

# Six Decades of Research and Development with Accelerators

In the Department of Interaction of Radiation with Matter of the Bariloche Atomic Centre

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INTERNATIONAL CONFERENCE ON  
**ACCELERATORS FOR RESEARCH AND SUSTAINABLE DEVELOPMENT**  
From good practices towards socioeconomic impact



**23–27 May 2022**

IAEA Headquarters, Vienna, Austria

<https://fisica.cab.cnea.gov.ar/dirm/>

# Department of Interaction of Radiation with Matter

Bariloche Atomic Center, National Atomic Energy Commission (CNEA)



Home

Research lines

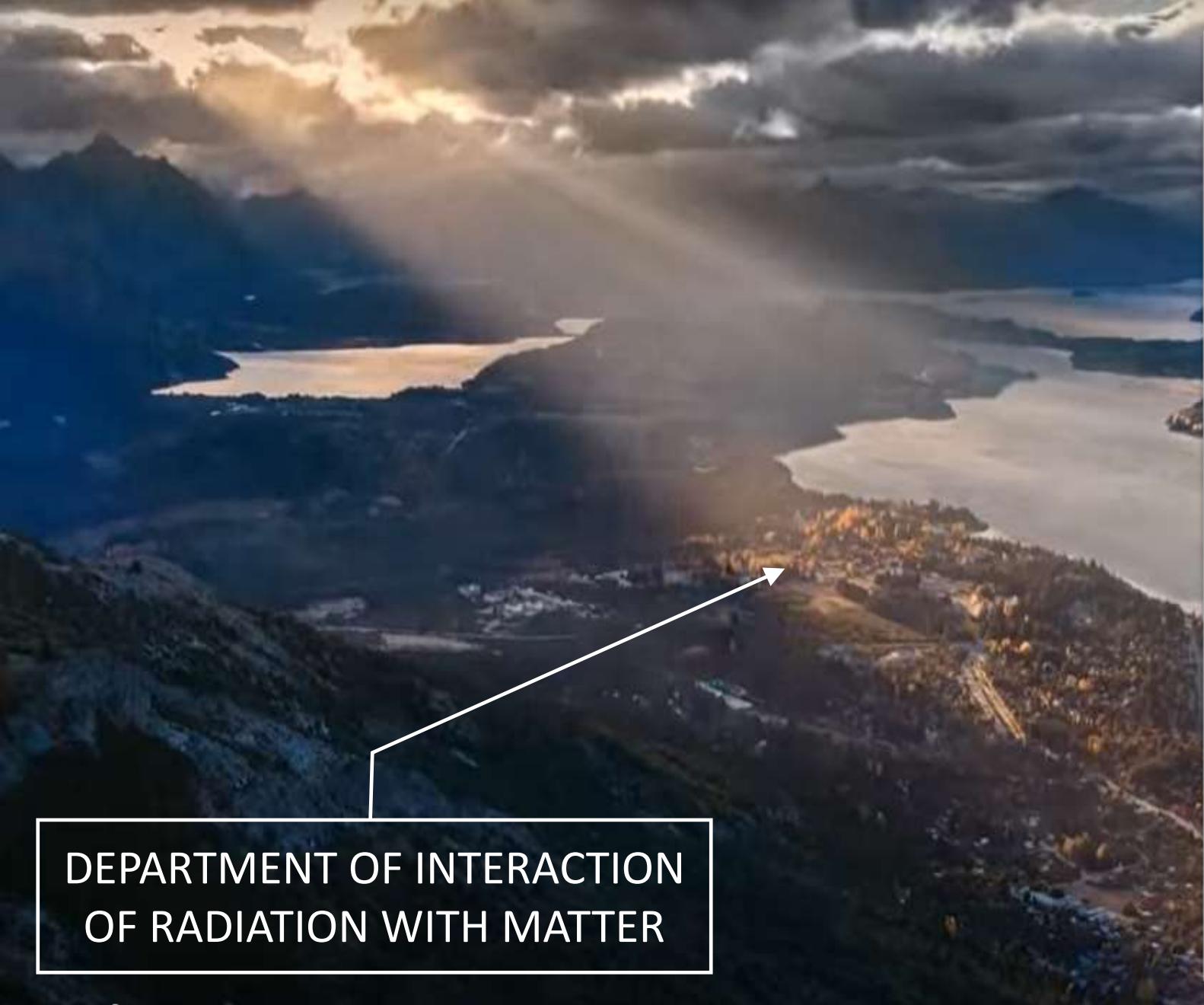
Facilities

Solicited research





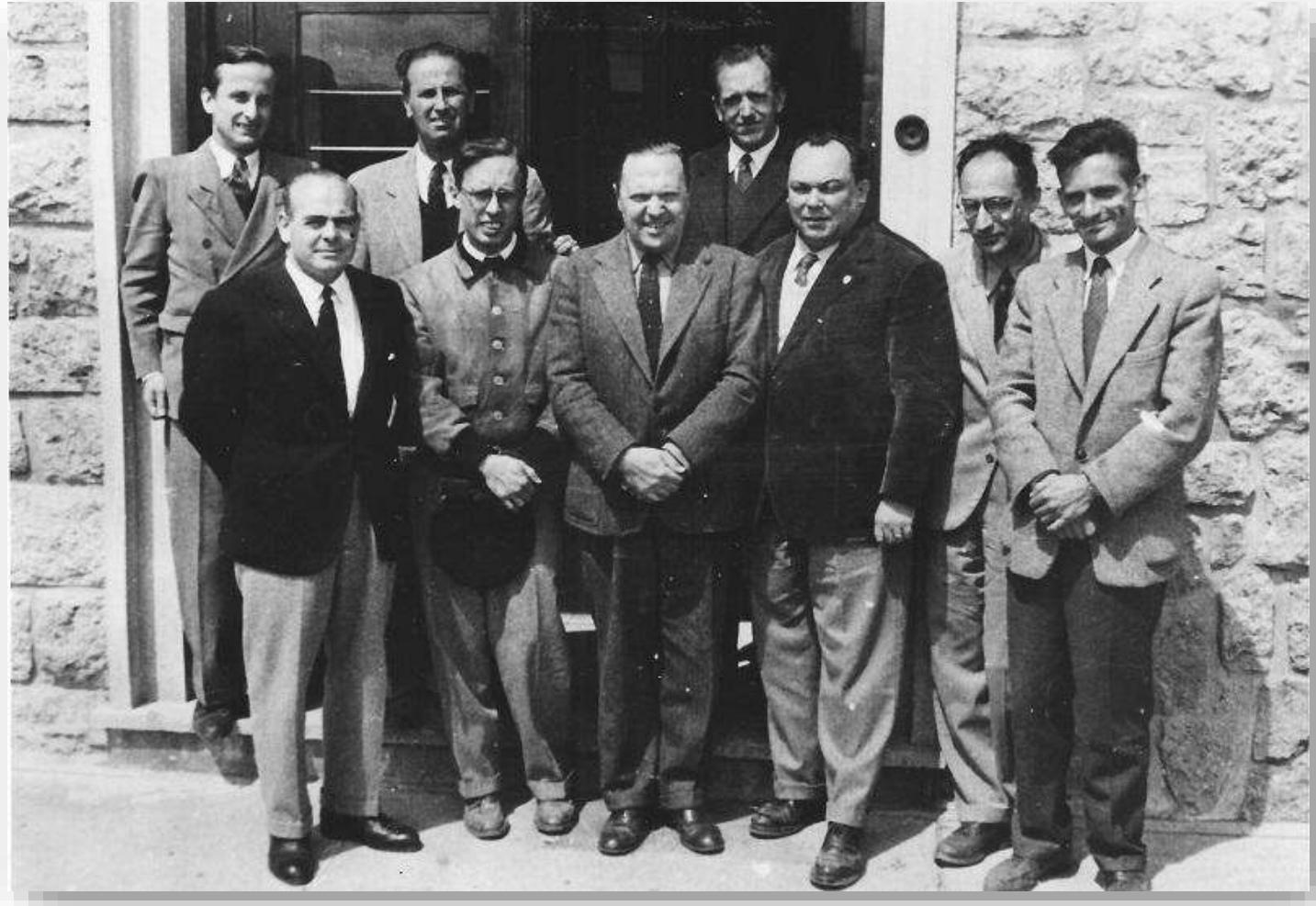
## DEPARTMENT OF INTERACTION OF RADIATION WITH MATTER



DEPARTMENT OF INTERACTION  
OF RADIATION WITH MATTER



# FIRST PROFESSORS OF THE INSTITUTE OF PHYSICS (BARILOCHE, 1955)



**Meckbach**   **Balanzat**      **Maiztegui**   **Moretti**  
**Cabrera**   **Abele**   **Quihillalt**   **Balseiro**   **McMillan**

# SAMUEL KING ALLISON (1900 – 1965)



# SAMUEL KING ALLISON (1900 – 1965)



*You are damned right!*

*Why don't you come to Chicago  
to introduce yourself in that field  
working in my lab?*

# ION BEAM LABORATORY



Bariloche, Patagonia, Argentina (1962)



# ALLISON'S KEVATRON



*“A big machine for a low voltage”.*

# MECKBACH'S KEVATRON



# MECKBACH'S KEVATRON



A four decades old “selfie” at the Kevatron console.



