

Major Player in the "X-Games"

Trident aids astrophysics, nuclear science, and cancer treatment

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If you're thinking of competing in the "X-Games of Contemporary Science," you might want to talk to David Montgomery, director of Los Alamos' Trident high-power-laser facility. He and other Trident scientists have cooked up some winning strategies for the events in the last 10 years or so.

In these X-Games, as the National Academy of Sciences calls them, scientists create and study, in the laboratory, the "extreme" matter usually found inside the sun, other stars, and gas giants such as Jupiter—or in even more exotic places such as near the edges of black holes and within gamma-ray bursts and the atmospheres of neutron stars. The conditions needed to sustain this matter are truly extreme; phrases like "millions of atmospheres," "millions of degrees," "many times the density of lead" are typically used to describe them.

More precisely, extreme matter is matter with an internal pressure of at least 1 million atmospheres, that is, 1 million times the pressure of Earth's atmosphere at sea level, and falls under the purview of "high-energy-density physics" (pressure can be expressed as an "energy density," or energy per unit volume).

Scientists can create extreme matter in the laboratory only briefly. But doing so lets them study it up close and personal, rather than through a telescope from millions or billions of light-years away. Such studies are already benefiting research on fusion energy and nuclear weapons, where these extremes also prevail.