

1106-65-2198

**Gregory T Minton\*** (gminton@alum.mit.edu). *Knotted Field Lines and Computer-Assisted Proof.*

Problem 18 in *The Scottish Book* asks whether magnetic field lines can be knotted; more specifically, the problem is to find a knotted simple closed curve such that, when current flows through it, the generated magnetic field has a field line which is also a knotted simple closed curve. We will demonstrate the existence of such knots by showing concrete, albeit non-explicit, examples. In addition to being knotted, these examples exhibit qualitatively different behavior from the simplest cases of magnetic field lines generated by linear current.

Our results were obtained numerically and then proven using computer-assisted proof techniques. This procedure can be understood as a rigorous spectral method for proving the existence of periodic solutions of ODEs. After presenting our results on Problem 18, we will outline this method of computer-assisted proof, show some other applications of the proof techniques, and close with some directions for future work. (Received September 16, 2014)