian" because while Aristotle affirmed the existence of a divine Unmoved Mover, as commonly interpreted he did not think the finality of things as such needed a divine or any other intelligent cause (Cf. Johnson 2005). Their natures alone sufficed to explain their directedness toward an end. (The idea of natural teleology without a divine source has recently been defended in Nagel 2012.) But there is a middle ground position between Aristotle's view so interpreted and the Platonic view, which is the Scholastic or at least Thomistic view of teleology. On this view, the *proximate* source of natural teleology is the nature of the things themselves, while the *distal* source is the divine ordering intellect. This is the view defended in Aquinas's Fifth Way, which affirms the Aristotelian view that finality is intrinsic to natural phenomena while

nevertheless arguing that it must ultimately depend on God (Feser 2009, pp. 110-20; Feser 2013b). (This parallels Aquinas's concurrentist view of efficient causality, on which things have -- contra occasionalism -- real causal power, but that divine concurrence is nevertheless necessary for any cause to be efficacious.)

An implication of the Thomistic view is that the question of whether natural teleology exists can be bracketed off from the question of whether it has a divine source. While the Thomist holds that natural teleology depends necessarily on God, he also holds that this thesis requires further argumentation, beyond the argumentation required to establish that natural finality exists in the first place. Hence the naturalist metaphysician cannot dismiss the idea of natural teleology merely on the basis of his atheism.

The question of whether finality exists in nature must also be distinguished from the question of whether irreducible teleology exists in the biological realm. For the Scholastic philosopher of nature, the key to the difference between living and non-living things lies in the distinction between *immanent* and *transeunt* (or "transient") causation (Klubertanz 1953, pp. 47-50; Koren 1955, chapter 1; Oderberg 2007, pp. 194-7; Oderberg 2013). Immanent causation begins and remains within the agent or cause (though it may also and at the same time have some external effects); and typically it in some way involves the fulfillment or perfection of the cause. Transeunt causation, by contrast, is directed entirely outwardly, from the cause to an external effect. An animal's digestion of a meal would be an example of immanent causation, since the process begins and remains within the animal and serves to fulfill or perfect it by allowing it to stay alive and grow. One rock knocking another one off the side of a cliff would be an example of transeunt causation. Living things can serve as transeunt causes, but what is characteristic of them is that they are also capable of immanent causation in a way that non-living things are not. A living thing can undertake activity that is *perfective* of it, that *fulfills* it or *furthers its own good*, while non-living things cannot do this.

In this way a living thing aims at a unique kind of end or goal. But it is only its having this specific *sort* of end or goal, and not the having of an end or goal as such, that makes it a living thing. For the



Scholastic metaphysician, finality is not confined to the biological realm and it is therefore not to be identified with immanent causation or biological function, which represent only one kind of finality. There is also finality or teleology in inorganic systems insofar as they are cyclical or tend toward certain end-states (Oderberg 2008; Cf. Hawthorne and Nolan 2006 for a sympathetic non-Scholastic treatment). More generally, there is finality wherever there is efficient causation of even the simplest sort.

That efficient and final causality go hand in hand is already implicit in the theory of act and potency. Efficient causation is just the actualization of a potency. But a potency is always a potency *for* some specific outcome or range of outcomes, and in that sense entails finality or directedness. Indeed, while early modern philosophers like Bacon and Descartes minimized the importance of final causes and later moderns would come to deny their reality altogether, for Scholastics like Aquinas, efficient causality, and indeed all of Aristotle's four causes, *presuppose* final causality. Hence in the *Commentary on Aristotle's Metaphysics*, Aquinas writes:

> [E]ven though the end is the last thing to come into being in some cases, it is always prior in causality. Hence it is called the cause of causes, because it is the cause of the causality of all causes. For it is the cause of efficient causality, as has already been pointed out... and the efficient cause is the cause of the causality of both the matter and the form, because by its motion it causes matter to be receptive of form and makes form exist in matter. Therefore the final cause is also the cause of the causality of both the matter and the form. Hence in those cases in which something is done for an end (as occurs in the realm of natural things, in that of moral matters, and in that of art), the most forceful demonstrations are derived from the final cause. (V.3.782)

This indicates that formal and material causes depend on final causes by way of efficient causes, but Aquinas asserts an even more direct link in *De principiis naturae*:

> [T]he end does not cause that which is the efficient cause, rather, it is a cause of the efficient cause's being an efficient cause. For health -- and I mean the health resulting from the

> physician's ministrations -- does not make a physician to be a physician; it causes him to be an efficient cause. Hence, the end is the cause of the causality of the efficient cause, for it makes the efficient cause be an efficient cause. Similarly, it makes the matter be matter, and form be form, since matter receives a form only for some end, and a form perfects matter only for an end. Wherefore the end is said to be the cause of causes, inasmuch as it is the cause of the causality of all the causes. (IV.24; Cf. *Commentary on Aristotle's Physics* II.5.186)

We will consider the nature of efficient causality in more detail below, and examine formal and material causes in chapter 3. For the moment let us consider why in Aquinas's view the reality of efficient causality entails the reality of final causality.

