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RESEARCH FROM THE SEAS OF SARDINIA THE ROMAN LEAD FOR THE GRAN SASSO LABORATORIES

After two thousand years spent under the sea, in the hold of a Roman ship which sank off the coast of Sardinia, 30 lead ingots of ancient Rome were transported in mid-January from Cagliari to the

Gran Sasso National Laboratories (LNGS) of INFN, where they joined the 120 ingots arrived in 2010. The recovery and transportation of this cargo is part of the "Roman Lead" project for the CUORE (*Cryogenic Underground Observatory for Rare Events*) experiment, at the Gran Sasso Laboratories. The goal of the experiment is to study the double beta decay without neutrino emission, a rare physical phenomenon that, if revealed, would confirm the assumption made in the '30s by the physicist from Catania, Ettore Majorana, that neutrinos and antineutrinos are manifestations of the same particle. This phenomenon may have been frequent in the primordial universe immediately after the Big Bang, and have determined the prevalence of matter over antimatter. The importance of the scientific, as well as archaeological, value of the Roman lead, lies in the need to shield apparatuses for the detection of rare events, like CUORE, from contamination by ambient radioactivity. While the modern lead contains weak radioactive contamination, the Roman lead, having been produced two thousand years ago, no longer contains radioactive isotopes and is therefore an important contribution to the sensitivity of the experiments. CUORE is the result of the international cooperation of 157 scientists from 30 institutions in Italy, USA, China, Spain and France.

The consignment of the ingots, celebrated at the National Archaeological Museum in Cagliari, is the result of an agreement between INFN, which funded the excavation works of the wreck and recovery of its cargo, and the Sardinia Archaeology Authority, with the approval of the Ministry of the Cultural Heritage and Activities and of Tourism (MIBACT).