

Peter Goddard Symposium

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Professor Peter Goddard is a distinguished mathematical physicist. He formulated the quantization of the relativistic string, proved the “no ghost theorem” of string theory, proposed the electromagnetic duality in non-abelian gauge theory, and provided remarkable evidences for it, introduced and studied a class of conformal field theory, which has become the foundation of our understanding of gauge symmetry in string theory. His seminal achievements in these areas provide important examples for researchers at the Kavli IPMU, who try to open new avenues of research at the interface between mathematics and physics.

Professor Goddard has also contributed in creating and maintaining environments for researchers. He played a leading role in establishing the Isaac Newton Institute for Mathematical Sciences at Cambridge University, where he was the Deputy Director. He was the Master of St. John's College, before becoming the eighth Director of the Institute for Advanced Study in Princeton. He stepped down from the position in 2012 and is currently a professor at the Institute.

Professor Goddard received the Dirac Prize and Medal from the International Center for Theoretical Physics in Trieste and is a Fellow of the Royal Society of London and a Commander of the Order of the British Empire.

Peter Goddard (left) and Hitoshi Murayama (right) talking at the Symposium.

Professor Goddard visited the Kavli IPMU in March and April, 2014. On this occasion, we organized a one-day symposium to celebrate his contribution in science. Some of the faculty members and affiliated members of the Kavli IPMU, who were visitors of the Newton Institute and members of the Institute for Advanced Study under his leadership, spoke at the symposium.

The Symposium opened with a talk by Hitoshi Murayama, the Director of the Kavli IPMU, on his recent work on geometry of non-relativistic Goldstone bosons. This work generalizes Nambu's work on spontaneous symmetry breaking in nontrivial ways.

Tohru Eguchi of Rikkyo University spoke on the Mathieu Moonshine, a joint work with Hiroshi Ooguri and Yuji Tachikawa of the Kavli IPMU. This work originated from the work of Eguchi and Ooguri, 25 years ago, with Anne Taormina and Sung-Kil Yang. 21 years after this original work, a chance encounter of Eguchi with Ooguri and Tachikawa in 2010 led to a discovery

of the remarkable connection between K3 geometry and the largest Mathieu group M24.

Kentaro Hori of the Kavli IPMU also talked about his PhD thesis published 20 years ago, which turned out to have significant implications of current theoretical research. Yuji Tachikawa talked about instantons and string theory and Simeon Hellerman on string theory of the Regge intercept. The Symposium ended with a talk by Peter Goddard himself on the formula of Cachazo, He, and Yuan for Yang-Mills tree amplitudes.

The speakers chose their topics to fit with the range of research activities of Peter Goddard, and there were lively discussions during coffee breaks and lunch. On the day after the symposium, the Kavli IPMU recorded a conversation of Peter Goddard with Hitoshi Murayama and Hiroshi Ooguri on research at the interface of physics and mathematics. Its transcript appears in two parts (Part I, pp. 14-21 in this issue, and Part II in the next issue) of the Kavli IPMU News.

