This manuscript has been read and accepted by the Graduate Faculty of the Graduate School of Biomedical Sciences, in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

Dissertation Advisor — Andrew Kasarskis, PhD . . .

Jue 26, 201)

Dean - Marta Filizola, PhD Heelo tolde 6/26/17

Date

James Iatridis, PhD (chair)

Adolfo García-Sastre, PhD

Joel Dudley, PhD

Jonathan Karr, PhD

Jun Zhu, PhD

Bo Shopsin, MD, PhD (outside reviewer)

ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI 2017