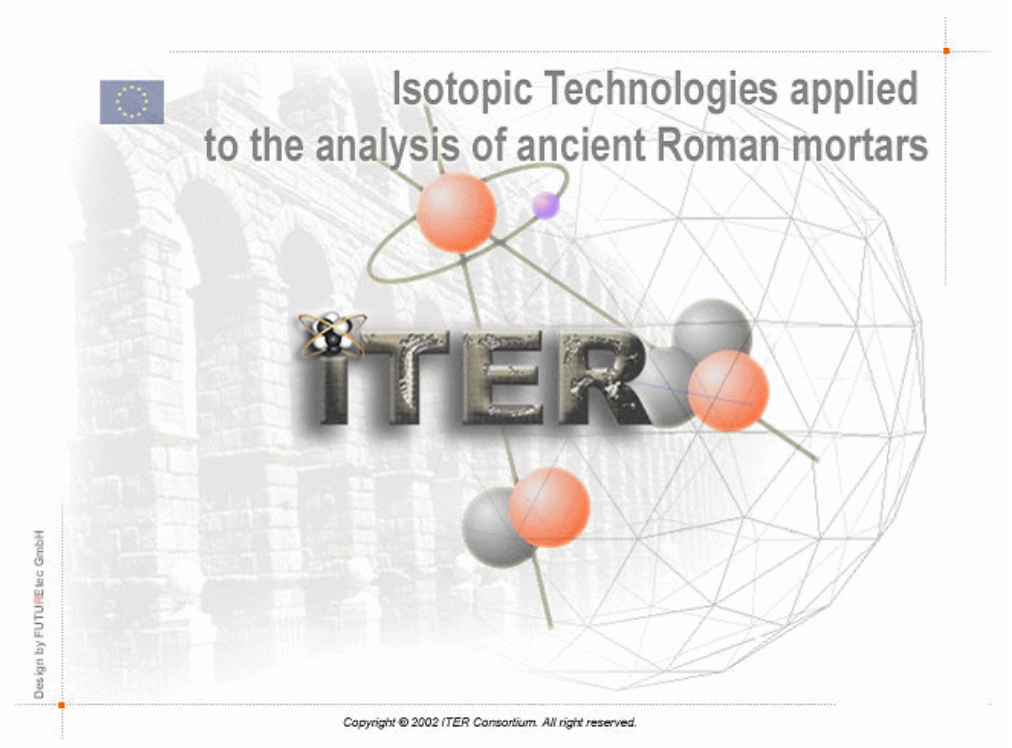
Sustaining Europe‘s Cultural Heritage: From Research to Policy

