1173-05-38 **Jonathan Joe** and **Matt Noble*** (matthew.noble@mga.edu). *A Triangle-free, 4-chromatic* $\mathbb{Q}^3$ *Distance Graph Scavenger Hunt!*

For a positive integer r, let $G(\mathbb{Q}^3, \sqrt{r})$ denote the graph whose set of vertices is the rational space $\mathbb{Q}^3$, with any two vertices being adjacent if and only if they are a Euclidean distance $\sqrt{r}$ apart. Let $\chi(\mathbb{Q}^3, \sqrt{r})$ be the chromatic number of such a graph – that is, the minimum number of colors needed to color the points of $\mathbb{Q}^3$ such that no two points at distance $\sqrt{r}$ apart receive the same color. It is known that $\chi(\mathbb{Q}^3, \sqrt{r}) \leq 4$ for any selection of r. A problem of Benda and Perles, originally posed over forty years ago, asks if there exists r with $\chi(\mathbb{Q}^3, \sqrt{r}) = 3$. In this talk, we will outline various search algorithms we have employed to find 4-chromatic subgraphs of $G(\mathbb{Q}^3, \sqrt{r})$ for many instances of r in which $\chi(\mathbb{Q}^3, \sqrt{r})$ was previously unknown. At present, Benda and Perles' question remains open, but it appears more and more likely that, should it be resolved, it will ultimately be answered in the negative. (Received September 10, 2021)