

What is Law?: the perception of Category Theory (in Session: Philosophy of Mathematics)

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Law controls our lives. We live under the rule of Law. We are everywhere also subject to the laws of science. Law in one way or another affects every facet of human life. We need therefore to understand better the way that Law operates. Do we even know the nature of law? To understand it we need to examine its roots. For they lie in logic. There is *prima facie* a distinction between the scientific law and human civil and criminal laws in that the former are always strictly obeyed whereas the latter may not be observed. However delving deeper we find that scientific law is not always universally obeyed. On the other hand it may come as a surprise to find that there is a sense in that human law always does.

Law whether scientific or human operates from a higher level. Current mainstream mathematics that derives from set theory cannot deal directly with separate levels but only collapse them into a model of first order. Alfred North Whitehead (1860-1947) who had established 20th Century mathematics subsequently drew attention to the limitations of first order models and advocated a move to Process at the higher level of metaphysics [1]. Unfortunately Whitehead did not have a formal metaphysical language to replace the at mathematics of set theory.

Today Category Theory now fills that gap. It is a formal language that operates across four levels recursively with features like adjointness between universal limits and co-limits that were not appreciated until the 1970's.

All Laws arise from this natural adjointness as underlying functors [2]. But there is the caveat that the current representation of Category Theory only holds up to the natural isomorphism of the axioms of set theory. Applied Category Theory needs to hold up to the natural isomorphism of Physics.

References

1. A.N. Whitehead, *Process and Reality: An Essay in Cosmology*, Macmillan Publishers, New York, 1929, corrected edition by D.R. Griffin & D.W. Sherburne, Free Press, New York, 1978, https://monoskop.org/File:Whitehead_Alfred_North_Process_and_Reality_corr_ed_1978.pdf.
2. M. Heather & N. Rossiter, "Logical Monism: The Global Identity of Applicable Logic", *Philosophia Mathematica*, vol. 14(2), 2006, pp. 39-52.