One of the greatest accomplishments in recent astrophysics is the creation of a model for the complete inventory of the Universe. All the observational data tells us with extremely high certainty that ordinary matter (every particle ever detected by every person who ever lived) makes up only one fifth of all the matter there is. The rest goes by the popular name of dark matter. Because it is dark, dark matter has been notoriously hard to detect; it doesn't emit or reflect radiation such as light or heat, and it can have only the feeblest of interactions with itself and ordinary matter. So how do we know it is there?

In this talk, I will discuss how astronomers observe the invisible matter in one of the true gems on the sky: a giant cluster of galaxies 1E0657-56. It is one of the hottest and most luminous X-ray clusters known and is unique in being a major supersonic cluster merger occurring nearly in the plane of the sky, earning it the nickname "the Bullet Cluster". Recently we have also discovered new Bullet-like clusters. In this talk I will present our measurements of the composition of these systems, show the evidence for existence of dark matter, and describe limits that can be placed on the intrinsic properties of dark matter particles. In addition, I will explain how this cluster offers a serious challenge to MOdified Newtonian Dynamics (MOND) theories. Finally I will conclude with results we have on using the Bullet cluster as a `cosmic telescope' to explore the Universe in its infancy.