PI Planetary Defense – Publications and Presentations

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PUBLICATIONS

Kendal, E, Kujawa, M, Lubin, P. (2026) Enabling Planetary Defense: Science, Law, Ethics. *Acta Astronautica*, vol 248, pp 715-721, https://doi.org/10.1016/j.actaastro.2026.06.043.

Bailey, B., Cohen, A.N., Egan, S., Lubin, P., Xu, R., Boslough, M., Robertson, D., Silber, E.A., Sagert, I., Korobkin, O., Sjoden, G. (2025). Evaluating Short-warning Mitigation via Intentional Robust Disruption of a Hypothetical Impact of Asteroid 2023 NT1. *The Astrophysical Journal*, vol. 981, pp. 181-197, https://doi.org/10.3847/1538-4357/adb289.

Silber, E.A., Trigo-Rodríguez, J.M., Oseghae, I., Peña-Asensio, E., Boslough, M., Whitaker, R., Pilger, C., Lubin, P., Sawal, V., Hetzer, C., Longenbaugh, R., Jenniskens, P., Bailey, B., Mas Sanz, E., Hupe, P., Cohen, A.N., Edwards, T.R., Egan, S., Silber, R.E., Czarnowski, S.C., Ronac Giannone, M. (2025). Multiparameter Constraints on Empirical Infrasound Period-Yield Relations for Bolides and Implications for Planetary Defense. *The Astronomical Journal*, vol. 170, pp. 38-57, https://doi.org/10.3847/1538-3881/add47d.

Bailey, B., Cohen, A.N., Egan, S., Lubin, P., Xu, R., Boslough, M., Meinhold, P., Taylor, S. (2025). Pulverize It (PI): Intentional Robust Disruption for Multi-modal Planetary Defense. *9th IAA Planetary Defense Conference Proceedings*, https://iaa.spacescience.ro/indico/event/1/contributions/28/, https://iaa.spacescience.ro/indico/event/1/contributions/28/attachments/216/443/IAA-PDC25-06-231-paper.pdf.

Cohen, A.N., Lubin, P., Robertson, D., Boslough, M., Egan, S., Stickle, A.M., Silber, E.A., Meinhold, P., Bailey, B., Patel, D. (2024). Asteroid disruption and deflection simulations for multi-modal planetary defense. *Acta Astronautica*, vol. 225, pp. 960-967, https://doi.org/10.1016/j.actaastro.2024.09.071.

Bailey, B., Cohen, A.N., Lubin, P., Robertson, D., Boslough, M., Egan, S., Silber, E.A., Patel, D. (2024). Optical and acoustic ground effects simulations from terminal defense asteroid disruption via the PI method. *Acta Astronautica*, vol. 221, pp. 230-239, https://doi.org/10.1016/j.actaastro.2024.05.002.

Lubin, P., Cohen, A.N. (2022). Don't Forget To Look Up. arXiv, astro-ph, https://doi.org/10.48550/arXiv.2201.10663.

Lubin, P., Cohen, A.N. (2023). Asteroid interception and disruption for terminal planetary defense. *Advances in Space Research*, vol. 71, issue 3, pp. 1827-1839, https://doi.org/10.1016/j.asr.2022.10.018.

Lubin, P. (2026). PI – Multimodal Planetary Defense. Supplementary material to Lubin & Cohen (2023), *Advances in Space Research*, vol. 71, issue 3, pp. 1827-1839, v17 updated June 2026, https://arxiv.org/abs/2110.07559.

COLLOQUIA, INVITED TALKS, PRESENTATIONS

Conference Presentations and Lectures

Bailey, B., Cohen, A.N. (2025). Investigating Hypothetical Mitigation of Asteroid 2024 YR4 via Intentional Robust Disruption. JAXA FY2025 Planetary Defense Symposium (17th Spaceguard Symposium), Sagamihara City, Kanagawa Prefecture, Japan: https://www.isas.jaxa.jp/researchers/symposium/planetary_defense/fy_2025.html (accessed May 2026).

