1064-05-249 **Marcus Schaefer*** (mschaefer@cdm.depaul.edu), DePaul University, 243 South Wabash, Ste 401, Chicago, IL 60604. *Realizability of Graphs and Linkages.*

Given a weighted graph, how hard is it to determine whether there is a straight-line drawing of the graph in the plane in which each edge has the length prescribed by its weight? This problem is known to be NP-hard, as shown by Saxe and Yemini in the seventies, but it turns out that it is much harder: even for the special case of unit distance graphs (all edges have unit length), the problem has the same complexity as deciding the truth of sentences in the existential theory of the reals. It turns out that this is not an isolated phenomenon: the complexity of many problems in geometry, graph drawing and other areas is captured precisely by the existential theory of the reals, including the rectilinear crossing number, the Steinitz problem and several families of intersection graphs. We will also look at some related problems on linkages and their rigidity. (Received September 10, 2010)