London, 1st to 3rd September 2004



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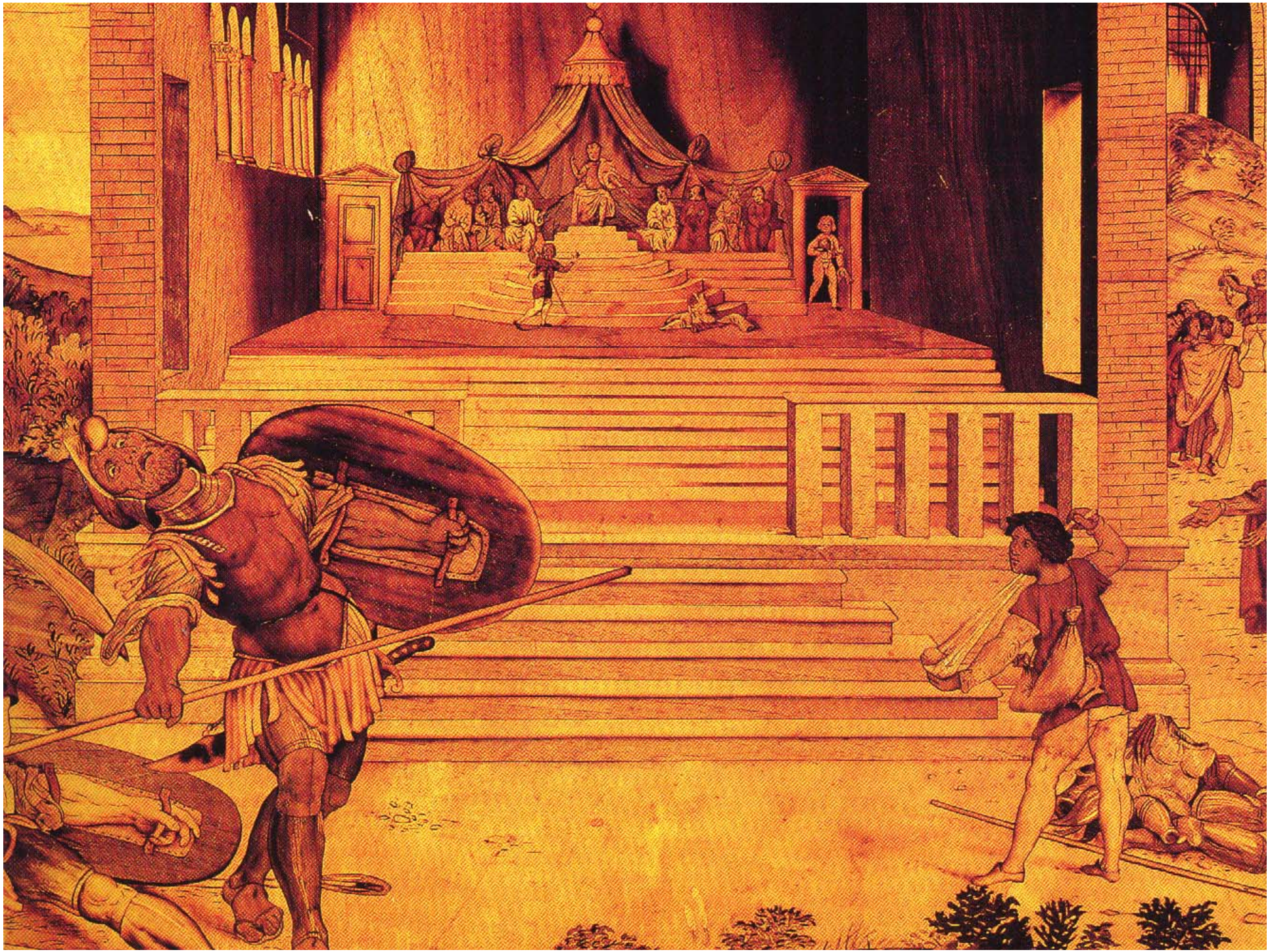


I would like to begin showing a masterpiece of wooden marquetry of 1540.

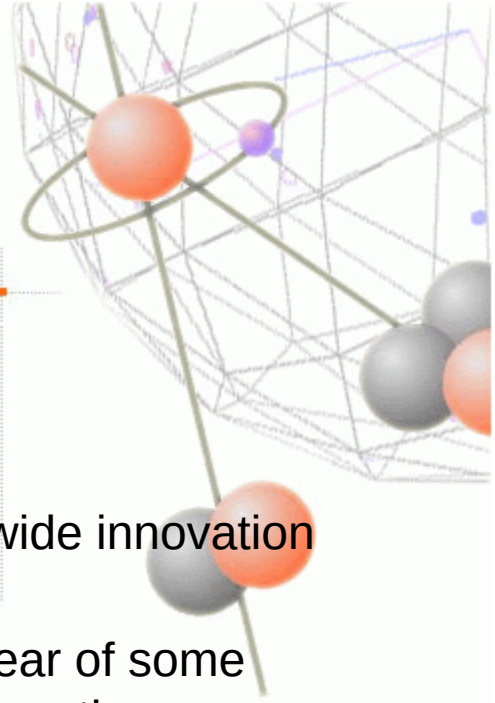
Lorenzo Lotto‘s choir, which can be admired in the Basilica Santa Maria Maggiore in Bergamo.

One of the ‚Imprese‘ shows the whole story of David + Goliath in one wooden panel of ca. 1.30 x 80.

I choose one particular of this story, the final part which I also saw as a similitude, representing how research and industry often work or not-work together.

This phenomenon is due to the fact that SMEs (here represented by David) often had and still have fear of loosing their ideas and the potential for innovation.

On the contrary, the big institutes (here represented by Goliath) sometimes live in a ‚turris eburnea‘ (ivory tower), remote from the practical life.