Cohen, A.N., Bailey, B. (2025). Hypervelocity penetrators for passive and nuclear planetary defense. 16th Planetary Crater Consortium, Boulder, Colorado, United States: https://drive.google.com/file/d/1PTRPYiE9KIyl3KKTzMQlE2k8z9vCe6Pm/view?usp=share_link (accessed May 2026).

Bailey, B., Cohen, A.N., Lubin, P., Egan, S., Boslough, M., Robertson, D.K., Silber, E.A. (2024). Pulverize It (PI): Intentional Robust Disruption (IRD) for Multi-modal Planetary Defense. 9th IAA Planetary Defense Conference, Stellenbosch, Cape Town, South Africa: https://www.youtube.com/live/zM72I18BBto?si=n54oI0fTbaI1ycQ6&t=3003 (accessed May 2026).

Bailey, B., Cohen, A.N., Lubin, P., Boslough, M., Robertson, D.K., Egan, S., Silber, E.A. (2024). Hypervelocity asteroid interception and fragmentation for planetary defense. AGU Fall Meeting, Washington, DC, United States: https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1634815 (accessed May 2026).

Lubin, P., Cohen, A.N., Bailey, B. (2024). Planetary defense using hypervelocity penetrators. United States Space Command Academic Engagement Enterprise Fall Symposium, Colorado Springs, Colorado, United States.

Bailey, B., Lubin, P., Cohen, A.N., Robertson, D.K., Boslough, M., Egan, S., Silber, E.A., Xu, R. (2024). Hypervelocity Asteroid Interception and Disruption for Planetary Defense. Geological Society of America (GSA) Connects 2024 Meeting, Anaheim, California: https://ui.adsabs.harvard.edu/abs/2024GSAA...5602391B/abstract (accessed May 2026).

Lubin, P., Cohen, A.N., Bailey, B. (2024). PI: Multi-Modal Planetary Defense. 2024 NASA Innovative Advanced Concepts (NIAC) Symposium, Pasadena, California, United States: https://vimeo.com/showcase/10973241 (accessed May 2026).

Bailey, B., Cohen, A.N., Lubin, P., Boslough, M., Robertson, D.K., Egan, S., Silber, E.A. (2024). Ground effects simulations of terminal asteroid disruption for planetary defense. 15th Planetary Crater Consortium, Flagstaff, Arizona, United States: https://drive.google.com/file/d/1l6qfdfux8UcdbN7-b-bekt3OvbLrHOf7/view?usp=sharing (accessed May 2026).

Lubin, P. (2025). Planetary Defense – Options for Operational Program, US Multi Agency briefing colloq.

Cohen, A.N., Lubin, P., Bailey, B., Robertson, D.K., Boslough, M., Egan, S., Silber, E.A. (2024). Hydrocode simulations of robust disruption and enhanced deflection of asteroids via hypervelocity penetrator interception. 15th Planetary Crater Consortium, Flagstaff, Arizona, United States: https://drive.google.com/file/d/1gBZ1YS3kSOIp1RToLEnpsAb9gHiEpNQi/view?usp=sharing (accessed May 2026).

Bailey, B. (2024). Ground effects from terminal asteroid disruption using Pulverize It (PI). American Institute of Aeronautics and Astronautics Los Angeles Section Planetary Defense and Asteroid Exploration Conference, Los Angeles, California, United States: https://lp.constantcontactpages.com/ev/reg/6b8mmnt/lp/b1558b03-fdb1-47fd-9ac9-7c43a3937d33?source_id=418af0e9-317f-4462-9f20-4b35ceb627be&source_type=em&c=WcM4RVfVOtEjILvHhotTVQGVdugHDBDiZfFzJpBxbncU7YeBYsaP3g== (accessed May 2026).