## 2.2 The principle of finality

### 2.2.1 Aquinas's argument

Consider an ice cube's tendency to cause the liquid or air surrounding it to grow cooler, or the tendency of the phosphorus in the head of a match to generate flame and heat when the match is struck. These, specifically, are the effects the ice cube or phosphorus will reliably bring about unless somehow impeded (for instance, by melting the ice cube before it has a chance to cool its surroundings, or by damaging the match by submerging it in water). The ice cube will cool the surrounding air *rather than* heating it, or causing it to become toxic, or having no effect at all; the phosphorus will cause flame and heat *rather than* frost and cold, or the smell of lilacs, or no effect at all. That the ice cube and phosphorus have just the specific effects they do in fact have rather than some others or none at all – or, counterfactually, that they would have had those specific effects had they not been impeded – is in Aquinas's view explicable only if we suppose that there is something in them that is *directed at* or *points to* precisely those outcomes rather than any others, as to an end or goal. In short, if A is by nature an *efficient* cause of B, then generating B must be the *final* cause of A. As Aquinas says, "every agent [i.e. efficient cause] acts for an end: otherwise one thing would not follow more than another from the action of the agent, unless it were by chance" (*Summa theologiae* I.44.4; Cf. *Summa theologiae* I-II.1.2 and *Summa contra gentiles* III.2). Later Scholastics would come to refer to this as the *principle of finality*. (See Bittle 1939, chapter XXXIII; Coffey 1970, chapter XV; De Raeymaeker 1954, pp. 270-75; Hart 1959, chapter XII; Klubertanz 1963, chapter VIII; Koren 1960, chapter 14; Phillips 1950b, pp. 245-54; Renard 1946, pp. 144-61; Smith and Kendzierski 1961, chapter VIII; and for a recent defense from outside the Scholastic camp, Hoffman 2009)



Aquinas is not to be read as regarding chance as an alternative explanation, however. For one thing, that A generates B in a *regular* way tells against the connection being a chance one. As Aquinas says in the first stage of the Fifth Way:

> We see that there are things that have no knowledge, like physical bodies, but which act for the sake of an end.
>
> This is clear in that they always, or for the most part, act in the same way, and achieve what is best. This shows that they reach their end not by chance but in virtue of some tendency. (*Summa theologiae* I.2.3, as translated in C. F. J. Martin 1997, p. 179)

For another thing, in Aquinas's view chance *presupposes* finality, and so provides no genuine alternative at all. Chance is nothing more than the accidental convergence of non-accidental lines of causation. To take a stock example from Boethius, suppose a farmer discovers treasure buried in the field he is plowing (*Consolations of Philosophy*, Book V, Chapter 1. Cf. Aristotle, *Physics*, Book II, Part 5). The discovery was in no way intended by either the farmer or the person who buried the treasure, nor is there any causal regularity in nature connecting plowing and the discovery of treasure. Still, the farmer did intend to plow, someone did intend to bury the treasure, and there are all sorts of natural causal regularities instantiated when the farmer plows the field and discovers the treasure. These regularities, as well as the actions of the farmer and the burier of the treasure, all involve finality. In Aquinas's view, it would therefore be incoherent to suggest that causal regularity can be accounted for by chance *rather* than finality, since to make sense of chance itself we need to *appeal* to finality.

Now modern philosophers would generally hold that we needn't appeal to chance *or* finality, insofar as efficient causality

alone suffices to account for causal regularities in the natural world. Such a view can even be found in some Scholastic thinkers. William of Ockham denied that it could be demonstrated through natural reason that final causes exist in non-rational natural objects. In his view, only agents with free will clearly exhibit teleology:

> [S]omeone who is just following natural reason would claim that the question 'For what reason?' is inappropriate in the case of natural actions. For he would maintain that it is no real question to ask for what reason a fire is generated; rather, this question is appropriate only in the case of voluntary actions. (*Quodlibet* 4, q. 1, in William of Ockham 1991, at p. 249)

To the argument that without final causes, an agent or efficient cause would act by chance rather than reliably generating its associated effect, Ockham responds:

> I reply that this argument goes through for a free agent, which is no more inclined by its nature toward the one effect than toward the other. However, the argument does not go through for a natural agent, since an agent of this sort is by its nature inclined toward one determinate effect in such a way that it is not able to cause an opposite effect. This is evident in the case of fire with respect to heat. (Ibid.)