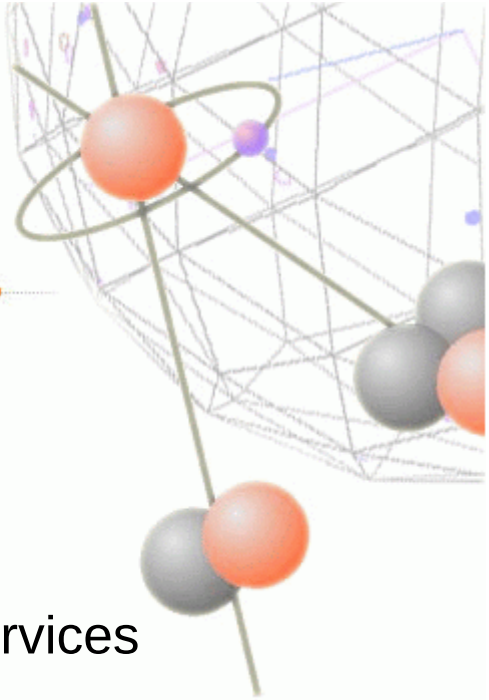
ITER was a CRAFT Project

When we begun to discuss the ITER idea, this was a worldwide innovation and a fundamental research project.

At that time we had lots of discussions concerned with the fear of some SMEs to hand over the idea to the institutes and then loose the innovation itself.

However, we recognized from the very beginning the essential need to gather a strong interdisciplinary team, working together to reach the common goal.

We considered the CRAFT programme as being the best opportunity.



Partners Contractors

SME Proposers

1 HYDROISOTOP GmbH, light isotopes
2 Servin – Servizi Integrati Csrl, environmental services
3 Krusemark GmbH, mortar producer
4 FUTUREtec GmbH, information technology and IPRs

RTD Performers

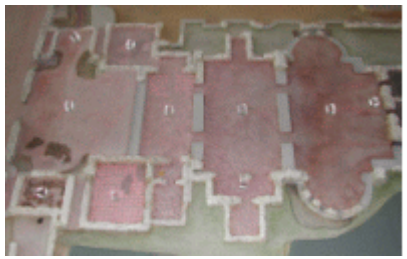
5 IFE, Institute for Energy Technology, heavy isotopes
6 CNR, “Gino Bozza”, mineralogical analysis

Partners Subcontractors

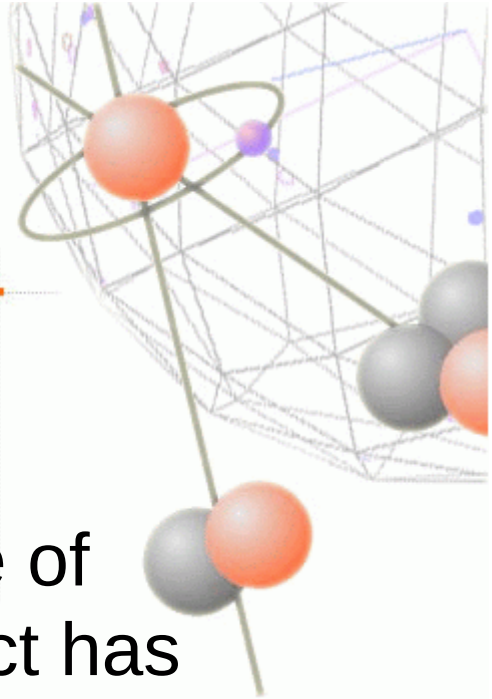
Soprintendenza Archeologica, Lazio

Arcinazzo Romano (Rome, Italy)
Villa Traiana (bedding mortar)

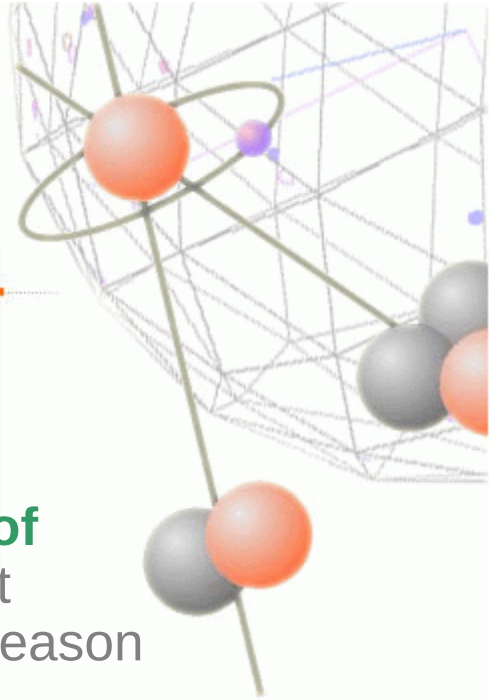
Israel Antiquities Authority
Kaisarya (קיסרית - Israel)
Different buildings



