



The first stage of learning usually involves coming to grips with the names of things and basic facts about them, but eventually our desire to know takes us deeper. This search for deeper knowledge is exemplified in the question “why,” a multi-faced question that can be answered in a myriad of ways.

Take, for example, 8-year-old Junior asking his Dad, “Why is the sky blue?” Dad simply answers, “Because the sun is out.” Although even a child knows that the sky is only blue during the day, Dad’s statement expresses an important point. The sky is not always blue, and the reason it is blue in the day but not at night is because of the sun. As an intense source of light, the sun causes an effect in the sky that lights it up and makes it appear blue. The sun is an efficient or agent cause of the sky’s blue color.

Unfortunately, Junior is not so easily satisfied and persists asking, “Why is the sky blue during the day?” Dad replies, “Because the sky absorbs a lot of the light from the sun, and some of it then gets showered down on us.” This second reply touches on what is known as “final causality,” focusing on a natural tendency of the air. Analogous to the way we can explain our actions by referring to an intended goal, we can explain many natural processes as a tendency towards a state of stability. As the light from the sun continuously excites the air, some of this absorbed energy is released allowing part of the air to momentarily return to its relaxed state. A portion of that energy reaches us as light, the brightness of the sky. Once the sun goes down the air is able to simply relax in its natural rest state.

Undeterred, Junior presses on with a simple, “Why?” Dad, seeing that things are getting

serious, answers, “Because the sky is made of lots of little particles of air. Any particular piece of sunlight might hit any particular piece of air and send it off in a random direction, some of it coming towards us.”

By appealing to the structure of the sky and the properties that follow from that structure Dad has given an argument from form. A formal cause describes the shape or organization of something and all the various activities that follow from it. While the form of air may simply be the arrangement of its molecules, in some

things, like living organisms, the form describes not only for the arrangement of parts, its molecules, cells, and organs, but also the ordering of those parts to the

good of the whole, and the activity that follows from that ordering.

Junior replies with a further query, “Why is the sky *blue*?” Dad presses on, “Because the individual molecules that air is composed of are much smaller than the wavelength of visible light, the shorter wavelength blue light is scattered much more frequently.”

Here we have an argument from what air is made of, its matter. While the organization and activity of something is ultimately determined by its formal cause, the matter, or material cause, limits the forms the thing can take on. The density and temperature of air can rearrange its molecules into various weather patterns, but no natural process can force a bunch of air molecules to take on the form of a hippopotamus, however delightful that would be to Junior.

Dad has made a valiant effort at explaining why the sky is blue to Junior, providing a robust explanation from a scientific perspective and even touching on all the various senses in which the question “why?” can be answered. Junior, of

Causality: What are the Four Causes of Things?

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course, may not be satisfied and is limited only by his stamina and his attention span. We could follow Junior and Dad as they probe the scientific understanding of the beautiful blue sky by looking deeper at each type of cause, but it is worth making a few more general comments on the idea of causality.

First, the idea of the four causes, formal, material, efficient and final, dates back to the ancient Greek philosopher Aristotle (384 B.C.–322 B.C.) and inspired a greater interest in nature when it was rediscovered in the thirteenth century. In this view a cause is an explanation for how a thing comes into being, how it remains in being, and eventually, how it ceases to be, by becoming something else.¹ This classical understanding of causality, where causes explain the being of things, is not the structure modern science generally approaches its work with, but it is not contrary to modern finding and methods either. Any fully satisfying scientific explanation will touch on all four classical causes. Second, two of these causes, efficient and final, deserve a closer look because of their importance for the disputed questions that follow.

In efficient causality it is often possible to point to one particular cause that is the immediate agent of an effect. However, we often ask about the cause of this immediate cause. Sometimes, this means tracing a chain of events back in time, for instance tracing sunlight back to the sun and the nuclear fusion that powers it. Other times we notice that the immediate agent is directly moved a moving agent, as when a saw cuts wood because it is moved by my hand. In this second case we find an example of instrumental causality where something acts as a cause, but only because it is empowered to act by another higher cause. The saw is an instrumental cause because it only cuts wood while being moved to do so by me.

Second, the final causality Dad ascribes to the sky is fairly simple: It involves the return of

excited air molecules to their stable rest states. While this aspect of stability is the basis of final causality, it is easier to recognize ends and goal in more complicated things. In living things we

see a tendency not towards any rest state, but towards specific states of perfection. A puppy tends to become a mature dog which in turn can produce more puppies and dogs. An even higher aspect of final causality appears in human acts.

We act with particular goals in mind; particular stable states in ourselves and in the world which we think will make us happy. Thus even the world of ethics and morality is rooted in final causality, the tendency toward a stable and perfective state.

Sometimes when people hear the phrase final causality, also known as teleology, they assume that it refers only to this highest form of final causality, the imposition of a rational will on things. To many it seems like this is contrary to the very goal of our study of nature, the study of the inner working of the world around us, even the inanimate. If teleology is only viewed as the external imposition of an intelligent will, they are right that it is contrary to this study. However, at its root, teleology begins with the basic natural tendency of things to move towards particular stable states. Indeed, if it were not for this basic internal tendency of natural things to move towards stability, the whole project of science would be impossible because there would be no consistency or order to make nature intelligible. **THE**

¹ St. Thomas Aquinas *De Principiis Naturae*, 18.