In general, Ockham held that apart from revelation, we could know very little about teleology:

> If I accepted no authority [i.e. the truths of faith], I would claim that it cannot be proved either from propositions known per se or from experience that every effect has a final cause that is either distinct or not distinct from its efficient cause. For it cannot be sufficiently proved that every effect has a final cause. (Ibid., p. 246)

The tendency to associate teleology only with rational agents is even more pronounced in the work of John Buridan. As Dennis Des Chene writes:

> Ockham had already argued, following Avicenna, that the final cause acts only by virtue of existing in the intellect of an agent; to which Buridan added that when it acts thus, it acts as an efficient cause, and that where the agent is not such as to conceive the ends by which it acts, there is no final cause at all, only efficient causes. To the argument that if there were no ends in nature, then one thing would follow from another haphazardly, Buridan replies (as we would) that efficient causes suffice. (1996, pp. 186-87)



Des Chene himself develops this objection to the argument for the principle of finality as follows:

> The [Aristotelian] argument is, on its face, unconvincing. Everyone agrees that efficient causes necessitate their effects ("if the cause is given, so is the effect," writes Eustachius with his usual brevity...). So people will not emerge from the sea ever if they do not always: one does not need ends to account for that regularity. Given that we have not seen any such occurrence, and that the sea remains constant in composition, there is no reason to expect that the weird event will occur. Likewise, if people have always given birth to people, and birds to birds, and if they remain constant in composition, then there is no reason to expect that people will bear birds or birds people. So if the regularity to be explained is 'people give birth only to people, and no other kind of thing does', then an appeal to the necessity of efficient causes seems to suffice. (Ibid., p. 178)

But the objection fails. For we need to know what it *means* to say that efficient causes necessitate their effects, and we need an *explanation* of this necessitation. Now the necessitation either involves something intrinsic to the causes and effects, or it does not; and either possibility poses grave problems for the view that efficient causation suffices to account for regularity.

Consider first the possibility that necessitation involves something *extrinsic* to the causes and effects themselves. On this view, that an efficient cause A necessitates its effect B has nothing to do with A or B themselves, but with something else. But what is this something else? One option is to hold that *God* ensures that B follows upon A. But that just raises the question of *how* God does so. If we answer that He efficiently causes B merely by necessitating it, then we have simply pushed the problem back a stage rather than solved it. If we answer instead that He causes B by virtue of having it in

view as an *end*, then we will have resorted to finality after all and given up the view that efficient causation alone suffices to account for regularity. (The proposal also has an obvious theological drawback insofar as it seems to entail occasionalism.)

Rather than appeal to God, though, might we not say that it is a "law of nature" that B follows upon A? Yet as we noted earlier, the appeal to "laws of nature" *by itself* hardly suffices to explain anything, for it just raises the question of what "laws of nature" are and why they hold. Now if we say that a law of nature is simply a kind of regularity, then we are led into either a vicious circle or a vicious regress, since the regularity of the connection between A and B is what we're trying to explain in the first place. For to explain regularities in nature in terms of efficient causal necessitation, efficient causal necessitation in terms of laws of nature, and laws of nature in terms of regularities, would be to go around in a circle; while if, to avoid this circularity, we say that the regularity enshrined in a law of nature is of a *higher order* than the sort we started out trying to explain, then we will now need an account of this higher-order regularity, and will thereby merely have pushed the problem back a stage rather than solved it.

To explain "laws of nature," then, we cannot appeal to regularity. And if, to explain them, we appeal instead either to higher-order instances of efficient causal necessitation or higher-order laws of nature, we will once again merely have pushed the problem back a stage rather than solved it. While if we explain laws of nature by reference to God, we will merely have reintroduced at a higher level the very problems the appeal to laws of nature was supposed to help us avoid. The only remaining alternative would seem to be to appeal instead to the Aristotelian idea that "laws of nature" are really a shorthand for a description of how things act given their natures. But this would be to concede that there is, after all, something *intrinsic* to A and B that explains the efficient causal relations holding between them, and thus to abandon the suggestion that the necessitation we've been discussing is *extrinsic* to causes and effects.

