

How to understand something that cannot be accessed by our sensory systems?

by Kunjumon Vadakkan

Physics understands different phenomena in nature that are not accessible to our sensory systems. How do physicists do it?



First, they make large number of observations (O_n).



Eventually a stage will arrive when they recognize the disparate nature of several of these findings. This means that these findings cannot be explained in terms of each other.



They recognize that there should be a deep underlying principle (x) that should inter-connect these disparate observations, which is yet to be discovered.



To solve this, they apply the principle of unification. This means that if it becomes possible to find “something more fundamental” that can explain all the observations (O_n), then this is likely a solution (x). The solution brings rapid progress in the field.



Reductive approaches will be necessary to discover x . How do physicists achieve this?



They use constraints provided by all the observations (O_n) to derive the solution x . They may fine-tune the derived solution to fit the minute details of the observations.



Derived phenomenon x is expected to be correct. Confirmation of x is carried out by making predictions and testing for the presence of these predictions.



We will not be able to sense the newly derived phenomenon directly by our sensory systems even after its discovery. It needs “indirectly indirect” methods for its appreciation!



This theoretical approach will improve the yield and reduce the cost to solve the system.



Similarly, disparate findings of the nervous system that are being studied by different branches of psychology and neuroscience necessitate unification. This is necessary to understand the main function of the nervous system – generation of internal sensations within the mind.



Summary: In physics, first a concept that fits with experimental findings is made followed by searching for mathematical fitness (e.g. symmetry, beauty, and inevitability). In biological systems, derivation of a structure-function mechanism that fits with all the observations from various levels can be made followed by its verification (giving room for variations).