

## The “Death” of a Virus

### *A Thoughtful Essay on the Intricacies of a Scientific Argument*

The *New Oxford American Dictionary* defines life as “the condition that distinguishes animals and plants from inorganic matter.” For most biologists, a living thing must undergo metabolism, maintain homeostasis, have a capability for growth, respond to stimuli, and reproduce. Other common prejudices for defining something as life include the possession of genetic material (i.e. DNA or RNA) or that it is capable of being parasitized. But should these be the concrete definitions for life? Does a virus count as life? Viruses pose a labyrinthine question that has persisted as a topic of debate for decades in the scientific community, but the compromises that must be made to qualify viruses as life are unacceptable.

Metabolism poses one of the most significant detriments to the argument that viruses are alive. Viruses do not break down organic components for use, at least not in and of themselves. Because viruses take control of a cell and use it to reproduce themselves, in a sense they do undergo metabolism. However, this is not an entirely fair attribution of metabolism to a virus, as it is still the cell doing the metabolism. But this just underscores the difficulty of defining viral “life” in any specific or definite manner; the fact that viruses require a host cell can be turned right around and used to say that, as they now control all of those cellular processes, they thus are alive. Temporary control does not equate to life, however, as a virus is incapable of creating any of the organelles required for

vital processes. A virus makes one-time, single-purpose use of life for the sole purpose of repeating the action in another cell.

Now, the question of whether a creature must be able to replicate independently poses another point to be considered. A virus cannot reproduce on its own. A virus depends upon an independently living cell that it can infect to continue its existence. How can such a thing qualify as life? A simple parasitic relationship is in play in this instance. Trichinella, tapeworms, and trypanosomes are all considered forms of life, parasitic though they are. They too require one or more hosts to reproduce. Thus an argument of the requirement of independent reproduction proves troublesome, but what of genetics?

One of the keys to life as we know and understand it is the necessity of genetic information. This, in the vast majority of cases, takes shape in the form of deoxyribonucleic acid, but in more specialised cases can also be found as ribonucleic acid alone. Here is one of the primary points used by those who believe that viruses do possess life; the components of a virus either *are* the DNA/RNA, or else exist solely to ferry that genetic material from the cell in which it was created to the next cell it hopes to infect. In a sense, a virus *is* genetic material. Some viruses have even integrated themselves into other organisms' genomes. However, DNA and RNA are only requisite for life and do not constitute life in and of themselves. But though a virus has genetic information, it still has that parasitic lifestyle. If a parasite, by definition, requires another organism in order to reproduce, what would it mean if a thing can be parasitized?

One speculation as a requirement of a definition of life has been “able to be parasitized.” If this is taken, what does it mean for viruses? If a parasite is a thing that infects another living thing, what does that mean if a virus can be parasitized? Just such a phenomena has recently been coming to light; a recently discovered, first-of-its-kind virophage has been observed. Dubbed the Sputnik Virophage, it can inhibit the life cycle of the largest virus, the mimivirus, and thus qualifies as a parasite of a virus. With this observation, does that mean that viruses can be qualified as living beings, as they are capable of being parasitized? Not entirely, as the virophage only inhibits the replication of the mimivirus, as opposed to taking over the capsid and using it for its own ends. However, broadening the definition of life in the hopes to include viruses can cause some unintended consequences.

As we have seen, the requirement of metabolism as a stipulation of life is the largest impairment to the argument that viruses are alive. But if we do away with this, and broaden the definition of life in order to include viruses, then other biological phenomenon sneak in and suddenly qualify as life as well. Specifically, the concern centres around prions. Prions are misfolding, infectious proteins most famously demonstrated in Creutzfeldt–Jakob disease, which is related to and likely caused by bovine spongiform encephalopathy (a.k.a. mad cow disease). While some scientists may be willing to accept that a virus is a form of life, most would not be open to considering a simple prion as life. But because prions are infectious, that is, they are capable of reproducing themselves, if the

definition of life is opened enough to allow in viruses, prions and possibly other as-yet-undiscovered biological phenomena could wheedle their way in as well (speaking anthropomorphically, of course). This obstruction is another poser in the argument for viral “life.”

The question of viral “life” is hotly debated with an uncomfortable amount of ambiguity and an unending supply of questions and debates. While the question lacks a consensus, valid and pertinent points and evidences have been advanced by both sides. However, the lack of a metabolism and other necessary operations bar a virus from the classification of life as it now stands. Broadening that definition allows too many things that are definitively deemed as nonliving to suddenly qualify as life. Viruses, though elaborate, remain unusually complex, but nonliving, units begging for a classification of their own.