

Phys 859: "Beyond the Standard Model" Lecturer: Raman Sundrum

This advanced graduate course in theoretical physics will review the roots of the Standard Model of Particle Physics and motivate directions to go beyond this minimal structure. It will include a selection of theory topics from Supersymmetry, Extra Dimensions, Particle Compositeness, Twin Higgs, Flavor Physics, Axions, Cosmic Inflation, Dark Matter, Dark Energy, and the Matter-Antimatter Asymmetry. It will also survey related experimental directions. The hope is to not just provide familiarity with existing theories, but to develop the instinct and taste for model-building new ones, and to provide a number of tricks of the trade that are hard to find in print.

The prerequisite is a knowledge of Quantum Field Theory and Gauge theory at the level of Peskin and Schroeder's textbook. A knowledge of General Relativity would also be useful. Course requirements will be discussed at the beginning of classes, but will include student seminars on a selection of topics.

I will be making up my own lectures, but here are some references that give some flavor of the material to be presented:

My GGI lectures on youtube

<https://www.youtube.com/watch?v=gvBY7b4kCck&list=PLDxsZU4NC6Z5xji9-WyPm5uTyfYCV-pK7>

Tasi 2004 lectures: To the fifth dimension and back

Raman Sundrum (Johns Hopkins U.). Aug 2005. 49 pp.

Lectures given at Conference: [C05-06-05.2](#), p.585-630, Lectures given at Conference: [C04-06-06.1](#), p.585-630
e-Print: [hep-th/0508134](#) | [PDF](#)

Supersymmetry phenomenology (with a broad brush)

Michael Dine (UC, Santa Cruz). Dec 1996. 67 pp.

SCIPP-96-73

Conference: [C96-06-02](#), p.813-881 [Proceedings](#)

e-Print: [hep-ph/9612389](#) | [PDF](#)

Baryogenesis for weakly interacting massive particles

Yanou Cui, Raman Sundrum (Maryland U.). Dec 2012. 5 pp.

Published in **Phys.Rev. D87 (2013) no.11, 116013**

UMD-PP-012-024

DOI: [10.1103/PhysRevD.87.116013](#)

e-Print: [arXiv:1212.2973](#) [hep-ph] | [PDF](#)

Natural Inflation and Quantum Gravity

Anton de la Fuente (Maryland U.), Prashant Saraswat (Maryland U. & Johns Hopkins U.), Raman Sundrum (Maryland U.). Dec 10, 2014. 6 pp.

Published in **Phys.Rev.Lett. 114 (2015) no.15, 151303**

UMD-PP-014-023

DOI: [10.1103/PhysRevLett.114.151303](#)

e-Print: [arXiv:1412.3457](#) [hep-th] | [PDF](#)