# MECKBACH'S KEVATRON



The Kevatron, today

# TÁNDEM



5 SDH Tandem accelerator from the National Electrostatics Corp. (NEC)

# ION SOURCES

SNICS II

ALPHATROSS

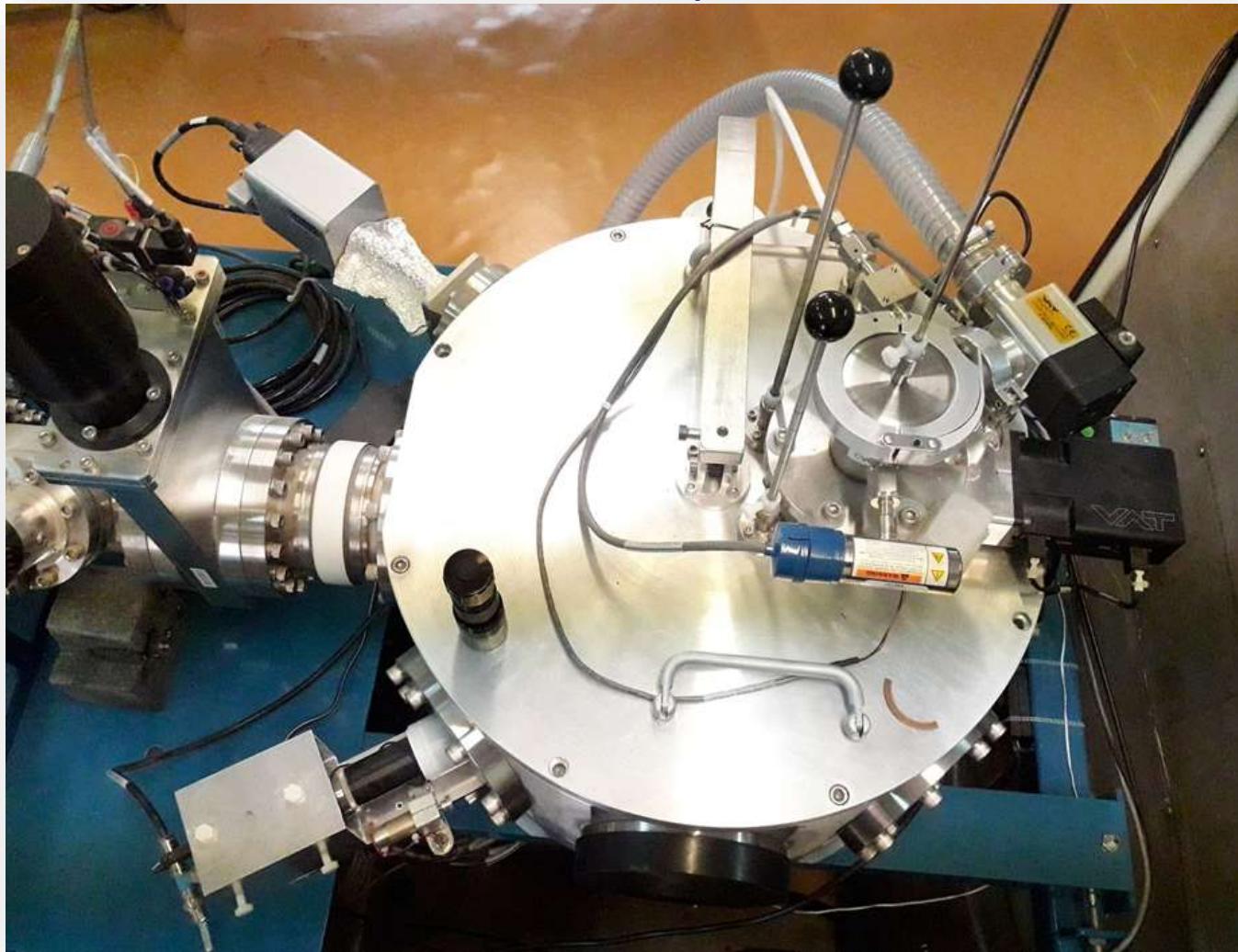


# ENDSTATIONS



# ENDSTATIONS

## RC43 Ion Beam Analysis Endstation

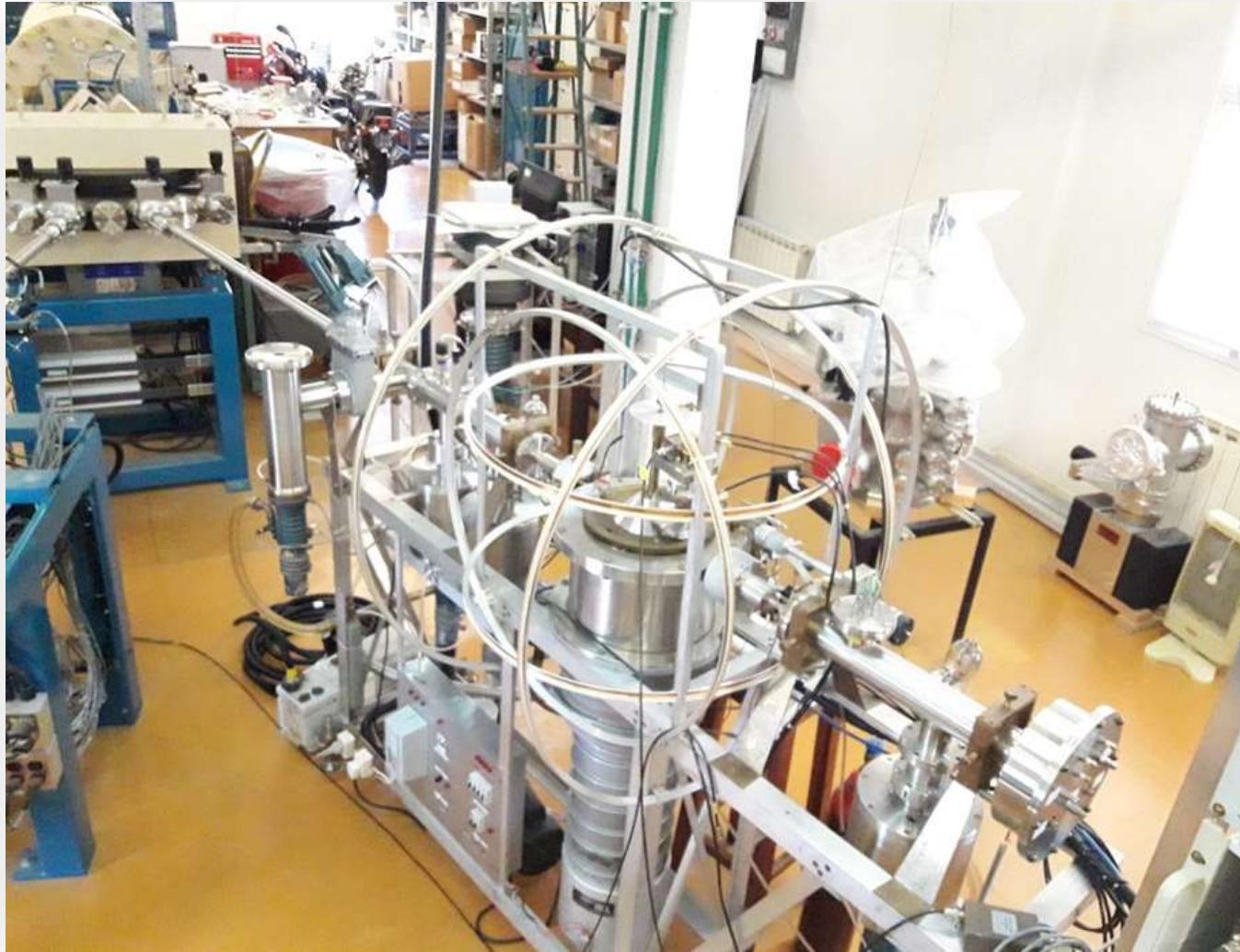


- ✓ Rutherford Backscattering Spectrometry (RBS)
- ✓ Elastic Recoil Detection Analysis (ERDA)
- ✓ Particle Induced X-ray Emission(PIXE)
- ✓ Nuclear Reaction Analysis (NRA)