LVR - LandesVerband Rheinland
Archäologischer Park, Xanten
Colonia Ulpia Traiana
Great Baths (bedding mortar)



- ITER has demonstrated that one of the keys to success in this project has not only been the cooperation among research and industry, but the involvement of 3 stakeholders and 1 business SME also during the phase of fundamental research.



Objectives

- **To demonstrate the scientific validity of isotopic analytical investigations** on ancient Roman mortars, for better understanding the reason why they are so resistant to physico-chemical alteration.
- **To create an innovative database** of mortar characteristics based on the collection of all analytical data concerning isotopic technologies in complement to the traditional ones.
- **To reproduce the mortars more accurately** for more authentic preservation and restoration of ancient buildings and artefacts.

Innovation:

Better origin assignment: Isotope techniques helped to better assign the origin of building materials with the help of Isotopes **87/86Sr, 13C, 18O**

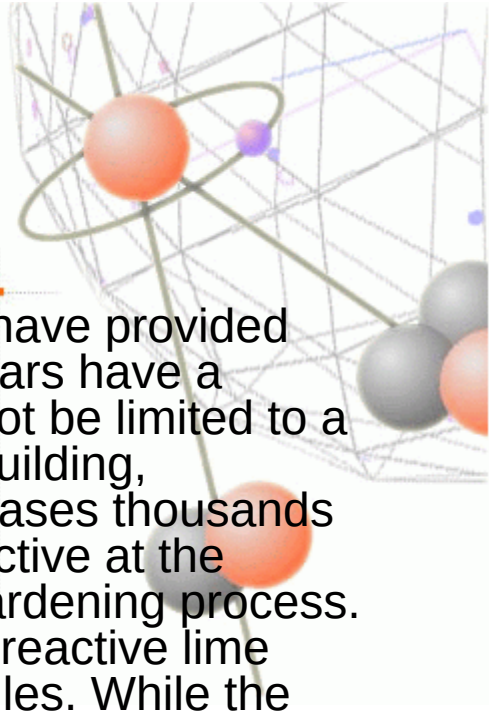
Building Techniques: Isotope techniques helped us to better understand the building techniques based on analysis of stable isotopes **13C, 18O**

Monitoring: Isotope techniques helped us to monitor and assess the wheathering state of materials using **13C, 18O and Pb isotopes**

Database: Within the ITER project an internet database was developed containing the key mineralogical and isotope data of the studied sites.

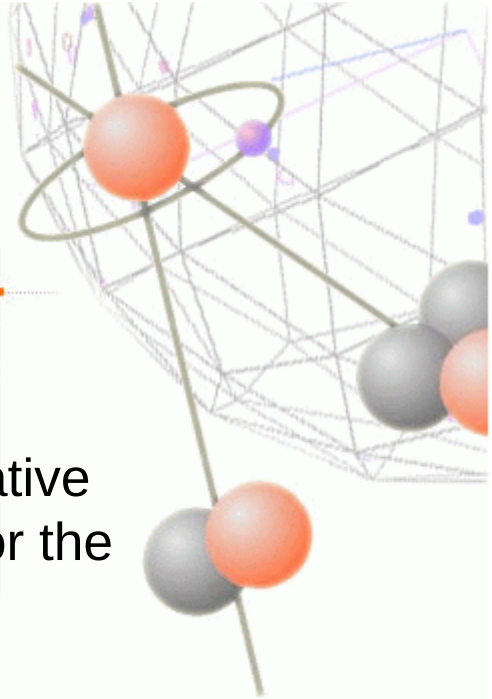
Innovation: Mortar Prototype

The first prototypes have been prepared using the new analytical techniques. We use a higher ratio of lime to filling material and a genuine „roman“ technique to compensate for the negative effects (water absorption and shrinking) – the result is a material with an inherent reaction potential to heal cracks.



