Questions and answers - Hugh Lippincott Lecture

The following questions were submitted through Google Form. Some / all may have been answered in the Q&A session already. Nevertheless, we request our lecturers to provide written answers here for the benefit of those who could not attend that session. Thank you!

Slide on bullet cluster. Does the velocity of the stars in the galaxies that have lost their dark matter in the Bullet Cluster follow the Newtonian velocity profile, slowing down farther away from the center of the galaxy?

This is a great question, and I don't know the answer. It's not obvious to me that we necessarily can measure the speeds of the galaxies in the Bullet cluster, and I'm sadly not an astrophysicist. I will ask around to see if I can find out.

Slide 19. What other interactions are there besides SI and SD?

In an effective field theory framework, you can generically write down the operators that might couple to the dark matter. One example are these two papers:
https://arxiv.org/pdf/1203.3542
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.89.065501

I think they have something like 10 different operators, one of which is the classic SI case, and one of which reduces to the SD cases. The biggest other class are momentum dependent. In general, the SI cross section tends to be the strongest, so the theory would need to have some mechanism that suppresses the nominal SI interaction to allow the others to be relevant. It's not actually that hard to do that theoretically, but that is one reason why people focus on the SI case.