# Endstations

## Atomic Collision Endstation (Channeltron detector)

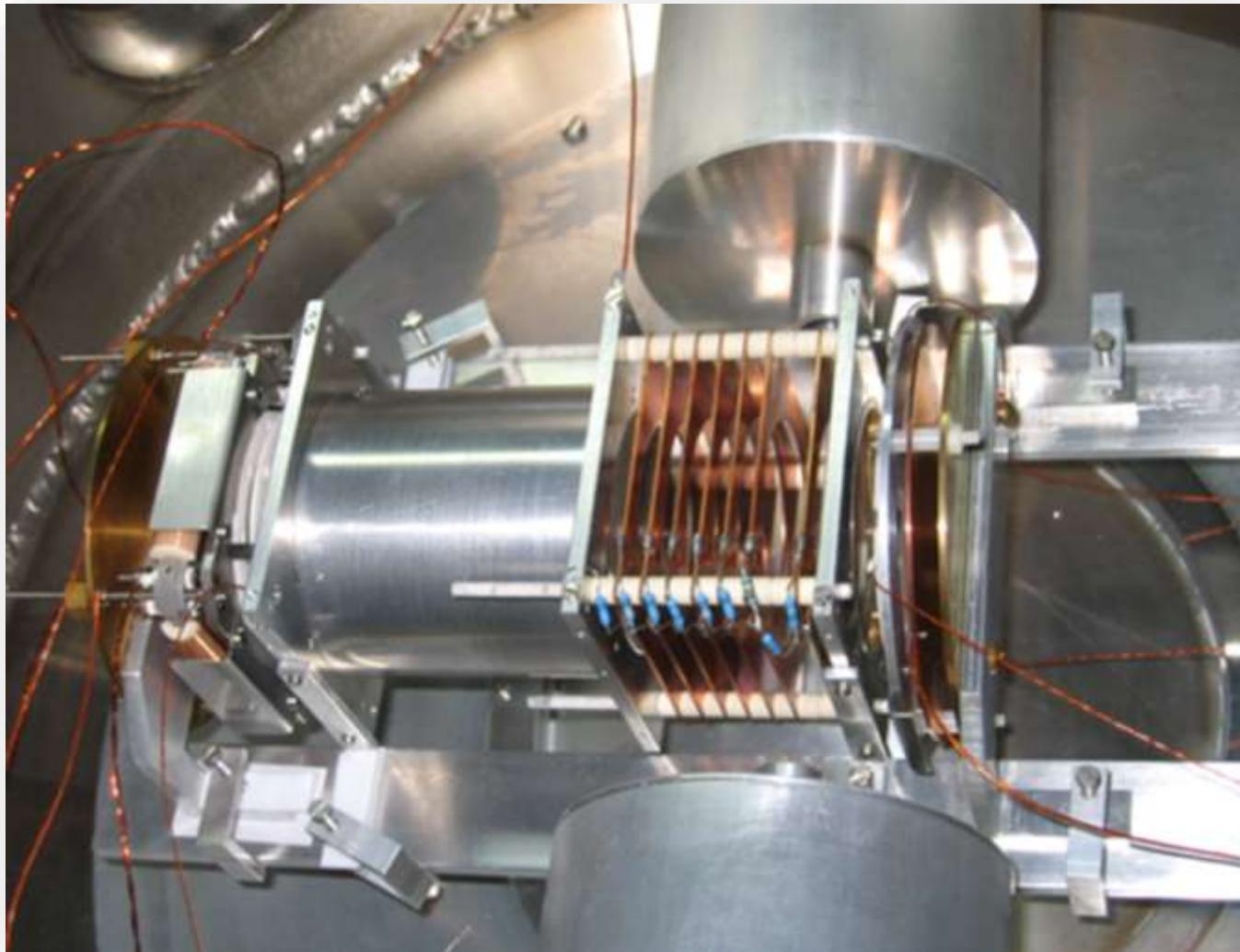


- ✓ Rutherford Backscattering Spectrometry (RBS)
- ✓ Elastic Recoil Detection Analysis (ERDA)
- ✓ Particle Induced X-ray Emission(PIXE)
- ✓ Nuclear Reaction Analysis (NRA)
- ✓ Ion-Atom Collisions.



# ENDSTATIONS

## COLTRIMS Reaction Microscope



- ✓ Rutherford Backscattering Spectrometry (RBS)
- ✓ Elastic Recoil Detection Analysis (ERDA)
- ✓ Particle Induced X-ray Emission(PIXE)
- ✓ Nuclear Reaction Analysis (NRA)
- ✓ Ion-Atom Collisions
- ✓ Cold Target Recoil-ion Momentum Spectroscopy (COLTRIMS)



# Endstations

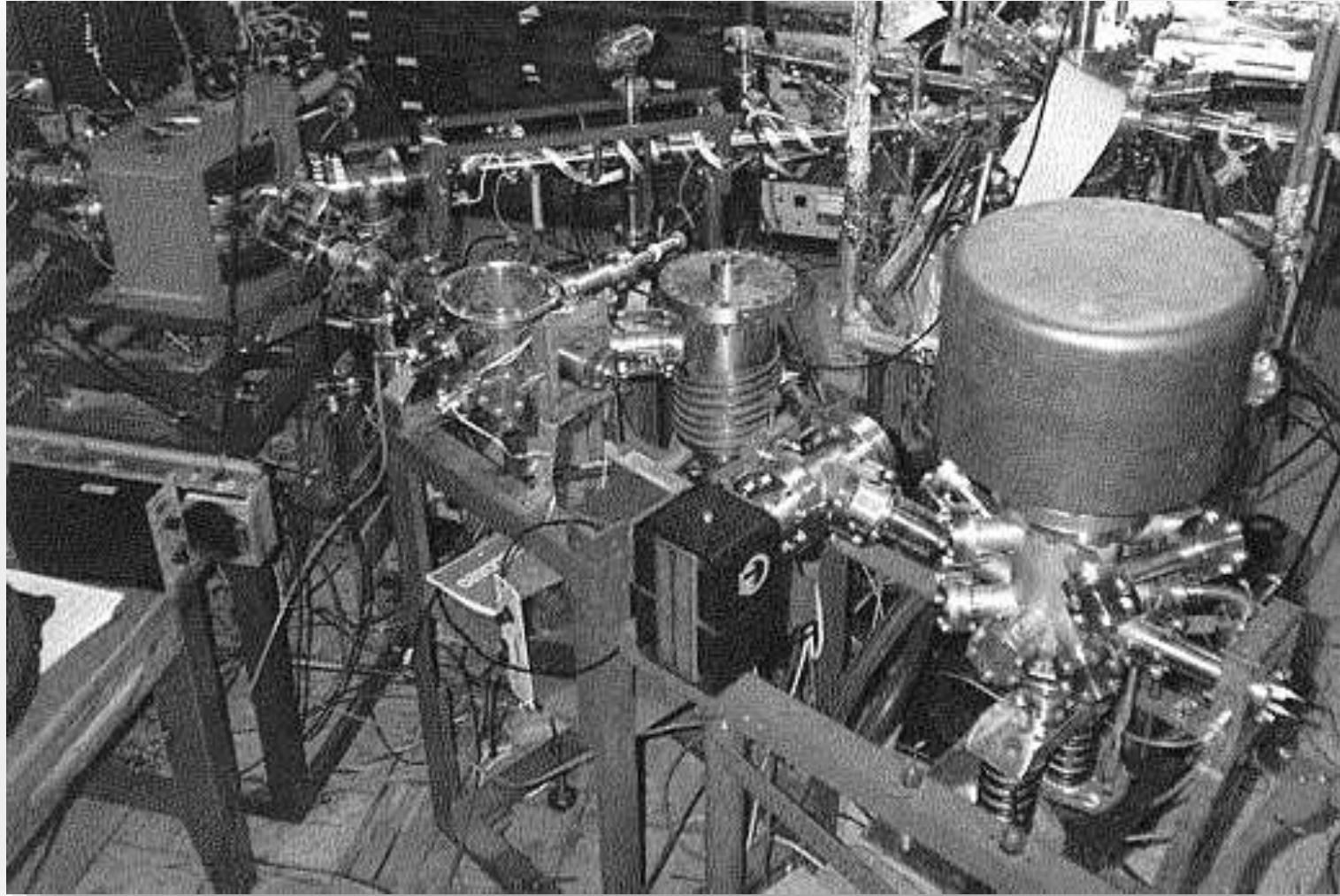
The new (still unnamed ) chamber



- ✓ Rutherford Backscattering Spectrometry (RBS)
- ✓ Elastic Recoil Detection Analysis (ERDA)
- ✓ Particle Induced X-ray Emission(PIXE)
- ✓ Nuclear Reaction Analysis (NRA)
- ✓ Ion-Atom Collisions
- ✓ Cold Target Recoil-ion Momentum Spectroscopy (COLTRIMS)
- ✓ Auger Electron Spectroscopy (AES)
- ✓ Wavelength Dispersive X-Ray Spectroscopy (WDS)



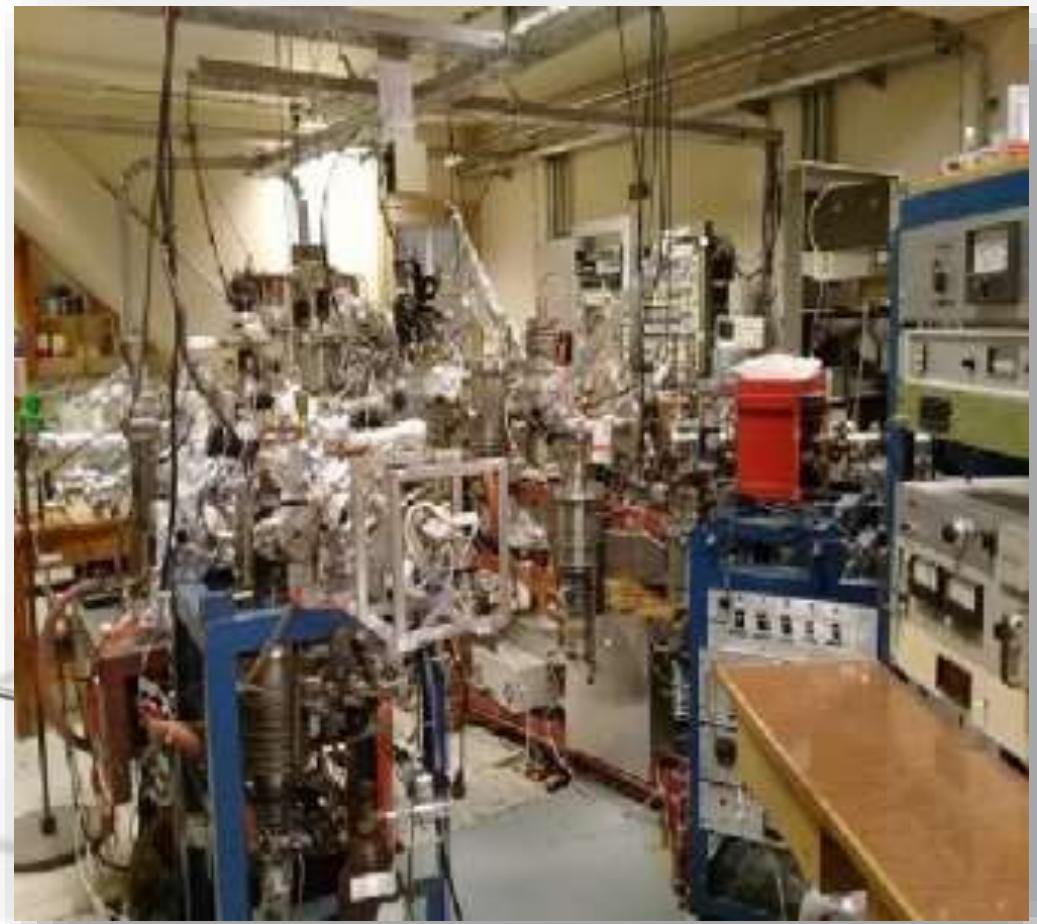
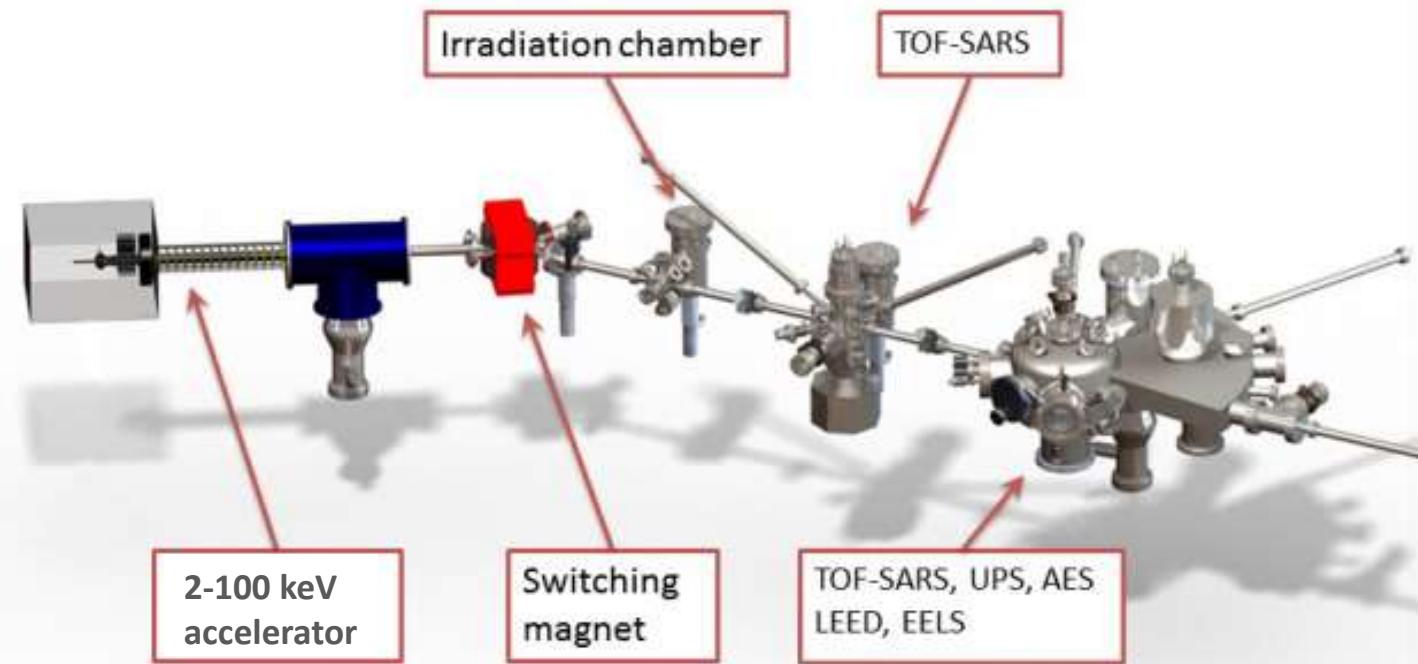
# KEVATRITO



