

Nuclear Forensics Capacity Building: New Technologies, Research & Development and Signature Research in Nuclear Forensics

Introduction

The Virtual Laboratory on Age Dating for Investigation Support (VLADIS) is a consortium of researchers from Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Australia's Nuclear Science and Technology Organisation (ANSTO), and the National Atomic Energy Commission of Argentina (CNEA). The VLADIS initiative was launched in October 2020 with the goal of creating and maintaining an online platform for practitioners of radiochronometry (age dating) in the field of nuclear forensics and investigation support. This initiative was born out of LLNL and LANL's successful and long-running collaboration with ANSTO through the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA) Office of Nuclear Smuggling Detection and Deterrence.

VLADIS aims to facilitate discussion between subject matter experts (SMEs), new staff, and partner agencies around the ever-evolving best practices of radiochronometry within the primarily online environment required by the COVID-19 pandemic. Whereas the group is organized by researchers at LLNL, it is facilitated by nuclear forensics technical analysts from all participating laboratories, including experts in chemistry, mass spectrometry, data analysis, and nuclear forensic signature evaluation. This initiative is not meant to replace in-person visits and technical exchanges between laboratories, rather, VLADIS will complement overall engagement between in-person meetings. The VLADIS initiative is being used as a pilot project for virtual information sharing and could be redesigned for use with other partner countries covering topics beyond radiochronometry. In addition to providing a forum for discussing the technical details of an age dating evaluation, VLADIS is a community where open communication and collaboration is the model, aiding both the science and the scientists.

The Nuclear Forensics International Technical Working Group provides a set of guidelines that outline how to prepare nuclear materials, measure their model production ages, and interpret these ages in the context of a nuclear forensic examination in support of a nuclear security investigation (nf-itwg.org). VLADIS seeks to build on this guidance by bringing together international colleagues at various stages in their careers for in-depth discussions on the technical aspects of age dating analysis, thereby establishing best practices for radiochronometry in the community. Monthly meetings, facilitated by nuclear forensics technical analysts from all participating laboratories, are held online at a time convenient for all international participants, which allows all participants to join for real-time discussions. As an example of the initiative's value, Argentina recently participated in an International Atomic Energy Agency Residential Assignment at LLNL in radiochronometry; through VLADIS this partnership has continued and expanded through use of online meeting platforms and our group of gathered experts.

As a supplement to online meetings, the virtual platform 'Slack' is used to facilitate and increase informal communication between the SMEs and users, as well as enable document sharing and archiving. Using these two platforms allows participants to communicate in a variety of ways, from "live" virtual discussions and presentations to posting/answering questions from one another and sharing relevant materials on Slack.

The content of VLADIS is participant-driven, based on individual laboratories' capabilities and specific needs. As such, meeting topics are updated routinely to reflect current challenges, needs, or interests of the group. Relevant literature, externally releasable materials (e.g., white papers), and technical reports are distributed via the Slack channel to foster communication.

Summary: VLADIS has bolstered the working relationships between participants and SMEs at LLNL, LANL, CNEA, and ANSTO in the area of radiochronometry. VLADIS can be viewed as a pilot program of active information sharing and collaboration between partner agencies that could be applied to additional partner countries, tailored to their specific capabilities and interests.

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