# Knowledge of Evolution and the Evolution of Knowledge

## Causation through Constructivism in Theory and Practice

Abel Ruben Hernandez-Ulloa and Elias Núñez
Norwegian University of Life Sciences / University of Guanajuato

The pace of mathematical model building in biology and other life sciences continues to be incremental. It has persuaded some of their proponents and interpreters to extol their relative successes as paradigmatic instances of the possibility that a more comprehensive model, or one constituted by a myriad of these 'sub-models', may one day lead to exhaustive and complete causal reduction (just in virtue of their being "mathematizable").

But often omitted – or perhaps neglected – is that model building is a highly abstract activity which is saddled with a series of epistemic commitments. Among them, for example, is that biological models that purport to lay bare the complete causal workings of evolution by natural selection with formal precision presuppose the necessity of having a "complete" Mathematics — a heavily contested notion among mathematicians themselves, often looked with distrust. Also, the position can become too philosophically disingenuous about how laboriously circumscribed the construction of such models remains. That is, too localized to a particular biological event, and sometimes narrowed even to one variable within an event, making causal extrapolation to more complex phenomena impossible or at best unreliable.

In addressing these concerns, and while valuing the contributions these models make, it will be suggested nonetheless that some of their embedded epistemic presuppositions seem at times to contradict a salient feature of the biological domain. Namely, that of its hierarchically structured constitution — smaller biological entities nested and clustered within larger ones conforming a multi-layered realm, whereby natural selection operates at different levels of which these models tend to frame only one.