The ``little'' Kevatron

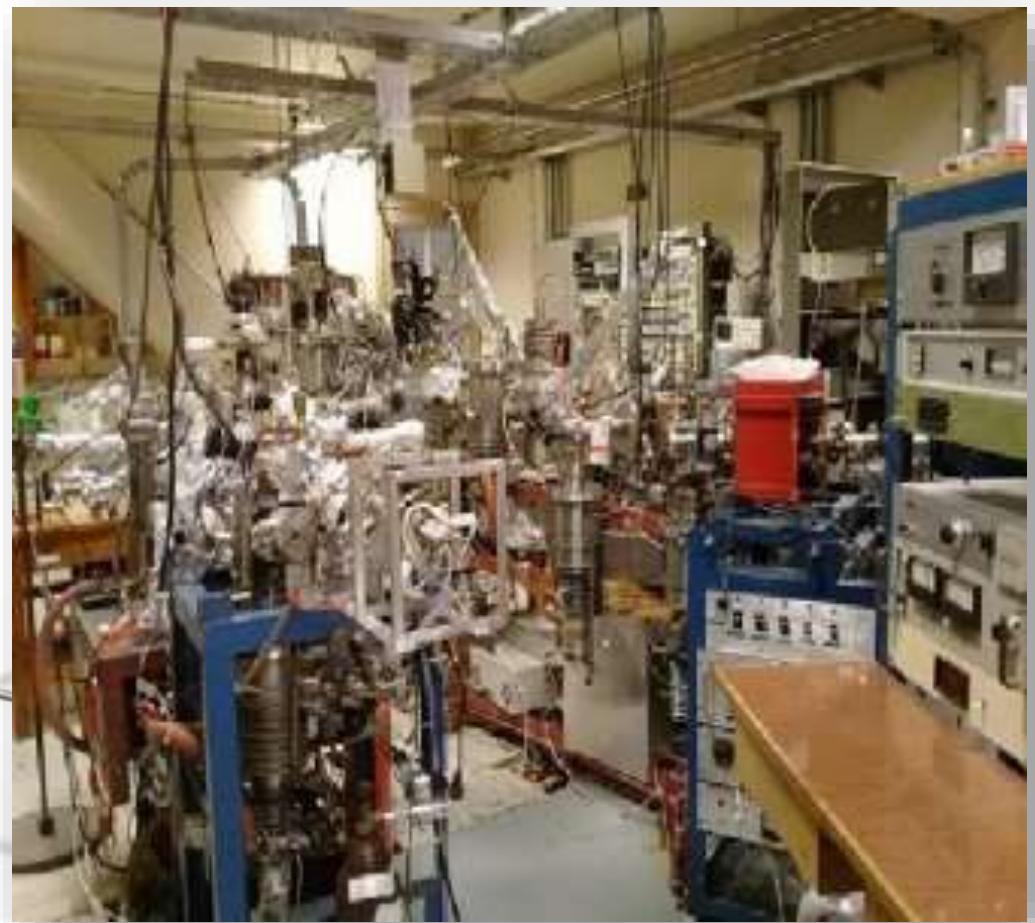
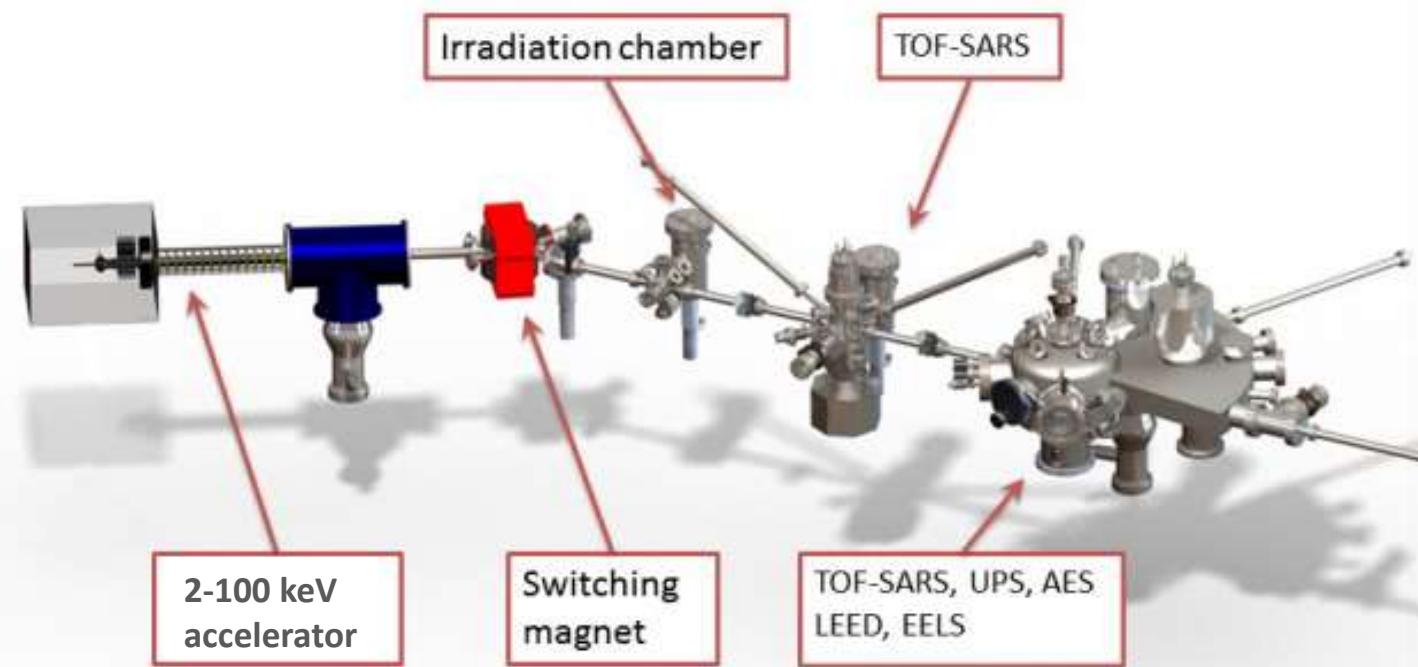


