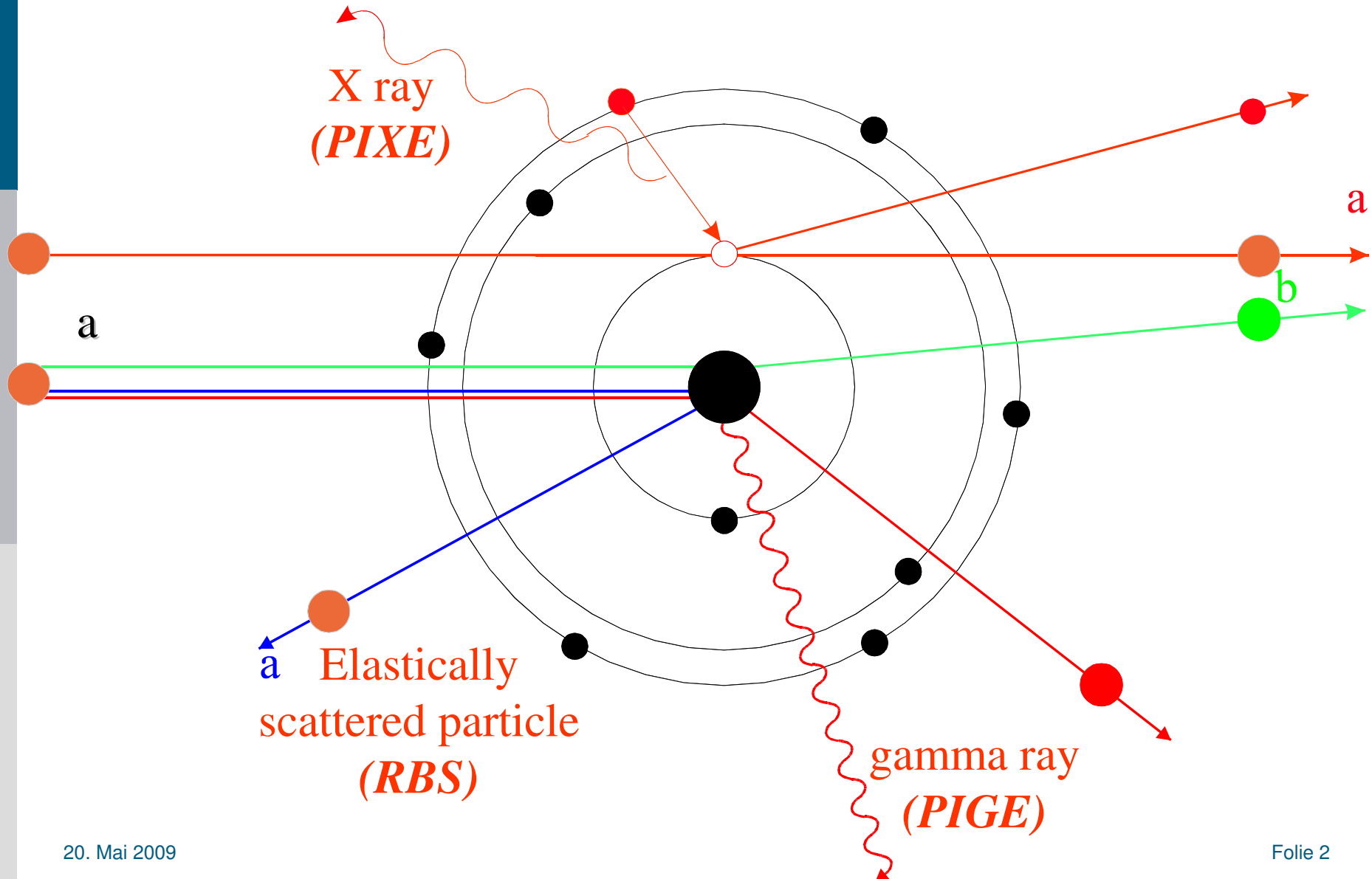


# Ion beam analysis for cultural heritage research

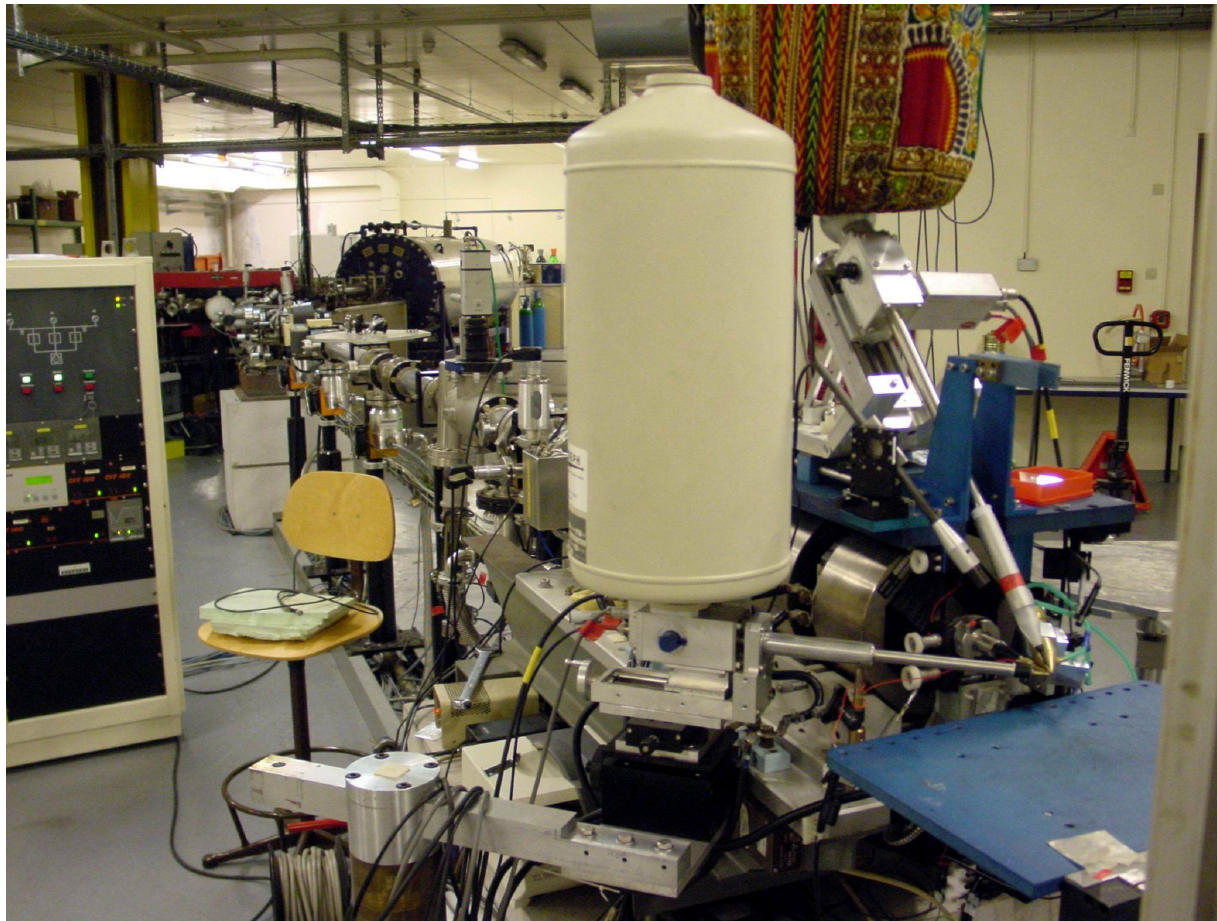
20. Mai 2009 | M. Rossbach

Institute for Energy Research, IEF-6

# *Ion Beam Analysis*



## Some dedicated facilities ...



- CNRS, Paris, France
- INFN, Florence, Italy
- JSI, Ljubljana, Slovenia
- Ruder Boskovic Inst., Zagreb, Croatia
- ANSTO, Australia
- Rossendorf, Germany
- Hahn-Meitner Institute, Berlin
- VERA Laboratory, Vienna, Austria
- Bhubaneswar, India
- Shanghai, China
- etc.

#### WORLD SURVEY OF ACCELERATOR BASED ANALYTICAL TECHNIQUES



Accelerators can provide some of the best analytical techniques and applications in a diverse range of fields such as materials science, environmental science, cultural heritage and the biosciences. The effective utilization of accelerators in the IAEA's Member States is being promoted through participation in knowledge building activities, dissemination of information, and the development and application of innovative nuclear science. These areas offer a broad spectrum of activities for the development, and new applications of accelerators and accelerator-based techniques. The Physics Section supports programmes on education, knowledge building, and technology transfer for accelerator projects in Member States.

