

# Laser Science At Your Service

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Research in LASERLAB-EUROPE ranges from fundamental science to technology-driven research and applied science. Many results from fundamental science are paving the way for solving the 'grand challenges' of society. Examples of projects in a wide range of fields show the benefit of 'Lasers for Society'.

## Cultural Heritage

**Laser rejuvenation of ancient Greek masterpieces**  
Laserlab partner IESL-FORTH, Crete

IESL-FORTH has developed a laser system capable of cleaning ancient sculptures. It is currently set up on the visitors' floor of the Acropolis Museum in Athens, where the Caryatids – sculpted female figures originally serving as columns or pillars – are displayed to the public. Since museum policy is to avoid risky transportation of the precious pieces from ancient Greece, removal of pollution accumulation now takes place under the eyes of the visitors – naturally behind a protective housing.



Laser cleaning of one of the Caryatids

## Health

**Early detection of cancer**  
Laserlab partner ICFO, Barcelona

For the treatment of cancer, early diagnosis of the illness is crucial. Recent research shows that specific molecules are relatively abundant at the surface of cancer cells and in the patient's blood. Early detection of these cancer markers may therefore allow treatment of cancer patients at an earlier stage of the disease, with lower doses and less secondary effects. ICFO develops a device which can detect molecules indicative of cancer with unprecedented sensitivity. These sensors will be implemented on a lab-on-a-chip, an advanced microfluidics chip, integrating several laboratory functions on a chip of only millimetres to a few square centimetres in size.



Detection of cancer markers on a lab-on-a-chip

## Using our facilities

If you would like to perform your own experiments at LASERLAB-EUROPE facilities, please see [www.laserlab-europe.eu](http://www.laserlab-europe.eu) to find out about research opportunities for scientists all over Europe.

## LASERLAB EUROPE

The Integrated Initiative of European Laser Laboratories

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BIOTECHNOLOGY  
CLIMATE  
CULTURAL HERITAGE  
EDUCATION  
EMPLOYMENT  
FOOD  
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ENERGY  
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INTEGRATION  
HEALTH  
NANOTECHNOLOGIES  
MIGRATION  
POLLUTION  
SECURITY  
NEW MATERIALS  
TRANSPORT

## Food

**Checking quality of packaged food – from the outside!**  
Laserlab partner Lund Laser Centre

The popularity of fresh, chilled foods – such as packaged fruit juices – is increasing by the day. As expiration dates are based on conservative estimates, huge quantities of chilled foods are thrown away daily while the quality might still be up to standard – whereas food that has, e.g., been stored at too high temperatures will still be spoiled before the expiration date. Over the years, many sensing techniques have been developed to check the quality of packaged foods, but almost all of them are intrusive – the package is destroyed and the food is wasted. Researchers at Lund Laser Centre have developed a novel laser-based, non-intrusive measurement technique that may lead to better quality assurance and less waste of packaged foods.



Packaged food quality monitoring

## Security

**Detection of concealed explosives**  
Laserlab partner LaserLaB Amsterdam

Detection and identification of explosives and their associated compounds in different environments is a problem of critical interest for security and forensic diagnostics. Many techniques have been investigated for this purpose, but the majority are not ideal for explosives detection in that they are invasive or require lengthy sample preparation. Raman spectroscopy is ideal for the rapid detection of potentially hazardous substances because it is non-invasive and provides a 'molecular fingerprint' that facilitates chemical identification. Researchers at LaserLaB Amsterdam now have been able to detect the presence of DNT (dinitrotoluene), a material found in many explosive materials, even through layers of non-transparent plastics by using a technique called time-resolved Raman spectroscopy.



Time-resolved Raman spectroscopy setup for detection of explosives



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