# KEVATRITO

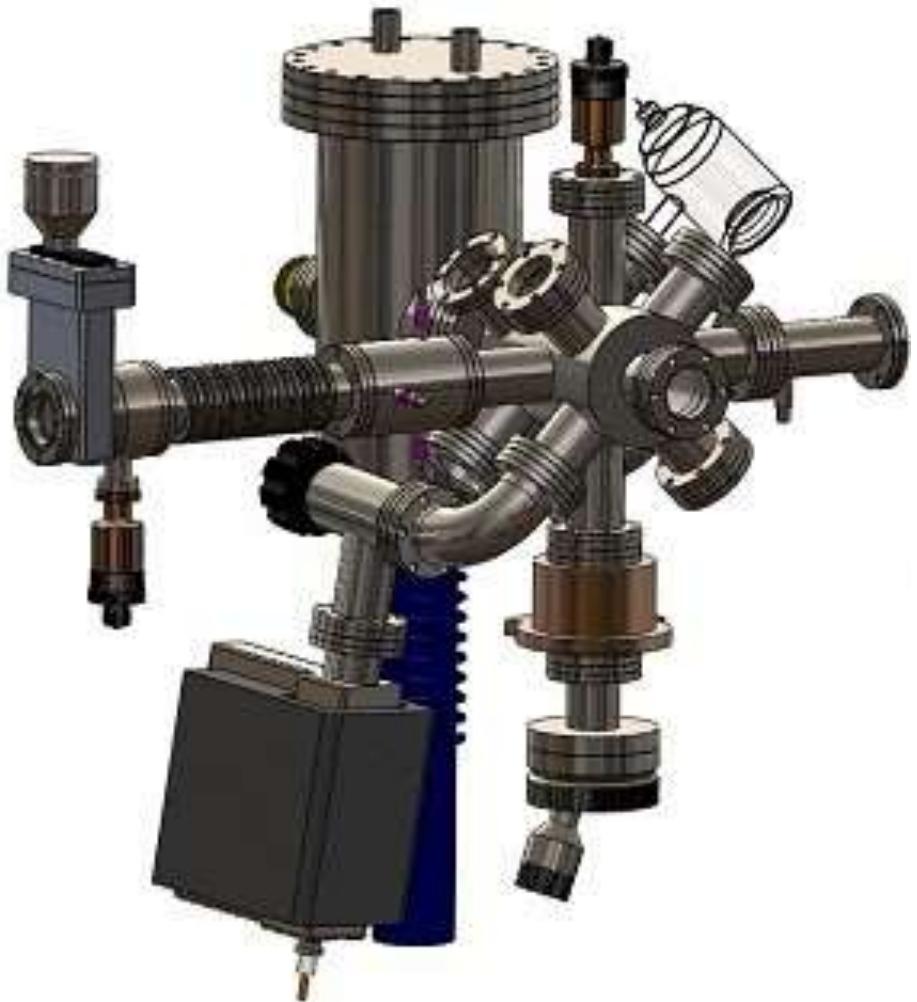


# KEVATRITO

- ✓ Time-of-flight scattering and recoiling spectrometer x 2 (TOF-SARS)
- ✓ Ultra-violet Photoelectron Spectroscopy (UPS)
- ✓ Auger Electron Spectroscopy (AES)
- ✓ Low Energy Electron Diffraction (LEED)
- ✓ Electron Energy Loss Spectroscopy (EELS)



# KEVATRITO



IRRADIATION CHAMBER

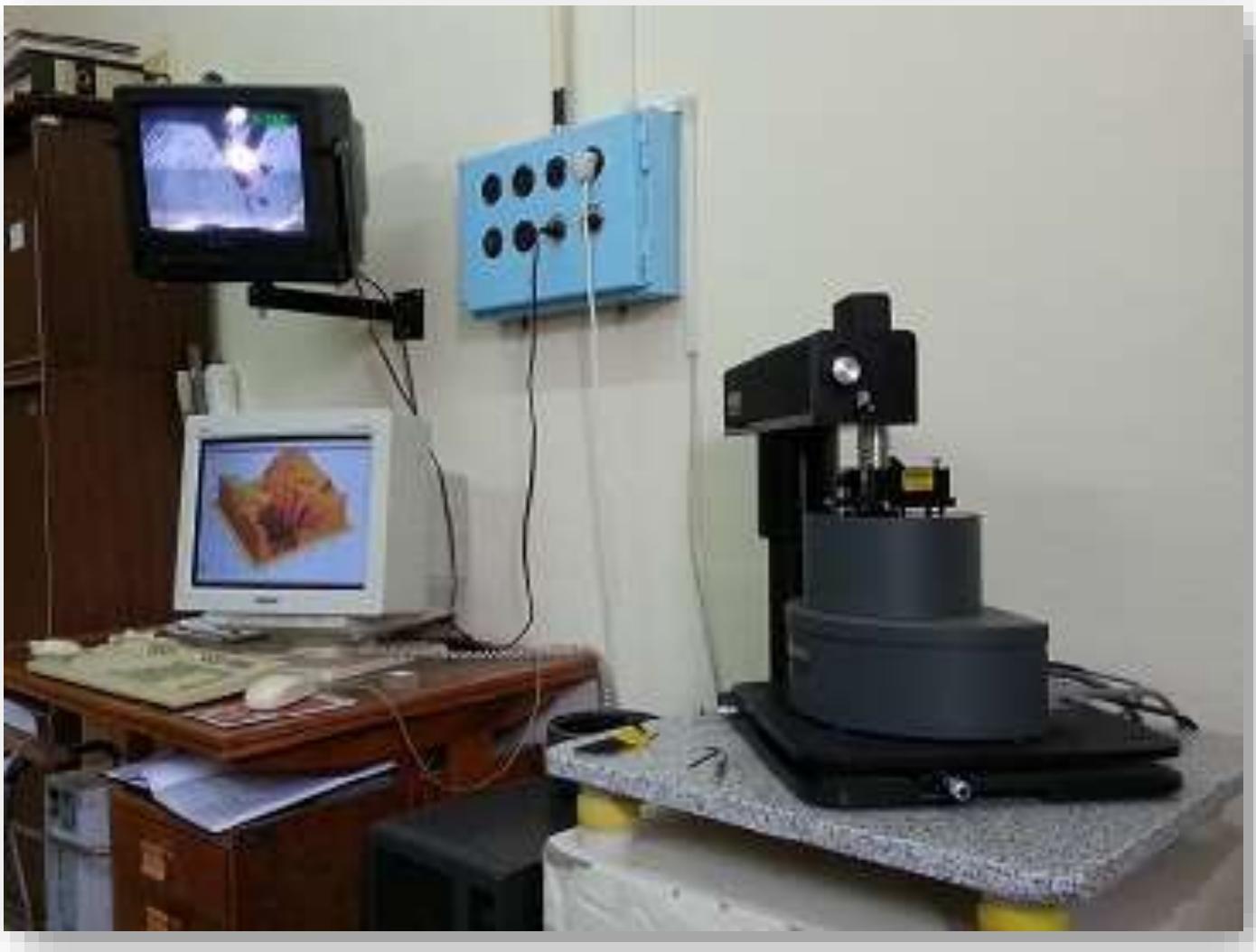


# STM / AFM MICROSCOPES



Omicron VT AFM 25 DRH microscope

# STM / AFM MICROSCOPES



Autoprobe CP microscope

# LOW-ENERGY-ACCELERATOR (LEA)



# XPS



Surface Analysis Equipment (SPECS)

