

Mathematics Department Colloquium

Organizer: Maciej Zworski

Thursday, 4:10–5:00pm, Evans 60

April 27 **Robbert Dijkgraaf**, University of Amsterdam

The Unreasonable Effectiveness of Quantum Physics in Modern Mathematics

Mathematics has proven to be “unreasonably effective” in understanding a large variety of phenomena in nature. Although we have no prior reasons to expect this, it has turned out that the fundamental laws of science are best formulated in terms of mathematical formalism. In this lecture I want to argue for the reverse effect: Nature is an important source of inspiration for mathematics, even of the purest kind. This phenomenon goes back a long time – analytic geometry and calculus grew out of classical mechanics. In recent years it has been the world of quantum field theory and elementary particles that has greatly stimulated mathematical thinking. It has led to surprising breakthroughs in our understanding of for example topology, as in understanding knots and curved manifolds. Quantum physics has also revolutionized algebraic geometry. These are all classical subjects in pure mathematics, that have their origin in the 19th century, but had to wait for their solution till the development of quantum physics with all its counterintuitive notions, such as the uncertainty principle, virtual particles, and the sum over histories. At this moment these interactions between mathematics and physics are one of the most intellectually fruitful areas in science.