The morphological study of old mortars and the 14C analysis have provided important data substantiating the hypothesis that lime mortars have a reaction potential. Crystallization of roman mortars might not be limited to a defined time span close to the time of construction of the building, crystallization might take place during hundreds, in some cases thousands of years. This is only possible if part of the lime used is inactive at the moment the building is constructed and during the initial hardening process. The morphological analysis has shown that this storage of reactive lime mortar might be provided by an encapsulation of lime nodules. While the outer surface is calcified sealing the inner part, the core of the nodule still contains Calcium-Hydroxide that can react upon physical stress, cracking and associated contact with CO2. The encapsulation of part of the binder in nodules therefore is an important part of the preparation technique. In fact, due to encapsulation the amount of active or reactive binder at the moment of construction should be close to the binder: aggregate ratios that are being used in modern mortars. The rest of the binder can be encapsulated representing a storage. This property can explain the durability of roman mortars. Upon access of CO2 due to cracks (!) the capsules react. Due to this process, areas under structural stress are fortified by calcite veins along the line of cracks. This behavior represents a healing-capacity.

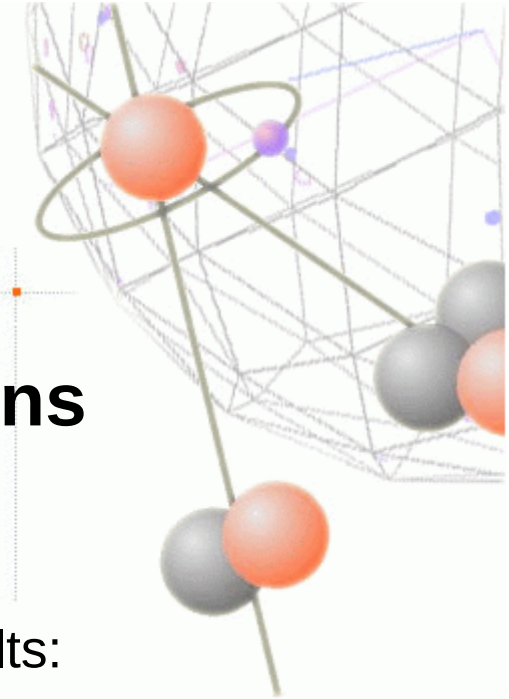
Living mortars !!!



Benefits for the ITER SMEs

According to the directives of the CRAFT Co-operative Research, the results of the project are available for the SMEs as the joint owners of:

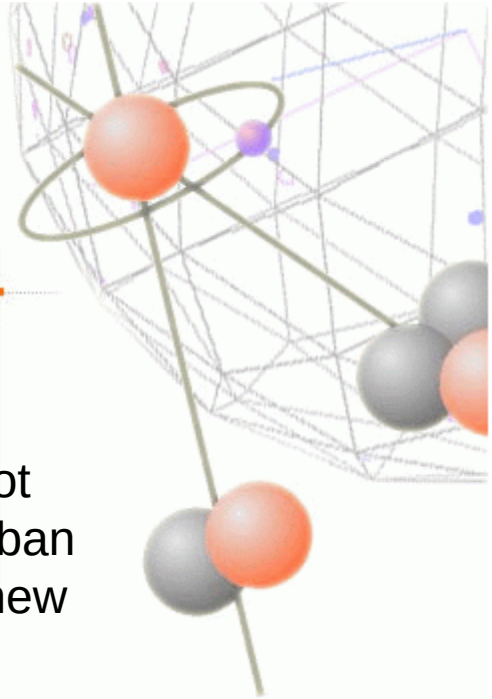
- New methods for assessing weathering state, environmental impact, material authenticity and provenience.
- A database containing historic, mineralogical and isotope data for examining and checking the chemical and physical characteristics of various mortars
- A mortar prototype at laboratory level
- A cooperative working tool to ease the management of interdisciplinary teams



