1163-11-847 **Sarah Arpin*** (sarah.arpin@colorado.edu), **Catalina Camacho-Navarro**, **Kristin Lauter**, **Joelle Lim**, **Kirstina Nelson**, **Travis Scholl** and **Jana Sotáková**. *Adventures in Supersingularland: An investigation into the Structure of Supersingular Isogeny Graphs.*

In this work we study isogeny graphs of supersingular elliptic curves. Supersingular isogeny graphs were introduced as a hard problem into cryptography by Charles, Goren, and Lauter for the construction of cryptographic hash functions [CGL06]. We consider two related graphs that help us understand the structure: the 'spine' S, which is the subgraph of the usual l-isogeny graph given by the j-invariants in Fp, and the graph in which both curves and isogenies must be defined over Fp. We show how to pass from the latter to the former. The graph S is relevant for cryptanalysis because routing between vertices in Fp is easier than in the full isogeny graph. We provide an analysis of the distances of connected components of S. We study the involution on the l-isogeny graph that is given by the Frobenius of Fp and give heuristics on how often shortest paths between two conjugate j-invariants are preserved by this involution (mirror paths). We also study the related question of what proportion of conjugate j-invariants are l-isogenous for l=2,3. This data is related to later work of Eisentraeger, Hallgren, Leonardi, Morrison, and Park. (Received September 13, 2020)