

# Abstract for student Colloquium

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Title: How numerical simulations work: Simulating particles in electric and magnetic fields

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Abstract:

Numerical simulations play an increasingly important role in physics.

In this Student Colloquium, I wish to outline how I made a simulation of classical non relativistic particles in various electric and magnetic setups. My simulation is based on the Runge-Kutta method for numerically solving ordinary differential equations, which I have implemented in C++ at various different orders, with constant and adaptive “step size”.

In this Colloquium I will both go through how and why the Runge-Kutta based simulation works, while also checking how large an error the method makes, when simulating an analytically solved system.

I have used my simulation to explore a particle in a constant magnetic field – an analytically solved system –, a particle interacting with a magnetic dipole, a particle in a cyclotron accelerator and a particle in a toroidal coil.