# TUCUTRÓN



TUCUMán + kevaTRÓN = TUCUTRÓN



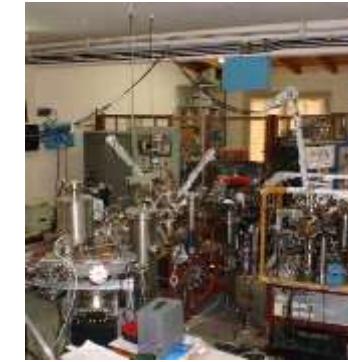
KEVATRON



TANDEM



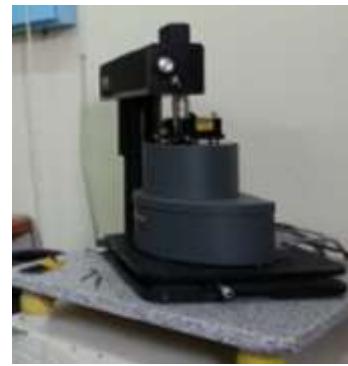
KEVATRITO



LEA



OMICRON AFM



AUTOPROBE CP

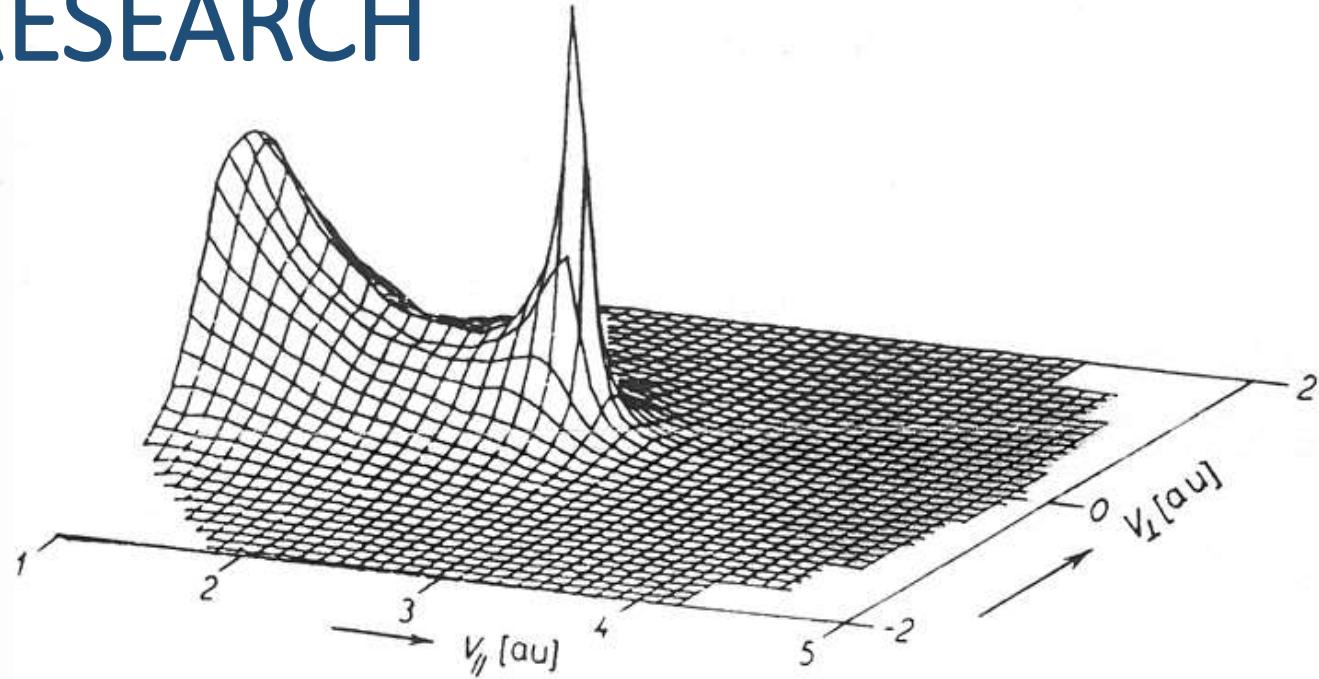
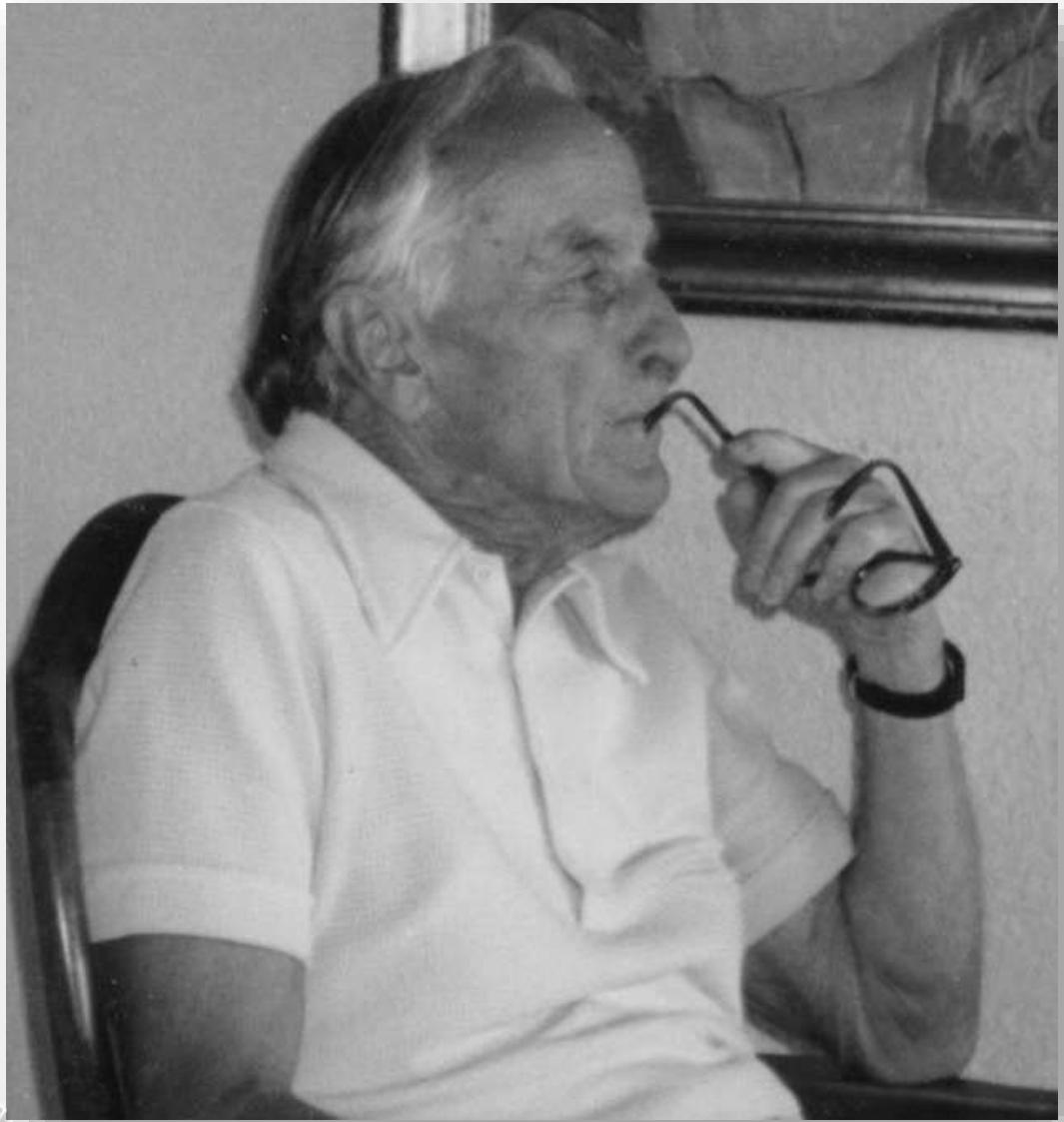


XPS SPECS



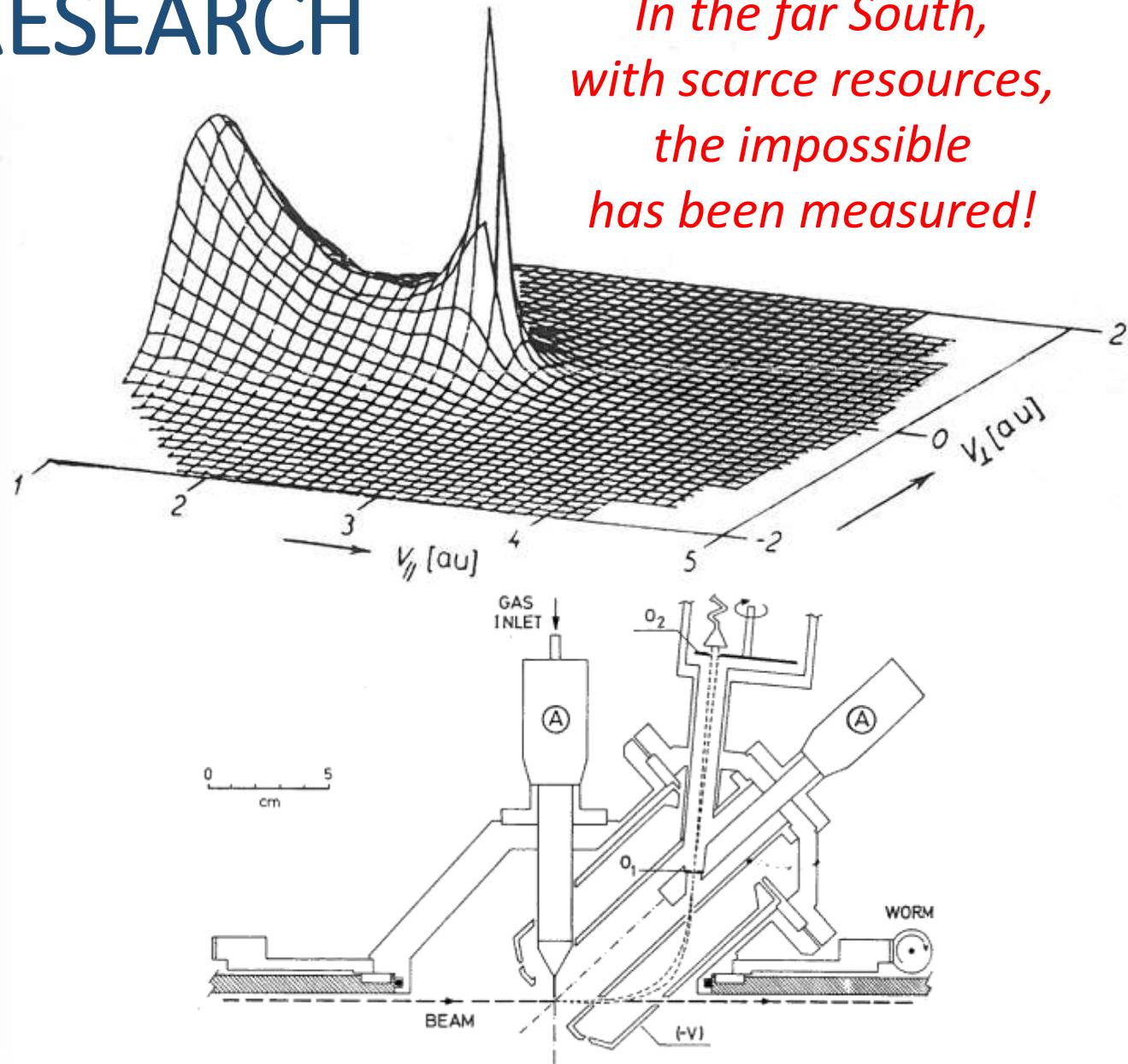
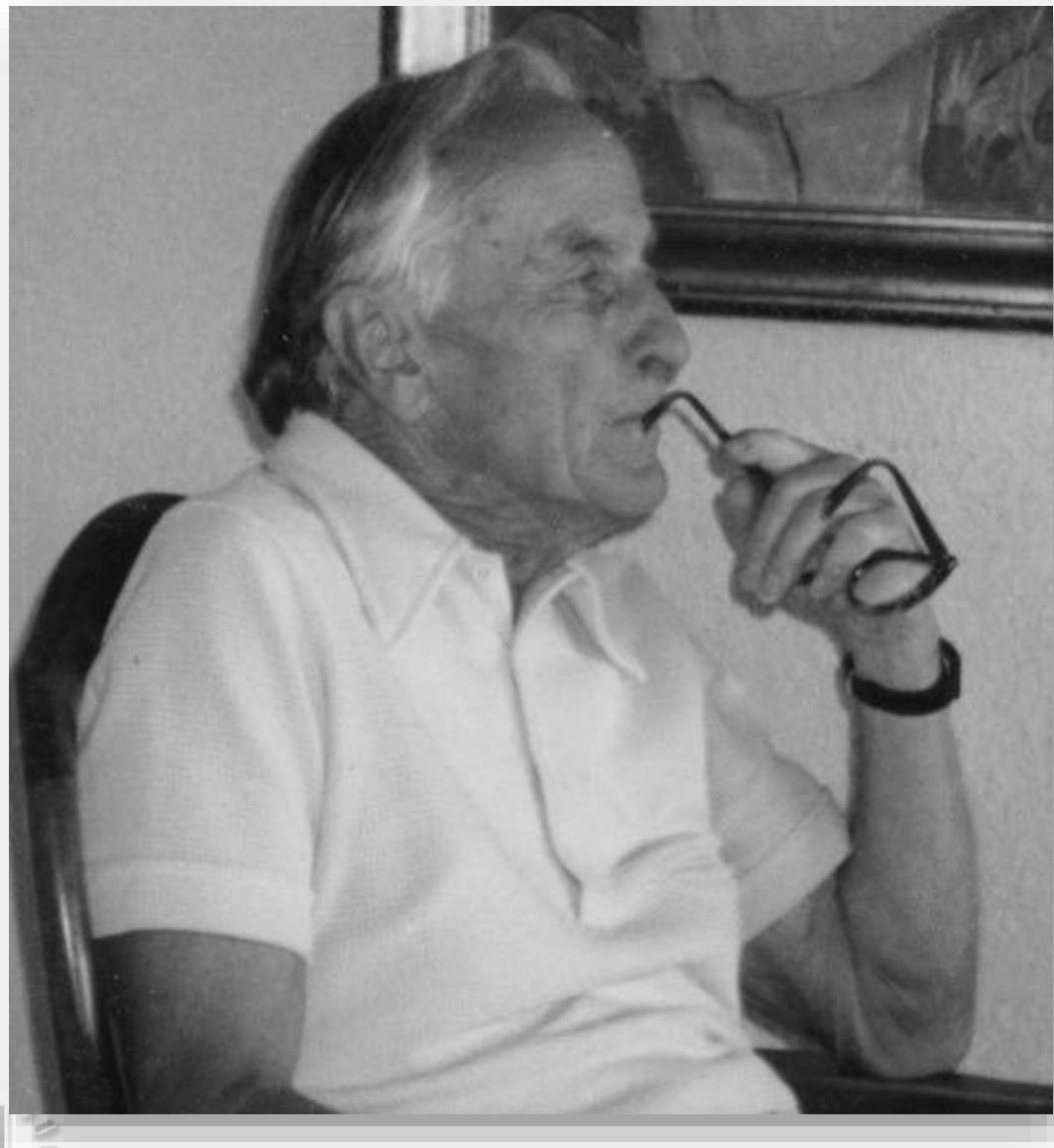
TUCUTRON