So, treating causal necessitation as grounded in something *extrinsic* to causes and effects would seem a hopeless strategy for anyone who wants to defend the view of Ockham, Buridan, and Des



Chene that efficient causation suffices to explain regularity. The only realistic option is to treat the necessitation as grounded in something *intrinsic* to the causes and effects. In particular, since an effect B doesn't even exist until generated by its efficient cause A, the necessitation will have to be grounded in something *intrinsic to A*. But what can this intrinsic feature be if it is not the very inclination to an end that Aquinas affirms and that the view in question is trying to avoid? What can it possibly be for A to be such that it *necessitates* the generation of B, other than that there is something in A that *inherently "points" to* the generation of *B specifically*, even before it actually generates B? It seems the only possible alternative intrinsic explanatory feature would be some further instance of efficient causal necessitation internal to A. But this would just raise the same questions all over again – and it would, yet again, thus lead the purported explanation of regularity in terms of efficient causes alone into either vicious regress or vicious circularity. (Cf. Garrigou-Lagrange 1939, pp. 356-58)

There seems, then, to be no way to avoid Aquinas's conclusion that to make efficient causal regularities intelligible we need to attribute finality to efficient causes. Every attempt to avoid doing so merely raises further puzzles which cannot be solved except by admitting finality. But it might seem that the defender of the view that efficient causes alone suffice to account for regularity has one more arrow in his quiver. For isn't Aquinas's position open to the same sorts of objection as his opponent's view is? In particular, if Aquinas holds that efficient causal regularities need to be accounted for by reference to final causes, can it not be said with equal plausibility that final causes in turn need to be accounted for, and that accounting for them will also lead to vicious regress or vicious circularity? Aren't the two positions – Aquinas's on the one hand, and that of Ockham, Buridan, Des Chene, and modern philosophers in general on the other hand – therefore at least at a stalemate?

In fact such a comparison would be spurious. The two views would be on a par only if each made use of its favored notion of causation *to the exclusion* of the other. And Aquinas is doing no such thing. His critic holds that efficient causes *suffice* to explain the regularity that exists in the world, so that no appeal to finality is necessary; indeed, naturalist philosophers typically hold that final causes

are ultimately not needed to explain *any* aspect of the natural world (or at least that any teleological notions that are needed can be reduced to non-teleological ones). But Aquinas does not hold that final causality *suffices* to explain either regularity or natural phenomena in general. He merely holds that it is a *necessary part* of a complete explanation. As an Aristotelian, he is committed to the explanatory indispensability of *all* of the traditional four causes – material, formal, efficient, and final – each of which has its place:

> Matter, indeed, is prior to form in generation and time, inasmuch as that to which something is added is prior to that which is added. But form is prior to matter in substance and in fully constituted being, because matter has complete existence only through form. Similarly, the efficient cause is prior to the end in generation and time, since the motion to the end comes about by the efficient cause; but the end is prior to the efficient cause as such in substance and completeness, since the action of the efficient cause is completed only through the end. Therefore, the material and the efficient causes are prior by way of generation, whereas form and end are prior by way of perfection. (*De principiis naturae* IV.25, in Aquinas 1965c)

There is no parity between the view of Aquinas and that of his critic, then. The critic has tried to show that efficient causes suffice to explain regularity, and has failed. Aquinas has not tried to show that final causes suffice to explain it, only that efficient causes do not and that reference to finality is needed as well. In failing to make his own case, the critic has only lent plausibility to Aquinas's.

It would also be a mistake to suppose that the scientific errors or oversimplifications reflected in some purported examples of final causality cast any doubt on the reality of final causality itself. For example, Aristotle and his medieval followers held that heavy objects naturally tend to fall down to the earth, specifically. Of course, that is not correct, for there is nothing special about the gravitational pull of the earth per se. The chemical facts underlying the behavior of phosphorus and ice are much more complicated than the toy examples I gave above would indicate. But none of this is relevant to Aquinas's argument for the principle of finality. For *whatever* the scientific details concerning gravitation, cooling, burning, etc. turn out



to be, they will involve patterns of efficient causation (gravitational attraction, molecular interaction, etc.). And these will presuppose finality. Science can tell us whether a particular *example* of finality is a good one, but not whether there *is* such a thing as finality.

