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Current Developments towards a Xenon Advanced Compton Telescope UWE OBERLACK, Rice University, ELENA APRILE, KARL-LUDWIG GIBONI, Columbia University, DANIEL KOCEVSKI, Rice University — Gamma-ray astronomy in the energy range of nuclear transitions holds great promise for a great number of astrophysical questions. Gamma-ray lines, in particular, probe deeply into the explosion mechanisms of supernovae and provide unique insight into formation, evolution, and death of stars and their associated nucleosynthesis. Yet, the most exciting science topics have barely been probed by gamma-ray telescopes to-date. Sensitivity is therefore the most important characteristic of a next-generation instrument. An "Advanced Compton Telescope," a visionary NASA mission currently under study, aims at improving sensitivity 100-fold over current instruments. We have recently been approved to continue the development of a detector technology based on multiple liquid xenon time projection chambers (LXeTPC). Recent advances in UV photosensors have opened new opportunities for the successful development of a Xenon ACT. These are: (a) Improvement of Energy Resolution by combination of charge and scintillation. (b) Application of Time-of-Flight in a compact telescope configuration. We report on the status of the LXeTPC technology to-date, and on our current and planned efforts to develop a telescope module that will meet the ACT challenge.

Uwe Oberlack
Rice University

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