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On-going scientific and development projects involving rare-isotope beams at ATLAS[1]

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The ATLAS Facility, located at Argonne National Laboratory, provides both radioactive and stable ion beams at energies around the Coulomb barrier (<20 MeV/u). Beams of this nature facilitate measurements related to nuclear structure, astrophysics, reactions, fundamental symmetries, and beyond. Along with the ability to accelerate nearly all stable ions from protons to Uranium, the facility also holds the capability to produce radioactive beams using the two-accelerator method, an in-flight production facility, or through the collection of spontaneous fission fragments at the CARIBU facility. The in-flight technique, in particular, is utilized to produce short-lived beams that are typically one to two-nucleons away from stability, and lighter than mass 40. The CARIBU facility, however, provides access to very neutron-rich isotopes, ranging from the vicinity of doubly-magic ^{132}Sn, to regions of large deformation near $A \approx 150$. CARIBU beams are available in both stopped and re-accelerated fashions, and therefore, measurement techniques involving trapping or stopping of the ions, as well as reactions requiring beam energies at or beyond the Coulomb barrier, are possible. In this presentation, highlights from various scientific results which have hinged on radioactive beams produced at ATLAS are to be shown. Also, introductions to, and descriptions of, the on-going technical initiatives aimed at enhancing the radioactive ion-beam production at ATLAS will be given. Finally, exciting future avenues for rare-isotope research, made possible because of the new initiative, is to be discussed. For example, installation of an electron beam ion source (EBIS) has recently been completed to increase both the purity and intensities of re-accelerated CARIBU beams. In addition, expansion of the isotopes produced in-flight, both mass and isospin, is going to occur with the construction of a dedicated separator, AIRIS. AIRIS is designed to highly suppress the intense un-reacted primary beam ($\sim$ 1 pμA), while still providing generous transport of the radioactive in-flight beams to nearly all experimental stations. Finally, in an attempt to reach *tera incognita* below ^{208}Pb, development of a modified gas-catcher is underway in order to capture, and allow for the extraction of, rare-isotopes produced through deep-inelastic reactions.

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