This CD-ROM version of the 2nd edition of the Database for Accelerator-Based Analytical Techniques (A-BAT) contains over 200 entries from 40 countries, with new and additional information on the characteristics and applications of accelerator facilities. It was compiled from information provided in response to a questionnaire distributed to accelerator laboratories in 2005. This database is being maintained and continuously updated based on information submitted to the Instrumentation Unit of the IAEA Laboratories (NAAL), Seibersdorf, Austria. The most current version of this database is available [online](#)

This scope of this CD-ROM is primarily limited to low and medium energy accelerators utilizing nuclear analytical techniques. The content supplements and complements other collations on specialized accelerator facilities, such as:

[Nuclear Microprobe Laboratories](#)

[AMS Laboratories](#)

[Synchrotron Light Laboratories](#)

[Proton Therapy Laboratories](#)

[Cyclotrons for Radionuclide Production](#)

[Listing of Accelerator Laboratories](#)

Andrew Wroe of Physics Section, NAPC and Dariusz Wegrzynek of Instrumentation Unit, NAAL were responsible for the production of this CD-ROM.



<http://www-naweb.iaea.org/napc/physics/AccelSurv/index.html>

N. Dytlewski et al.:

*The International Atomic Energy Agency's programme on utilisation of accelerators.*

Nucl. Instr. Meth. Part A, 562  
(2006) 650-655

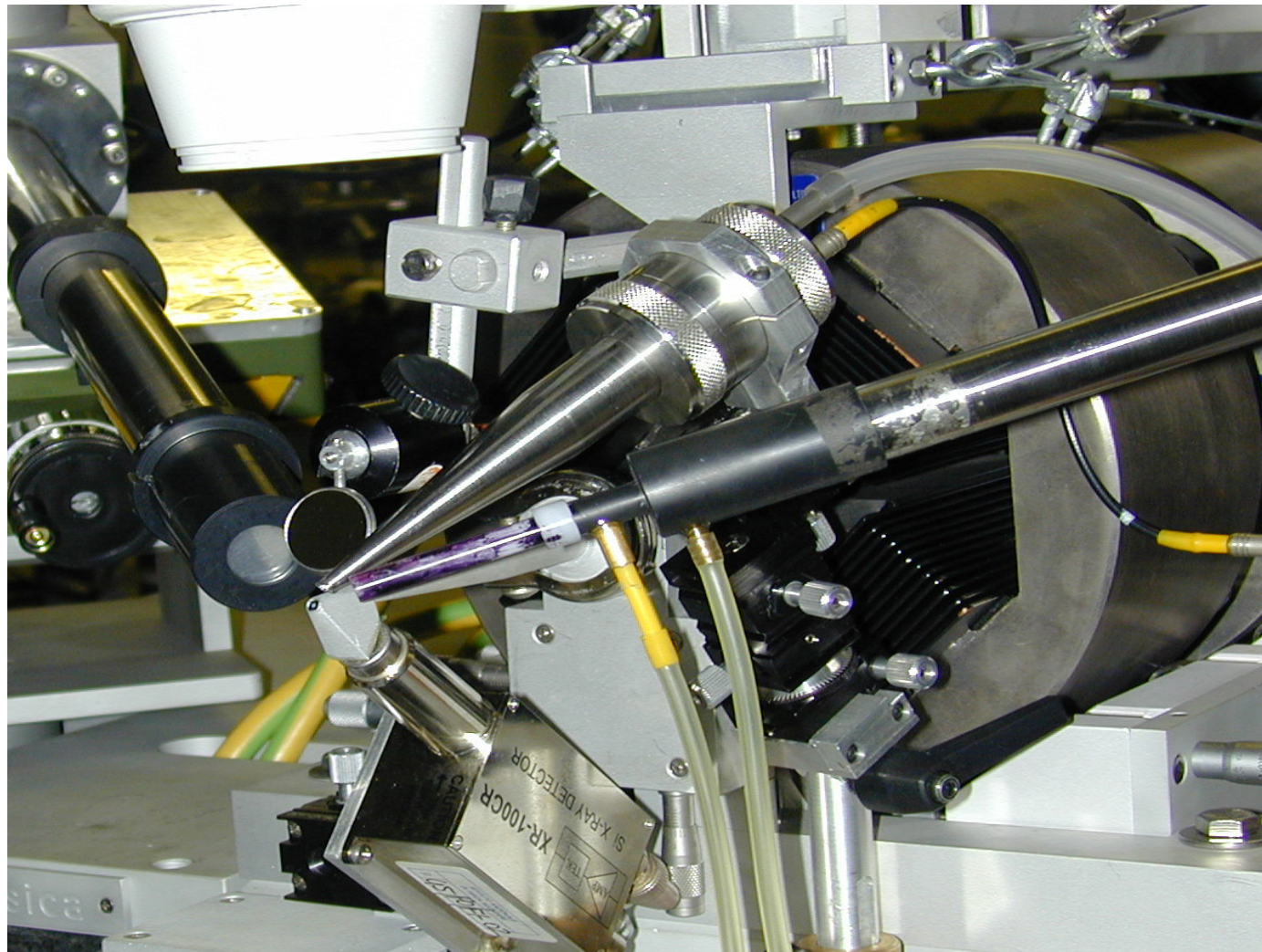
Last updated: August 2, 2007

[Editorial](#)

