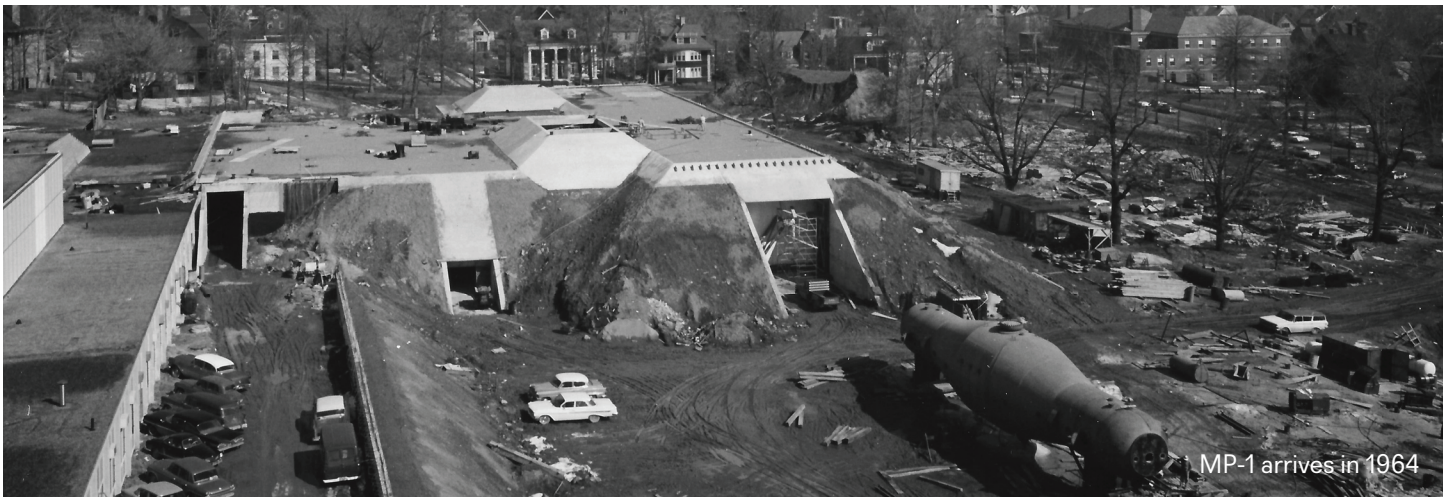
The Historic Wright Nuclear Structure Laboratory at Yale University



MP-1 arrives in 1964

Advancing scientific investigation since 1966: The Wright Nuclear Structure Laboratory at Yale University played a historic role in the development of the field of nuclear science, and especially heavy ion nuclear physics. With the first "Emperor" tandem nuclear accelerator (MP-1) installed and operating at WNSL by 1966, the acceleration of ions over much of the nuclear chart to energies exceeding the Coulomb barrier became possible and enabled, for the first time, the study of a broad range of medium-mass and heavy nuclei. This launched the still flourishing era of heavy ion physics and inspired the installation of similar tandem accelerators worldwide.

Over several decades, research at WNSL made important contributions to nuclear structure, including the discovery of nuclear quantum phase transitions, elegantly and successfully modeled by Yale's J.W. Gibbs Professor of Physics and Chemistry Francesco Iachello, to nuclear astrophysics, and to interdisciplinary fields such as nuclear geophysics. Wright Laboratory's tandem accelerator facilities were particularly well suited for this role because of the combination of the flexibility of its external ion sources (as a tandem) and its emphasis on achieving higher voltage central terminals in each succeeding generation of the accelerator. The Yale MP-1 accelerator was upgraded from 1985-88, under the direction of D. Allan Bromley, to become the Extended Stretched TransUranium (ESTU) tandem accelerator. The conversion made the ESTU the most powerful stand-alone tandem accelerator in the world until the end of its operation in 2011. The research at today's new facilities for the study of exotic unstable nuclei is an outgrowth of earlier studies with these advanced tandem accelerators and relativistic heavy ion accelerators have a parentage in machines like Yale's tandem.

