Entity in a virtual image

MUOGRAPHY

2016 9/6 — 10/2 9:30–17:00

Muography utilizes muons, elementary particles, in order to image the internal structure of gigantic objects such as volcanoes. This exhibition will introduce the newest muography instruments and methods.

Hosted by Osaka Science Museum, Earthquake Research Institute, The University of Tokyo
Co-hosted by The University Museum, The University of Tokyo, Istituto Nazionale di Fisica Nucleare, Istituto Nazionale di Geofisica e Vulcanologia, MTA Wigner Fizikai Kutatóközpont
Supported by Embassy of Italy in Japan, Embassy of Hungary in Japan, Consulate General of Italy in Osaka, Japan, Consulate General of Hungary in Osaka, Japan Istituto Italiano di Cultura Osaka, Kansai Hungary Exchange Association, Komazawa University, J-PARC Center, Hitachi Medico

Osaka Science Museum http://www.sci-museum.jp/

4-2-1 Nakanoshima, Kita-ku, OSAKA

Opening hours: 9:30-17:00

Closed on: Monday, 20th September

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Osaka Science Museum

1 Beginning of challenge

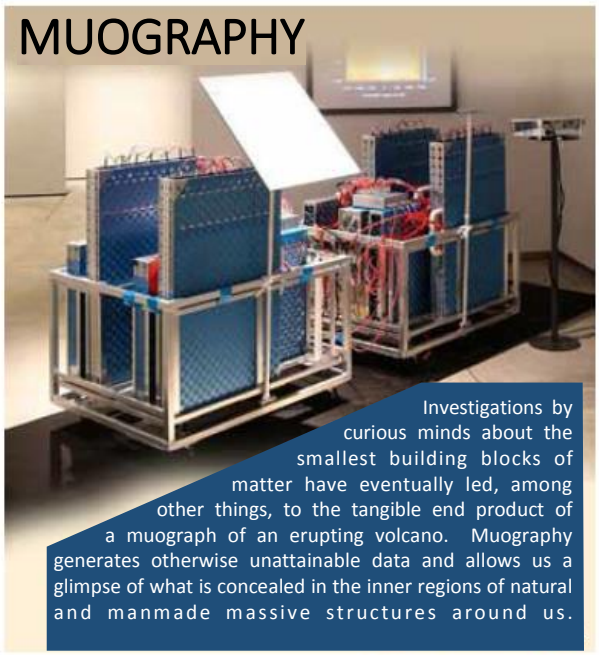
By the time that X-ray photography began (1895), photography had already evolved considerably from a novelty of the 17th century to become a convenient and widespread means of reproducing images. Over the years this idea has evolved into the computational axial tomography (CAT) technique, which has the capability to three dimensionally image not only human body but also industrial materials.

X-ray image
credit: wikipedia

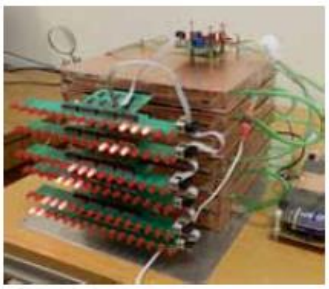
X-ray tube for CAT

2 Towards the Earth's interior -MUOGRAPHY

Why can't we use an x-ray machine to see inside volcanoes and other gigantic structures?



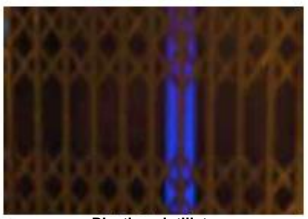
Investigations by curious minds about the smallest building blocks of matter have eventually led, among other things, to the tangible end product of a muograph of an erupting volcano. Muography generates otherwise unattainable data and allows us a glimpse of what is concealed in the inner regions of natural and manmade massive structures around us.



Wigner Research Centre for Physics of the Hungarian Academy of Science and Eötvös Loránd University in Budapest, Hungary developed HEP-tracker-based muographic applications based on their increased tolerance against mechanical shocks

credit: MTA Wigner Research Centre for Physics

Multi wire proportional chamber



Plastic scintillator

Photomultiplier tube

The key component of this detector is the unique plastic material, which is designed to efficiently convert charged particles into photons. Once these photons are converted, they can be pinpointed with electric current generated by photomultiplier tubes. In this way, we can determine the arriving directions of muons.

3 Various challenges of visualization

Neutrion Radiography (Panel exhibition)
Neuton radiography can visualize water or oil
Inside materials

Credit:
(top) JAEA Materials Sciences Research Center
(bottom) JAEA J-PARC Center

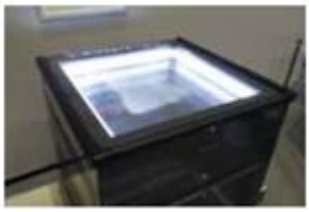
Principle of laser interferometer

Mirror of Interferometer

Laser interferometers can measure Earth strain.

Credit:
Earthquake Research Institute, The University of Tokyo

4 Related exhibitions



Large cloud chamber

Cockcroft-Walton Accelerator

Spark chmber

Photomultiplier tube