

HIGHER STRUCTURES

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Abstract: *Although higher structures have been around for quite some time, they recently have come back into focus through renewed interest in higher categories. There are several reasons for this.*

In geometry one is trying to interpret extended cobordism theories, where the higher structures are meant to mimic higher codimensions. An analogue in algebra is known to the 2-categorical level, the prime example being the 2-category of rings, bi-modules and bi-module morphisms. Beyond this there are many open questions of fundamental nature. The central problem is what type of coherence to require.

In physics higher structures naturally appear through the extended field theories. Geometric and physical points of view combine in the constructions of string topology and in the proofs of the cobordism hypothesis. One approach to this is

the operadic point of view as many higher categorical structures can be interpreted as actions of certain operads. The classical homotopy theory teaches us that this is the correct way to encode higher homotopies and homotopical algebra in general.

We will illustrate the idea of higher structures on two examples:

(1) homotopy-everything versions of algebraic structures, and

(2) higher category theory.

At the end we formulate a form of the cobordism hypothesis to illustrate how higher categorical properties may describe objects of geometric nature.