Perspectives of future Applications

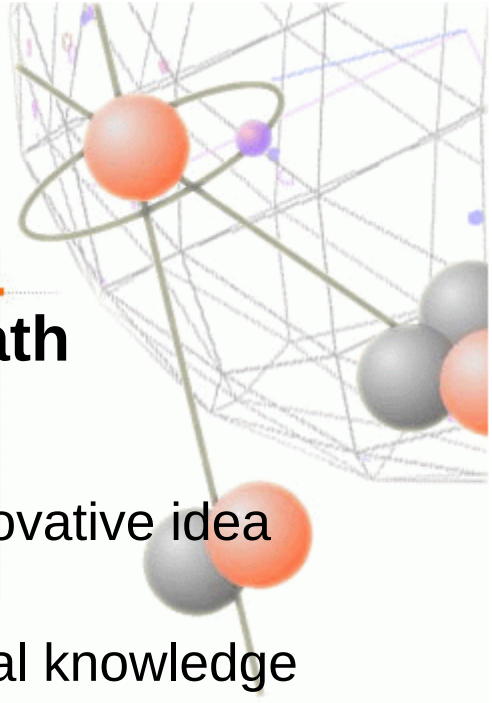
There are several target sectors for the dissemination and exploitation of the ITER results:

- Analysis of building materials, as well as monitoring and condition assessment
- Conservation of historical buildings
- Production of raw materials for construction
- New construction techniques



Policy Aspects

1. The ITER project is expected to have a spin-off, not only on historic buildings conservation, but also urban environment monitoring, material monitoring and new building technologies.
2. The results can help to improve and control the quality of conservation measures.
3. The state of buildings, especially environmental impacts due to traffic and air pollution, can be better distinguished from deterioration related to the reconstruction and materials used.
4. In the future, the methodologies could help to monitor the state of cultural heritage on a European level and provide dedicated tools for deliberation to decision makers



How did David cooperate with Goliath in the ITER project?

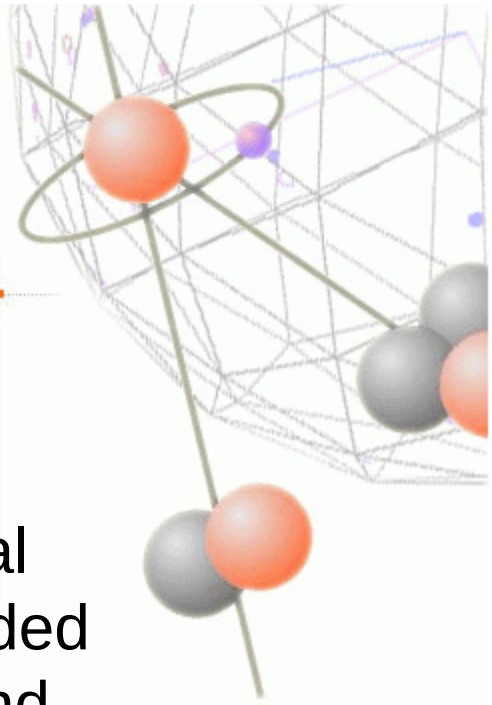
David (SMEs) overcame his fear of loosing their innovative idea thanks to IPR protection

Goliath (RTDs) shared their specific and fundamental knowledge

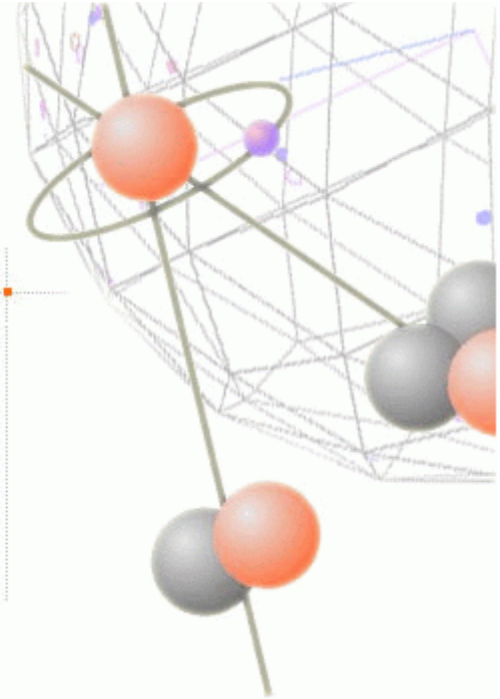
The stakeholders did an excellent job providing a precious day-to-day practical experience

The successful cooperation was secured through

- solid team work, as well as building trust and consolidating it during the project time
- sharing interdisciplinary expertise and knowledge among partners and in particular stakeholders



In a world given over to globalization, local heritage and culture gives a much needed security to people's sense of identity and their communities ability to recognize themselves.



Thank you for reading !

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