The thesis that efficient causality presupposes final causality is certainly lent plausibility by the history of thinking about efficient causes after final causes were deemphasized and then abandoned by the nominalist Scholastics and the early modern philosophers and scientists. Ockham's move away from Aquinas's view of the relationship between the two kinds of cause was part of a package of theses about causality which, as we saw in the previous chapter, culminated in Humean skepticism about causality as a real feature of the world. The crux of this skepticism is the Humean position -- prefigured in Ockham, Autrecourt, and occasionalism -- that causes and effects are inherently "loose and separate" (*Enquiry Concerning Human Understanding*, Section VII, Part II), and that we have "no idea of a power or efficacy in any object" by which it brings about its characteristic effect (*Treatise of Human Nature*, Part III, Section XIV). The power and necessity we see in causes could thus be seen as a mere projection of the mind. Yet causes and effects can be loose and separate only if there is nothing in an efficient cause that inherently *points to* or is *directed toward* its effect. And causes can lack power only if there is no active potency in them, where potency, as we have seen, presupposes finality or directedness toward a characteristic manifestation. Thus, Humean skepticism was plausibly the inevitable sequel to the abandonment of final causes. Conversely, to affirm that efficient causes have real causal power and are necessarily tied to their effects entails affirming that there is after all something in them that points to or is directed at the production of those effects.

Of course, the Humean might also argue that the "conceivability" of a cause existing without its usual effect evidences a lack of necessary connection. I will have more to say about this sort of argument below, but for the moment we can note that it falsely supposes that the necessity in causation has to do with a "constant conjunction" between causes and effects, such that the latter follow invariably upon the former. But as our discussion of "finks," "masks," and the like in the previous chapter indicates, the advocate of causal powers does not hold that a power will *invariably* generate its charac-

teristic manifestation. For it might be frustrated in various ways. As Aquinas writes:

> [A]mong inanimate things the contingency of causes is due to imperfection and deficiency, for by their nature they are determined to one result which they always achieve, unless there be some impediment arising either from a weakness of their power, or on the part of an external agent, or because of the unsuitability of the matter. And for this reason, natural agent causes are not capable of varied results; rather, in most cases, they produce their effect in the same way, failing to do so but rarely. (*Summa contra gentiles* 3.73.2)

The principle of finality tells us the sense in which causes and effects are necessarily connected despite the occasional failure of the latter to follow upon the former. An efficient cause A of its nature *points to* and *tends toward* its characteristic effect B as toward an end or goal. Because B is the object or end toward which A points by its very nature, the connection between them is necessary. But because the relationship is merely one of pointing or tending, the generation of B can be blocked given the presence of finks, masks, and the like.

### 2.2.2 Physical intentionality in recent analytic metaphysics

This brings us back yet again to the contemporary analytic powers theorists, some of whom have essentially endorsed a return to the principle of finality, and essentially for the reasons Scholastic writers like Aquinas were committed to it. These recent theorists do not use the language of "finality" or "final causality," though. They speak of powers or dispositions as "pointing" or "directed" toward their characteristic manifestations, and they model this directedness or pointing on the "intentionality" of thought. Hence George Molnar speaks of "physical intentionality" (2003, chapter 3), John Heil of "natural intentionality" (2003, pp. 221-22), and U. T. Place of dispositions being "intentional states" (1996).

Molnar especially has explored the respects in which the "physical intentionality" of powers might be said to be like and unlike the intentionality of the mental. Since the time Franz Brentano famously put forward the thesis that intentionality is the mark of the mental,



four criteria for the existence of intentionality have, Molnar says (2003, pp. 62-63), come generally to be accepted:

(1) An intentional state is *directed* toward an object. For instance, the thought that *the cat is on the mat* is directed toward the state of affairs of the cat's being on the mat.

(2) The intentional object may or may not exist. For instance, one can have the thought that *the cat is on the mat* even if there is no cat.

(3) The intentional object can be indeterminate, either because it is considered only in a partial way or because it is simply vague. For example, one can have the thought that *there is a cat on the mat* without thinking of the cat's particular color or weight, and the thought that *there is something or other over in that direction* has only a vague object.

(4) Ascriptions of intentional states can exhibit *referential opacity*. For example, if one has the thought that *the cat is on the mat*, then even if the cat's name is Felix, it doesn't follow that one has the thought that *Felix is on the mat*.

Molnar argues that powers exhibit features parallel to these four, and can therefore be said to possess a kind of intentionality (2003, pp. 63-66):

(1) Powers are directed toward their characteristic manifestations. For example, solubility is directed toward dissolving.

(2) The manifestation toward which the power is directed need never in fact exist. For example, a thing is still soluble even if it never in fact dissolves.

(3) A power can have an indeterminate object. For example, there is no particular moment when a given radium atom's disposition to disintegrate must manifest.

(4) Power ascriptions can also exhibit referential opacity. For example, that *acid has the power to turn this piece of litmus paper red* does not entail that *acid has the power to turn this piece of litmus paper the color of Pope Benedict's shoes* (since, though the pope's