MSEE | MATERIALS SCIENCE IN EXTREME ENVIRONMENTS UNIVERSITY RESEARCH ALLIANCE

# Seminar

## Nuclear Weapons Options and Effects

Tim Goorley

Chief Scientist for Nuclear Weapon Effects

Los Alamos National Laboratory

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In an age of increasing explicit and implicit nuclear weapons threats, it is important to understand what limitations there are to the destructive potential they have. This talk will describe (at the unclassified level) a variety of nuclear weapons options that existed in the US historic stockpile, touch on the kinds of threats arrayed against the US today, and how destructive nuclear weapon detonations really are. Detailed information about height of burst, impacts from near surface detonations, historical observations from Hiroshima and Nagasaki, and modern non-nuclear detonation in Beirut affect our understanding of blast environments and the effects and damage they cause. In short, nuclear weapons detonations are not nearly as destructive as Hollywood would lead you to believe, and there is much life saving that could be accomplished by planning and preparation for an event we hope never occurs.

Dr. Tim Goorley is the Chief Scientist for Nuclear Weapon Effects at Los Alamos National Laboratory (LANL), a role which guides and directs technical analyses, modeling and simulation capability development, and training. Ultimately these efforts inform LANL senior leaders about mission effectiveness, survivability, and consequences of execution, and 'The Art of the Possible'. For the past 23 years at LANL, Dr. Goorley has been applying his nuclear engineering expertise to various nuclear weapons detonation related diagnostics, weapons effects, and forensics related missions.

For seven of these years, Dr. Goorley has led groups of ~25 people in their successful support of nuclear weapons missions within the Weapons Physics Directorate at LANL. These missions include assessments of intrinsic radiation, modern and historic diagnostics, radiation shielding, nuclear forensics, criticality assessments, weapons effects, and the development of software used in these analyses.

Dr. Goorley's dissertation topic was the computational evaluation of a new form of brain tumor therapy based on the element Gadolinium and neutron or gamma radiation. For his 6 years as a graduate student, Tim was part of the Harvard/MIT Boron Neutron Capture Therapy (BNCT) human clinical trials team, which used 10 Gy doses of mixed neutron and gamma radiation to investigate the potential therapy of advanced brain cancers.  It is this expertise that he continues to leverage to understand the physical impacts that nuclear detonations have on people.

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