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[Disclaimer](#)



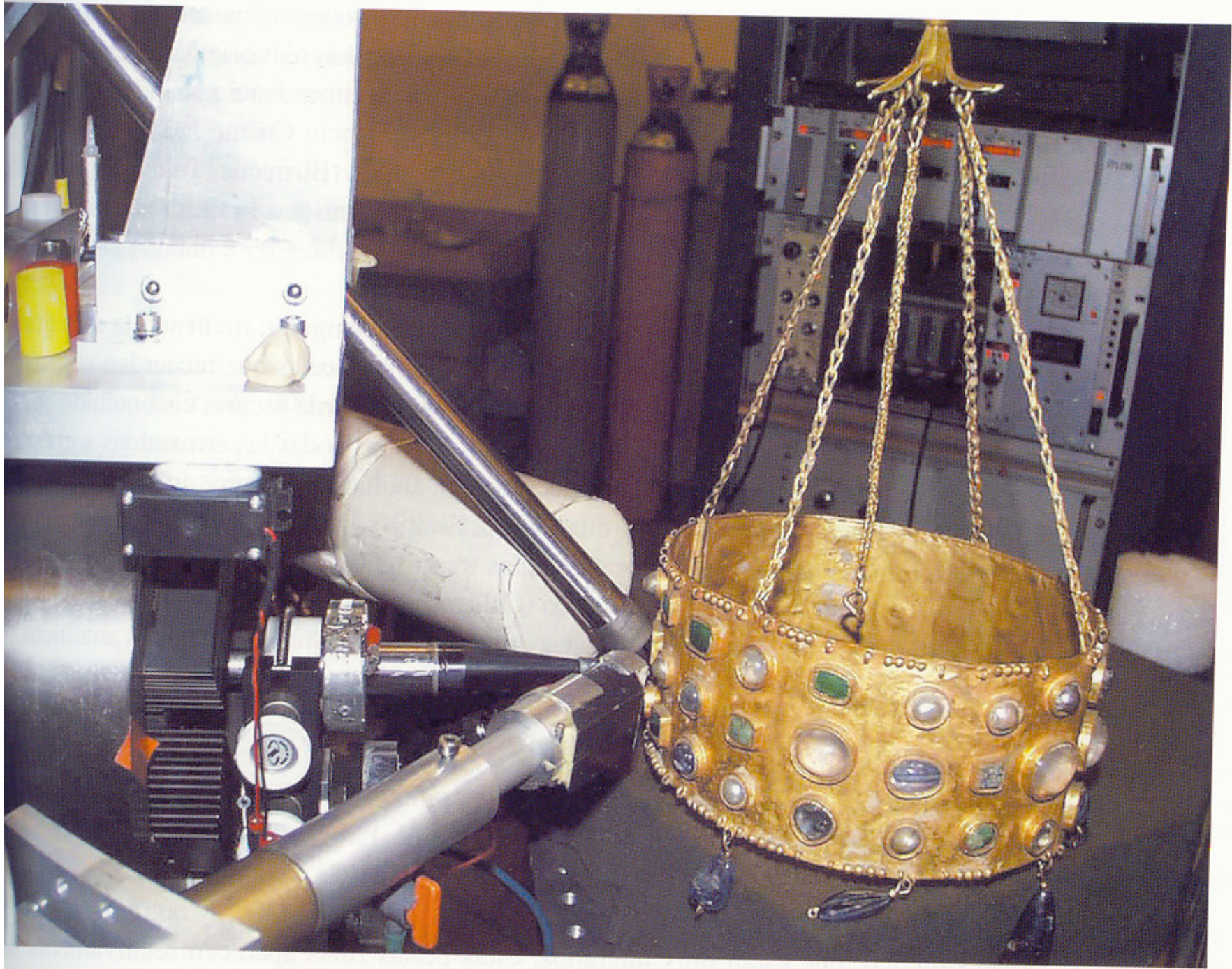