# BASIC RESEARCH



Wolfgang Meckbach

# BASIC RESEARCH



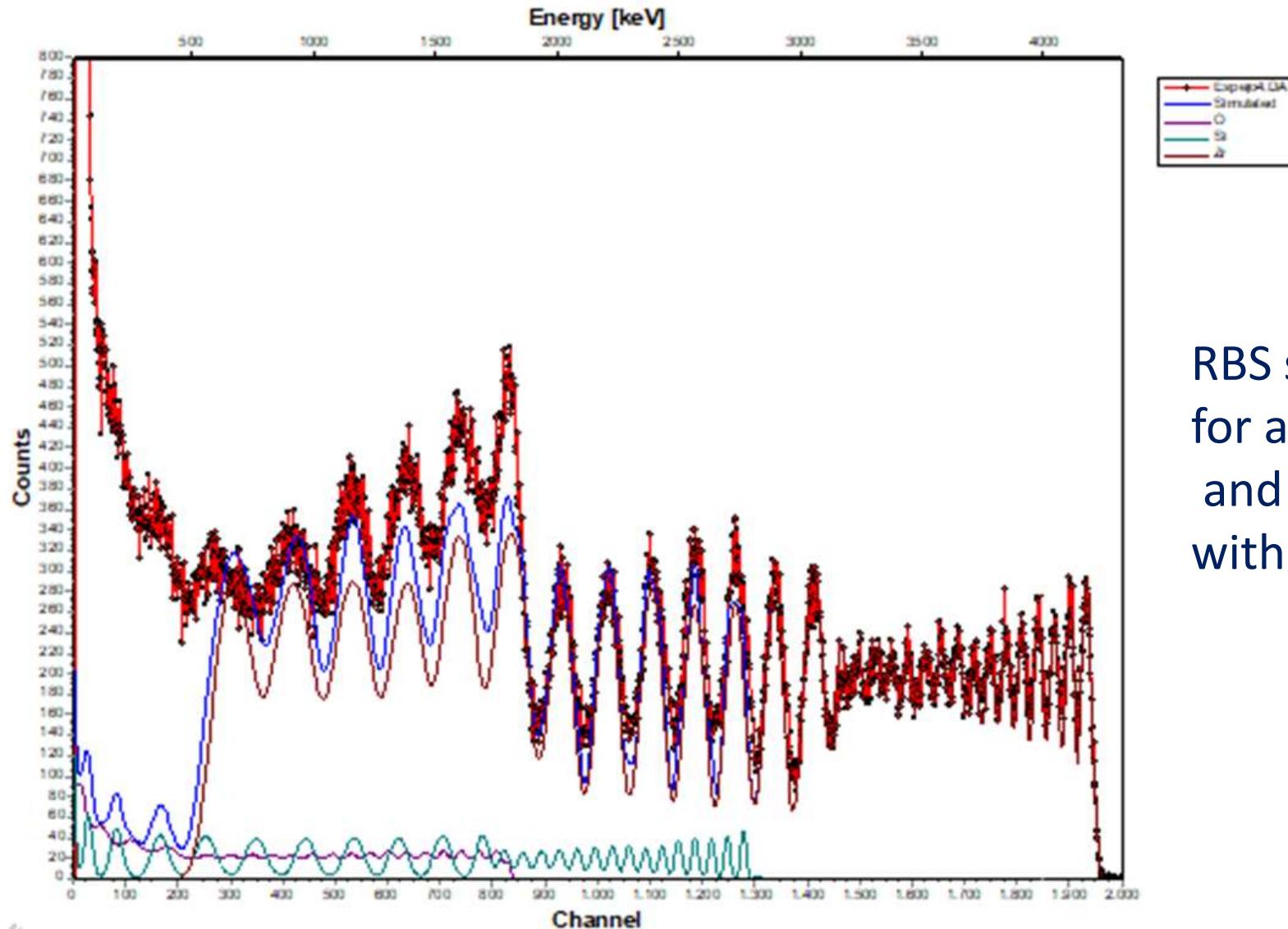
# CNEA



Headquarters of the National Atomic Energy Commission (Buenos Aires)

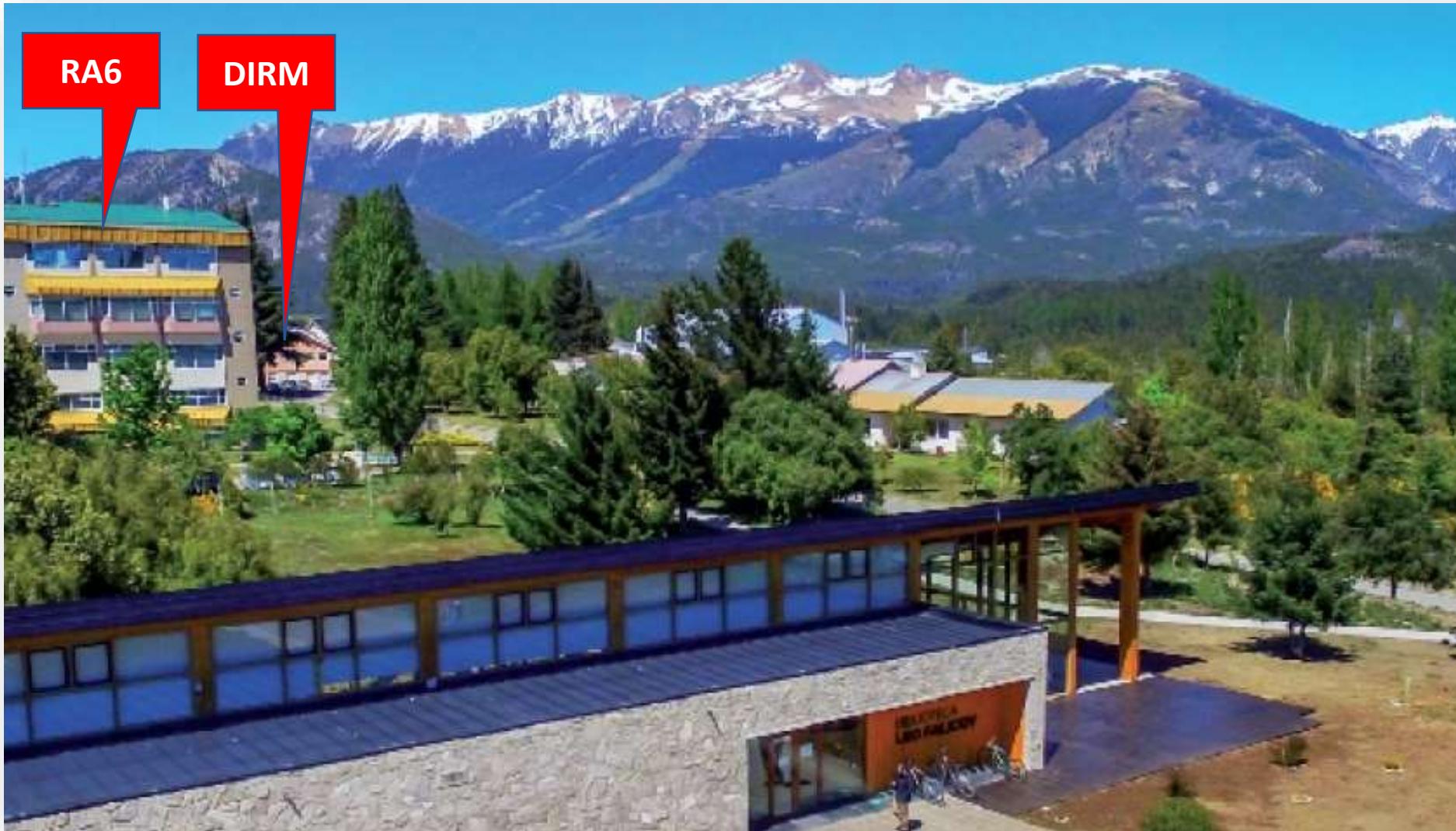


# LOCA ACCIDENT



RBS spectrum  
for a multilayer  $\text{ZrO}_2/\text{SiO}_2$  sample  
and the fit obtained  
with the SIMNRA software