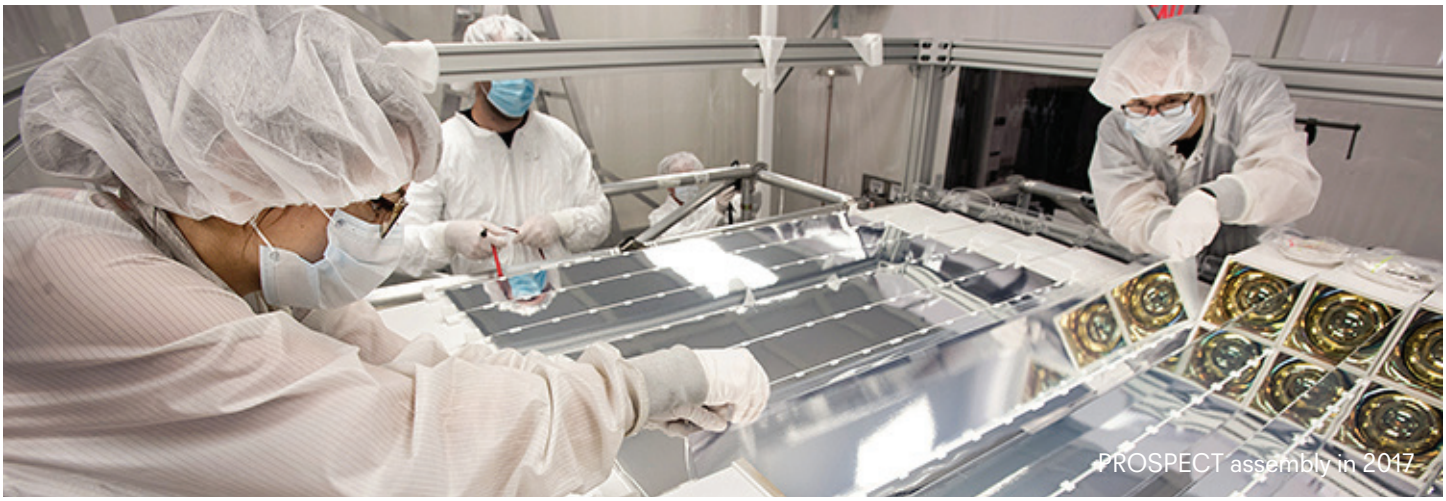
Arthur Williams Wright, for whom the Yale Wright Laboratory is named, held the first Ph.D. in science awarded in the New World. His doctoral dissertation—on satellite mechanics—was one of three accepted by Yale University for the degree in 1861. From 1863 to 1868, Wright taught Latin and then Physics at Yale, returning in 1872 as Professor of Molecular Physics and Chemistry (later changed to Experimental Physics) until his death, in New Haven, in 1915.

Dr. Wright pioneered in many different areas of research in physics and astronomy. He developed the glow discharge preparation of reflecting optics and used these extensively in the first studies of polarization of the solar corona. He first discovered the occurrence of gases in stony meteorites and subjected them to extensive chemical and spectroscopic investigation. Immediately following the discovery of X-radiation, he was the first American to produce and the first to utilize this radiation in his analytic studies.

D. Allan Bromley: The Wright Nuclear Structure Laboratory and its research program at the tandem accelerator was the innovative vision of D. Allan Bromley, who significantly impacted the development of nuclear physics in the past century and became a leading figure in science policy. Bromley initiated the concept of the first WNSL accelerator in 1962, succeeded in resolving the technical issues associated with high voltage terminals, upgraded the accelerator in the mid-1980s, and led its physics program as Director of WNSL for more than 20 years. Known as "the father of modern heavy ion physics," Bromley was a towering figure whose insights, knowledge, and perseverance changed the history of the field. Bromley also extended his influence nationally and internationally as the first Cabinet-level Assistant to the President of the United States for Science and Technology and Director of the White House Office of Science and Technology Policy from 1989-1993. He was the first Sterling Professor of Sciences at Yale and was awarded the APS Dwight Nicholson Medal for "his roles as a research scientist, an outstanding teacher, a supportive mentor and colleague, a leader of the physics community in this country and worldwide, and advisor to governments".

WNSL Control Room in 1988

New instrumentation for fundamental science: Yale's Wright Nuclear Structure Laboratory is also associated with the design of instrumentation for nuclear physics. Yale's Emperor accelerator alone would not have been sufficient to achieve its physics goals. It physics program needed, encouraged, and directly advanced the development of new types of instrumentation for gamma ray detection and nuclear reaction studies. Yale's Wright Nuclear Structure Laboratory was one of the laboratories on the forefront of the development of computer instrumentation for data acquisition and control of accelerator experiments, pioneering the use of computers to enable a new class of physics investigation. The transformed Yale Wright Laboratory continues to advance the frontiers of fundamental science today with its unique combination of on-site state-of-the-art research facilities, technical infrastructure, and interaction spaces that support innovative instrumentation development, hands-on research, and training the next generation of scientists.



PROSPECT assembly in 2017

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Wright Laboratory