## External beam set-up



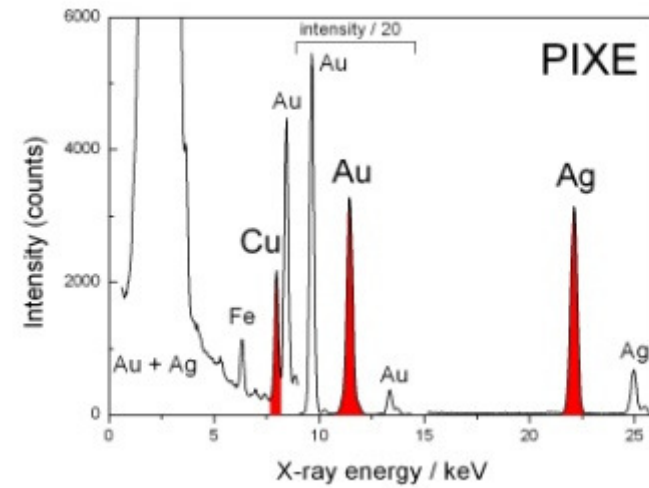
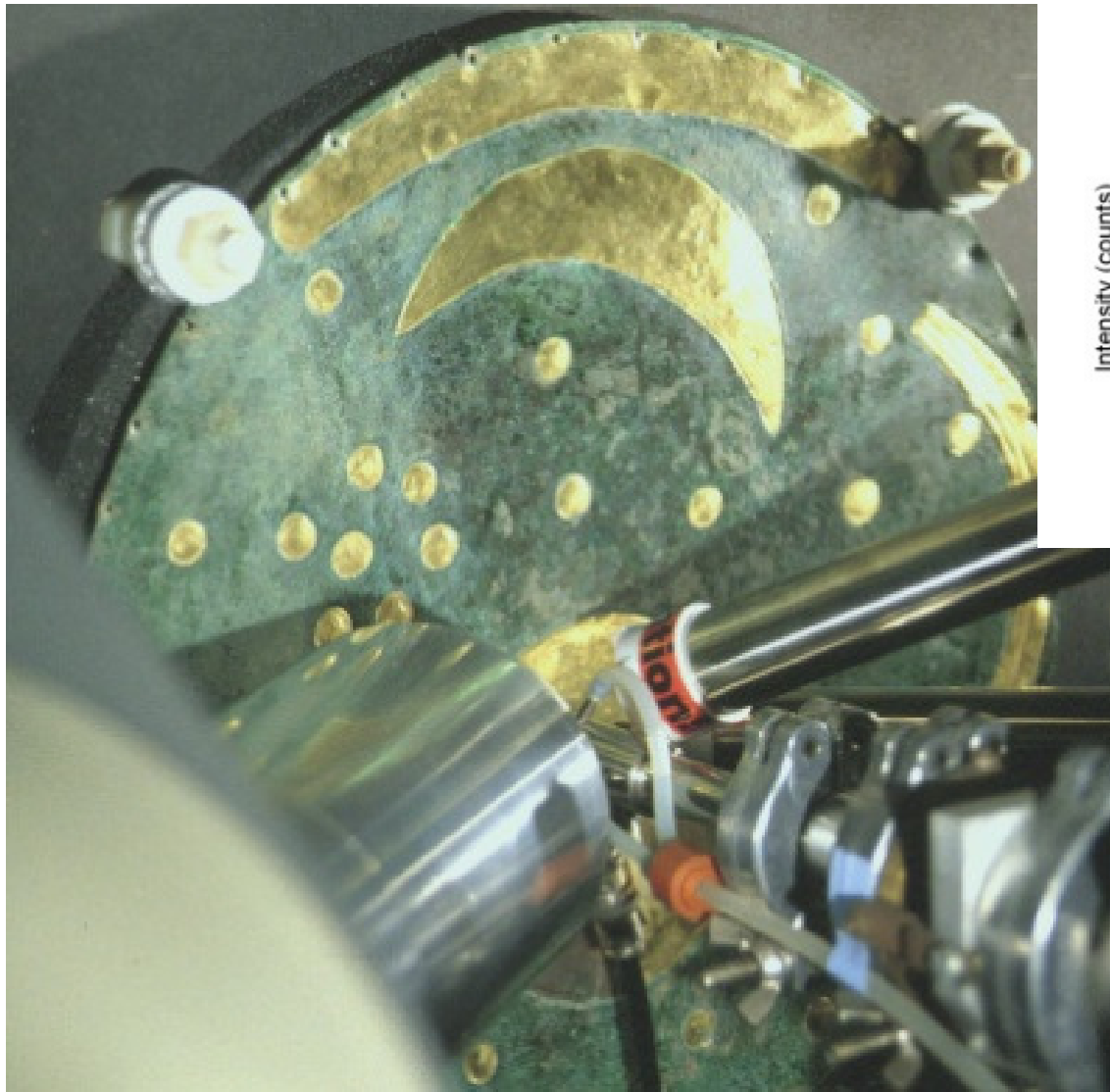










