

The onset of wildness

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Abstract

There are many instances in mathematics of some phenomenon, depending on a parameter, which is well behaved for a while but at certain value of the parameter, becomes wild. The onset of turbulence is a well known example but there are examples in algebra such as Gabriel's quiver theory.

Subfactors are objects, that among other things extend the notion of finite groups, their representations and permutation actions. The "size" of a subfactor is measured by a number called its index and one might expect an onset of wildness phenomenon as the index grows. Indeed since the mid 1980's it has been known that there is an A-D-E Coxeter graph classification of subfactors of index less than or equal to four. But Bisch and Haagerup showed that at index 6 the situation is "wild". This is because free product of $\mathbb{Z}/2\mathbb{Z}$ and $\mathbb{Z}/3\mathbb{Z}$ is almost a free group. But in subfactor land there is a subfactor of index approximately 2.6 so it is possible that wildness begins at about 5.2. There is thus a hope of a complete enumeration of subfactors between index 4 and 5.2. This enumeration begins with Haagerup's subfactor of index $\frac{5+\sqrt{13}}{2}$ and other exotic objects whose existence is only known by combinatorial and planar methods.