HERTZ LECTURE.

DESY Lecture on Physics 2016

The Frontiers of Fundamental **Physics**

Prof. Dr. Nathan Seiberg (Institute for Advanced Study, Princeton)

29 September 2016

17:30 h, DESY Auditorium Notkestraße 85 | 22607 Hamburg | Germany http://www.desy.de/hertz

Accelerators | Photon Science | Particle Physics

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 $\tilde{\mathcal{F}}_D = \mathcal{F}_D(a - 2a_D)$

 \mathcal{M}_q

In recent decades, physicists and astronomers have discovered two beautiful Standard Models, one for the quantum world of extremely short distances, and one for the universe as a whole. Both models have had spectacular success, but there are also strong arguments for new physics al Field Theory (RCFT) is that this

 $\mathcal{F}_D(a_D) = \frac{a_D^2}{4\pi i} \log\left[\frac{a_D}{\Lambda}\right] - \frac{\Lambda^2}{2\pi i} \sum_{\ell=1}^{\infty} c_\ell^D \left(\frac{ia_D}{\Lambda}\right)^\ell$

 $\mathcal{F}(a) = rac{ia^2}{\pi} \log ig[rac{a^2}{\Lambda^2}ig] + rac{a^2}{2\pi i} \sum_{\ell=1}^\infty c_\ell ig(rac{\Lambda}{a}ig)^{4\ell}$

beyond these models. ow.) In the language of FS [5], these blocks are interpreted as the In this lecture, Seiberg will review these models, their successes and their shortfalls. He will describe how experiments in the near future could point to new physics suggesting a profound conceptual revolution, which could change our view of the worldour point function on the

ction on the torus can be obtained by sewing as in Figs. 3 or as in 4. Different ways of sewing the same surface lead to different blocks. The assumption vector space. Hence, the conformal blocks obtained by one way of n a RCFT these matrices are finite dimensional.

complex whose sites correspond to the different ways of sewing a given surface. are defined to be "simple moves." Other duality matrices are given by a product of

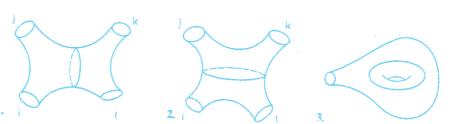
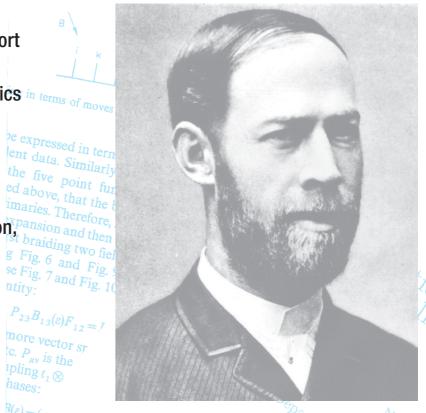


Fig. 1. One sewing of the four-point function on the sphere Fig. 2. Another sewing of the four-r Fig. 3. One sewing of the one-point function on the torus Fig. 4. Another sewing of the one-point function on the torus

G. Moore and N. Seiberg netric version of the braiding/fu



Heinrich Hertz 1857 Hamburg-Karlsruhe-Bonn 1894

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g Fig. 6 and

c. P_{uv} is the $\operatorname{pling}_{t_1}^{\mathsf{r}}\otimes$

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