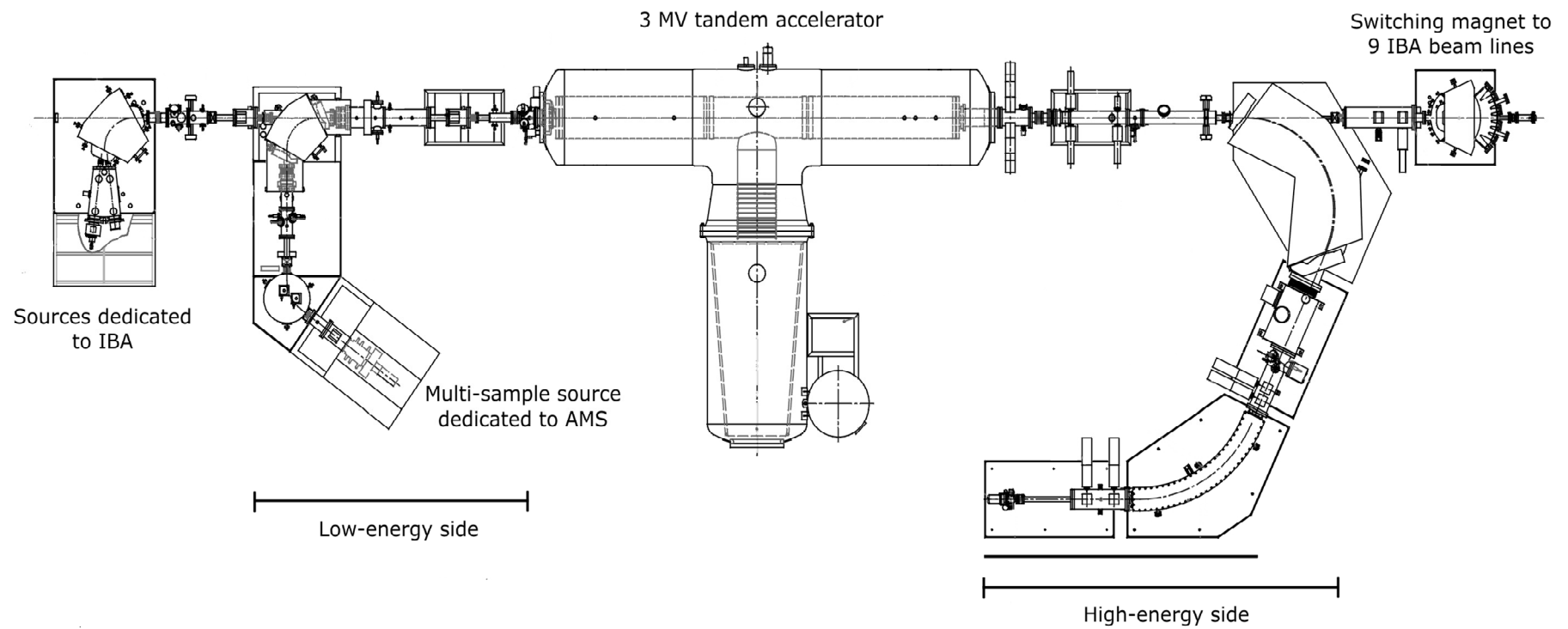


*The “Himmelsscheibe von Nebra” positioned for analysis of Au/Cu at the Rossendorf external proton beam with typical PIXE spektrum.*