Cohen, A.N. (2024). Hydrocode simulations of asteroid disruption and deflection for planetary defense. American Institute of Aeronautics and Astronautics Los Angeles Section Planetary Defense and Asteroid Exploration Conference, Los Angeles, California, United States: https://lp.constantcontactpages.com/ev/reg/6b8mmnt/lp/b1558b03-fdb1-47fd-9ac9-7c43a3937d33?source_id=418af0e9-317f-4462-9f20-4b35ceb627be&source_type=em&c=WcM4RVfVOtEjILvHhotTVQGVdugHDBDiZfFzJpBxbncU7YeBYsaP3g== (accessed May 2026).

Bailey, B., Cohen, A.N., Lubin, P., Robertson, D., Boslough, M., Egan, S., Silber, E.A. (2024). Acoustical ground effects simulations of terminal asteroid disruption via the "Pulverize It" method. Acoustical Society of America Annual Meeting, Ottawa, Ontario, Canada: https://eppro02.ativ.me/web/index.php?page=Session&project=ASASPRING24&id=3657765 (accessed May 2024).

Lubin, P. (2024). Planetary Defense Capability using Hypervelocity Penetrators. Limitless Space Institute Teachers Colloquium, Houston, Texas, United States.

Lubin, P. (2024). Planetary Defense using PI. January Colloquium, NASA Future In-Space Operations (FISO).

Bailey, B., Lubin, P., Cohen, A.N., Patel, D. (2023). Fragmented asteroid airburst ground effects: custom C++ code for shockwave & optical pulse modeling. 8th IAA Planetary Defense Conference, Vienna, Austria: https://media.un.org/en/asset/k11/k112i49pj8 (accessed May 2023).

Lubin, P., Cohen, A.N., Bailey, B., Patel, D., Boslough, M., Robertson, D.K., Webb, J., Khetia, J. (2023). PI – Terminal Planetary Defense. 8th IAA Planetary Defense Conference, Vienna, Austria: https://media.un.org/en/asset/k11/k112i49pj8 (accessed May 2023).

Lubin, P., Cohen, A.N., Bailey, B., Patel, D. (2022). PI: Planetary Defense via Fragmentation. NASA Ames Asteroid Impact Global Effects Technical Interchange Meeting, Mountain View, California, United States.

Lubin, P. (2022) Planetary Defense using Hypervelocity Penetrators. Department of Physics Colloquium, University of California, Santa Barbara, Santa Barbara, United States.

Lubin, P. (2022). A Single Launcher Solution for Planetary Defense. Space-X Presentation.

Lubin, P. (2022) Planetary Defense Options – Department of Physics Colloquium, University of Hawaii, Honolulu, Hawaii, United States.

Lubin, P. (2021) Planetary Defense Operational Capability. United States Space Force Briefing.

Lubin, P. (2021). A Research Program to Support Comprehensive Planetary Defense. White House National Space Council Meeting, Washington, D.C., United States.

Poster Presentations

Bailey, B., Cohen, A.N., Egan, S., Lubin, P., Xu, R., Boslough, M., Robertson, D.K., Silber, E. (2025). Investigating Hypothetical Mitigation of Asteroid 2024 YR4 via Intentional Robust Disruption. AGU Fall Meeting 2025, New Orleans, Louisiana, United States: https://agu.confex.com/agu/agu25/meetingapp.cgi/Paper/2000515, https://agu25.ipostersessions.com/Default.aspx?s=68-2E-DF-48-99-FA-A5-0E-C3-21-76-9A-4A-19-B7-1A (accessed May 2026).

Bailey, B., Cohen, A.N., Lubin, P., Boslough, M., Robertson, D.K., Egan, S., Silber, E., Patel, D., Khetia, J., Costa, T., Sagert, I., Korobkin, O., Sjoden, G. (2024). Asteroid 2023 NT1: A Cautionary Tale. Lunar and Planetary Science Conference, The Woodlands, Texas, United States: https://www.hou.usra.edu/meetings/lpsc2024/pdf/2617.pdf (accessed May 2026).