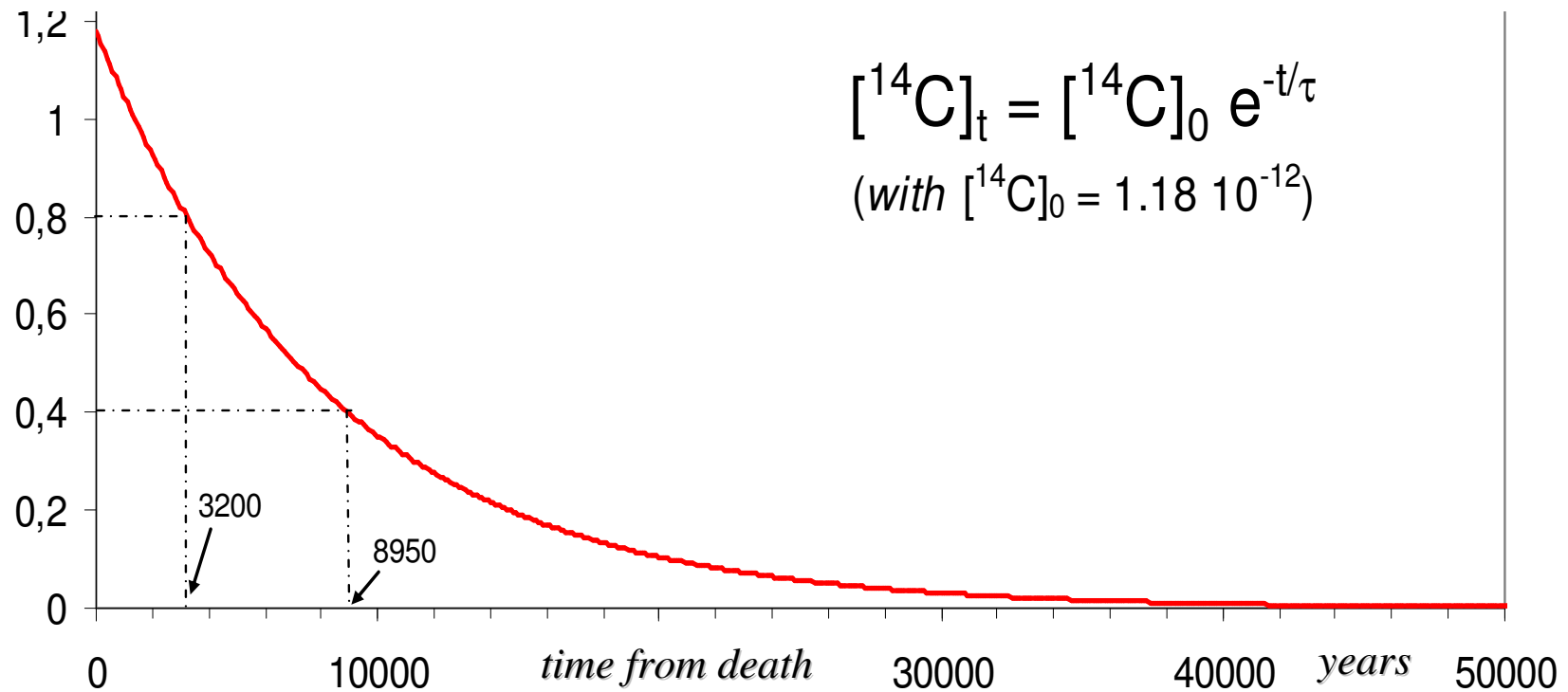


# Ion beams for Accelerator Mass Spectrometry

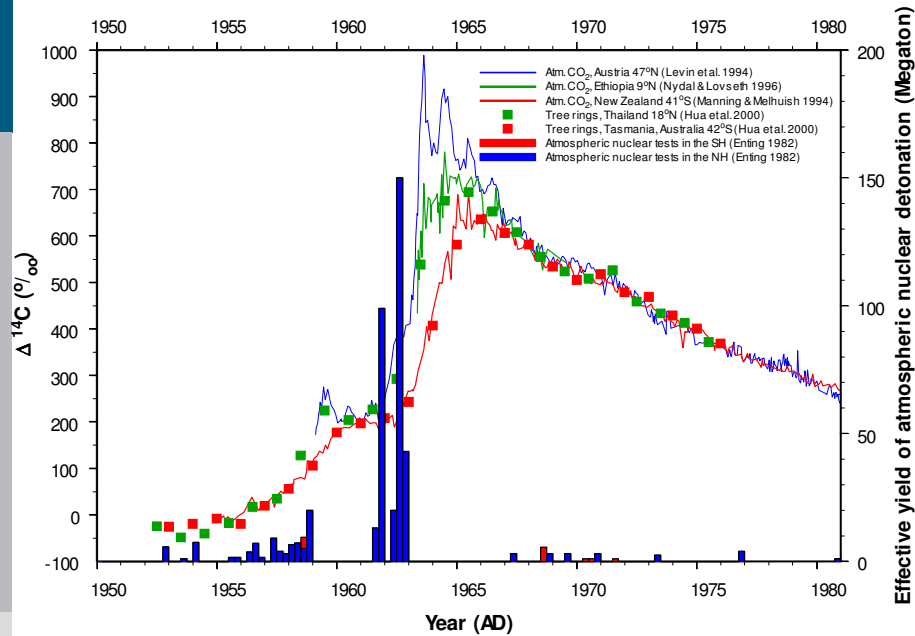




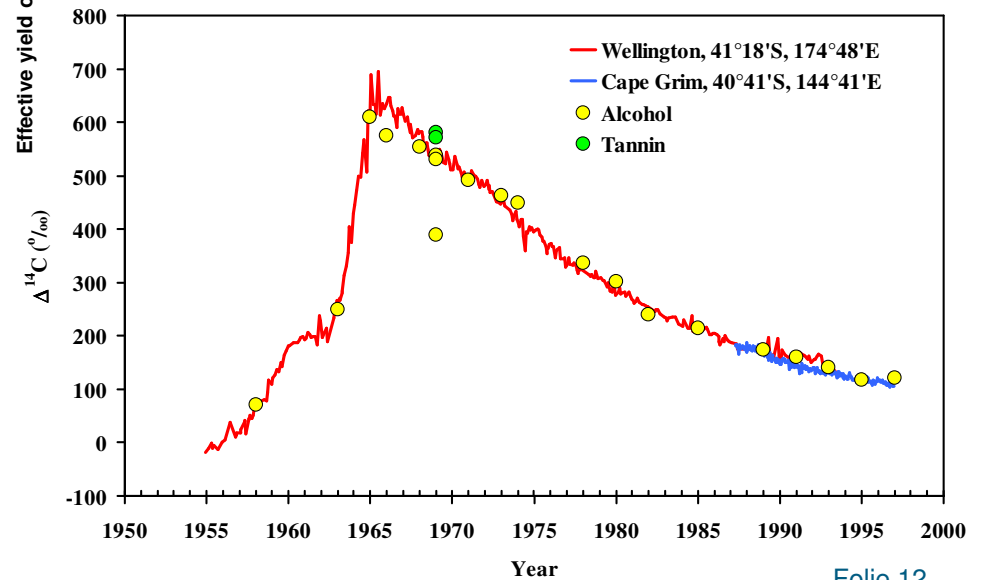
# <sup>14</sup>C dating



# <sup>14</sup>C dating, bomb pulse testing



e.g. wine dating



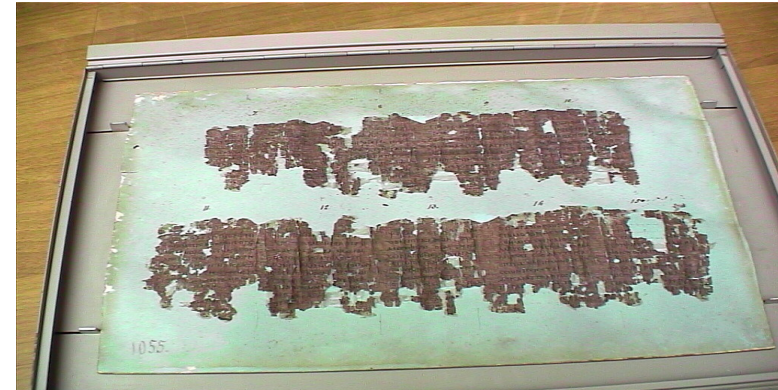


# *Radiocarbon Dating: providing answers to significant historical events and archaeological mysteries*

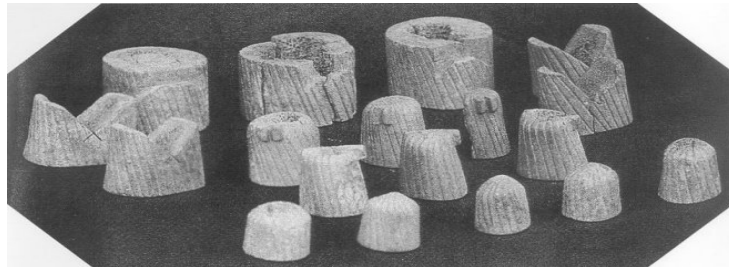


Accelerator Mass Spectrometry is the world's most sensitive method for measuring radioisotopes.

Radiocarbon dating requires only a tiny amount of organic material, to determine ages as far back as 50,000 BC.



Supporting scholars to understand the evolution of our written language. Ancient writings on fragile parchments (circa 275 BC).



Resolving archaeological mysteries: the Venafrò chessmen. The chessmen, found in a Roman tomb in 1932, then spawned a theory that chess was played during Roman times. The pieces, now dated 885-1017 AD, supports the wisdom that chess was introduced to Europe during the Saracen invasions of the 9<sup>th</sup> century AD.



A window of history was opened into the living conditions and climate of prehistoric European man, with the discovery and dating of Iceman Ötzi's body and equipment (3100-3300 BC).