POPULAR PAPERS and MEDIA COLLABORATIONS

Scoles, S. (2026). "Inside a bold plan to pulverize an Earth-bound asteroid." Scientific American [article]: https://www.scientificamerican.com/article/inside-a-bold-plan-to-pulverize-an-earth-bound-asteroid/.

Snow, S. (2025). "'What, You Don't Know Who They Are?'" UCSB Division of Mathematical, Life and Physical Sciences [press article]: https://youtu.be/dKm7T13X7n4?si=8lPV708zWSa0BS3U.

Lozano, E., Aquino, M., Steib, E., Lubin, P., Cohen, A.N., Bailey, B.K. (2025). "Can Humanity Stop A Planet-Killing Asteroid?" *YouTube*, uploaded by Kurzgesagt – In a Nutshell [video]: https://youtu.be/dKm7T13X7n4?si=8lPV708zWSa0BS3U.

Phillips, R.F., Bailey, B.K., Cohen, A.N. (2024). "Pulverizing Asteroids For Planetary Defense! w/Brin Bailey & Sasha Cohen." *YouTube*, uploaded by GeoSociety, GSA Connects 2024 Meeting [video]: https://www.youtube.com/watch?v=tQx5ZLdlJZs.

Bailey, B.K. (2024). "What could happen to Earth if we blew up an incoming asteroid?" Acoustical Society of America 186th Meeting, Lay Language Paper, Physical Acoustics [plain language summary]: https://acoustics.org/what-could-happen-to-earth-if-we-blew-up-an-incoming-asteroid/.

Lewis, B. (2023). "What astronomers learned from a near-Earth asteroid they never saw coming." Popular Science [blog post]: https://www.popsci.com/science/asteroid-nt1-earth-planetary-defense/.

Skibba, R. (2023). "DART Showed How to Smash an Asteroid. So Where Did the Space Shrapnel Go?" Wired [blog post & podcast episode]: https://www.wired.com/story/dart-showed-how-to-smash-an-asteroid-so-where-did-the-space-shrapnel-go/.

Kim, J.J. (2023). "Eye in the Sky With AI: UCSB Initiative Aims to Pulverize Space Threats Using NVIDIA RTX." NVIDIA [blog post]: https://blogs.nvidia.com/blog/planetary-defense-rtx/.

Lubin, P., Cohen, A.N. (2021). "Planetary Defense Is Good—but Is Planetary Offense Better?" Scientific American [article]: https://www.scientificamerican.com/article/planetary-defense-is-good-but-is-planetary-offense-better/

Fernandez, S. (2021). "Is Planetary Defense PI in the Sky?" *The Current*, UCSB [press article]: https://news.ucsb.edu/2021/020432/planetary-defense-pi-sky

EDUCATIONAL VIDEOS

Kurzgesagt Video – "Can Humanity Stop and Planet Killing Asteroid" (10/25)
https://www.youtube.com/watch?v=dKm7T13X7n4

https://www.cbsnews.com/news/asteroid-comet-dont-look-up-nuclear-explosives/

Eye in the Sky With AI: UCSB Initiative Aims to Pulverize Space Threats Using NVIDIA RTX
https://blogs.nvidia.com/blog/planetary-defense-rtx/

UCSB YouTube Channel with PD Simulations
www.youtube.com/@UCSBDeepspace

PAPERS IN PROGRESS (as of June 2026)

Lubin, P., Bailey, B.K., Cohen, A.N., Egan, S., Meinhold, P., Taylor, S. Radiological Effects of Nuclear Mitigation for Planetary Defense. In submission process.

Proceedings for the 2026 Hypervelocity Impact Symposium. To be submitted to the International Journal of Impact Engineering.

Bailey, B.K., Cohen, A.N., Egan, S., Lubin, P., Xu, R., Boslough, M., Robertson, D., Silber, E.A. 2024 YR4: A Cautionary Tale.

Xu, R., Bailey, B.K., Cohen, A.N., Lubin, P. Simulations of Atmospheric Airburst Effects Following Terminal Planetary Defense Asteroid Disruption. To be submitted to The Astrophysical Journal.