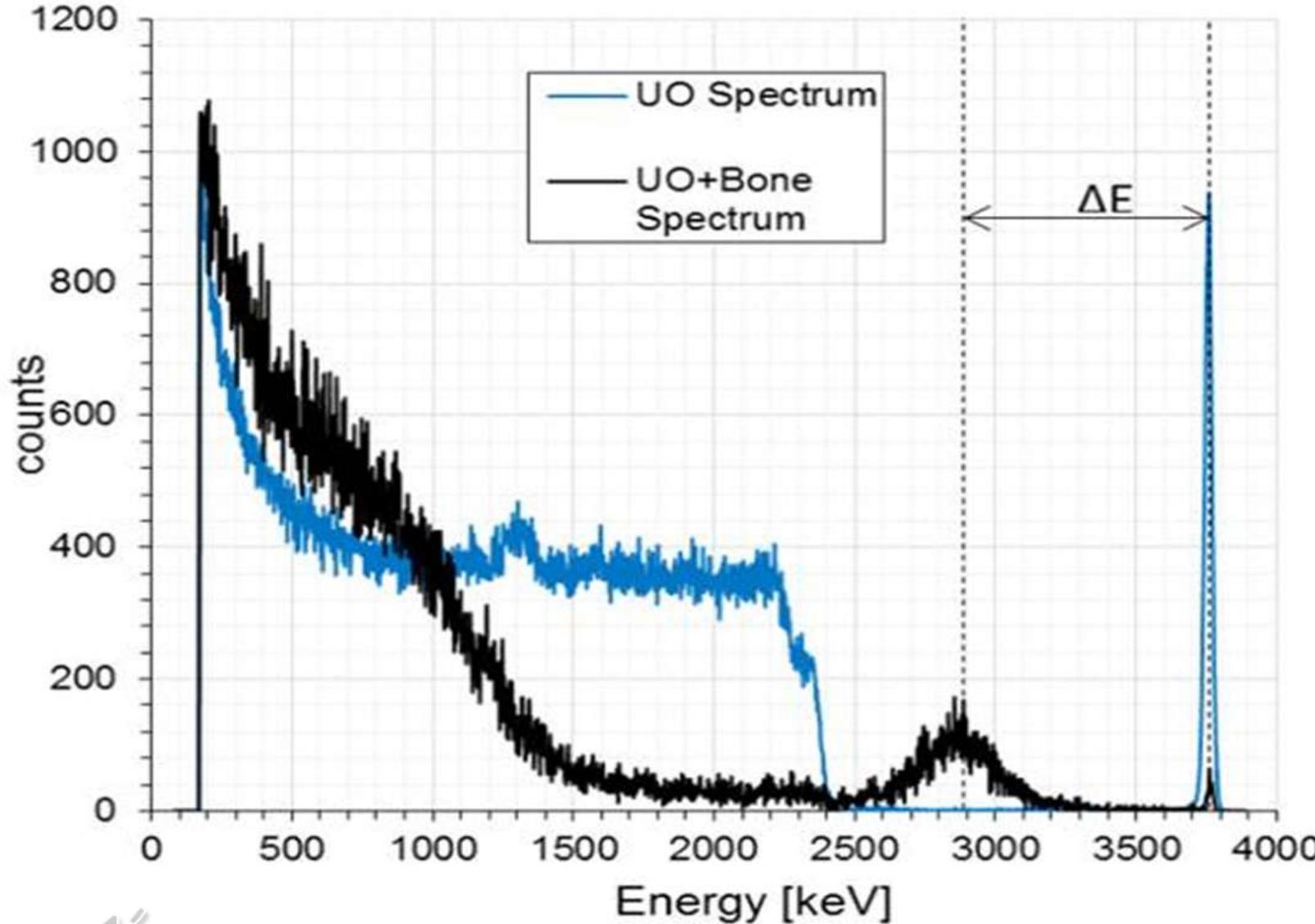
# RA-6 NUCLEAR RESEARCH REACTOR



The "neighborhood" of our Laboratory



# BNCT



Stopping power of  $\alpha$  particles  
in compact bone  
for research in BNCT  
(Boron Neutron Capture Therapy)

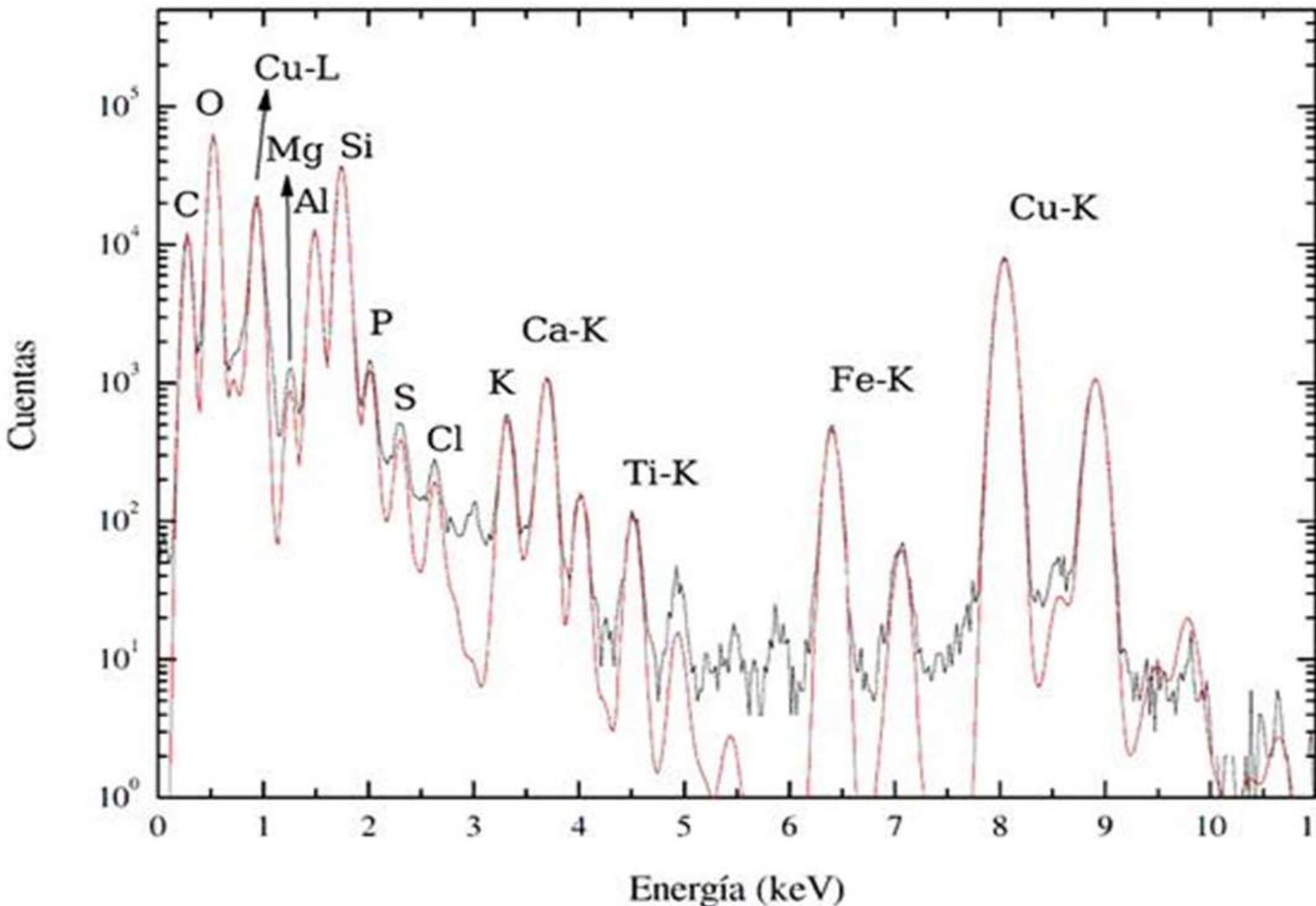


# ARCHEOLOGY AND PALEONTOLOGY



Cave of the Hands (Santa Cruz, Patagonia Argentina)

# ARCHEOLOGY AND PALEONTOLOGY



X-ray spectrum  
of a Patagonian  
archeological sample  
and fit obtained  
with the GUPIX software

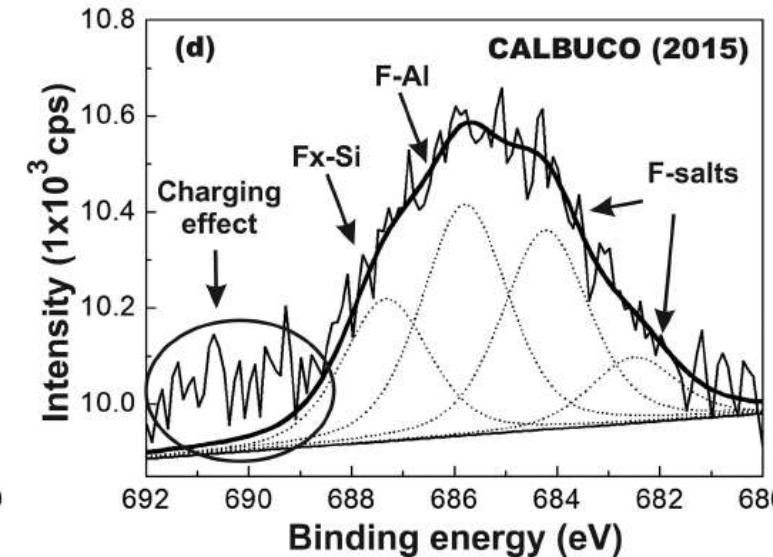
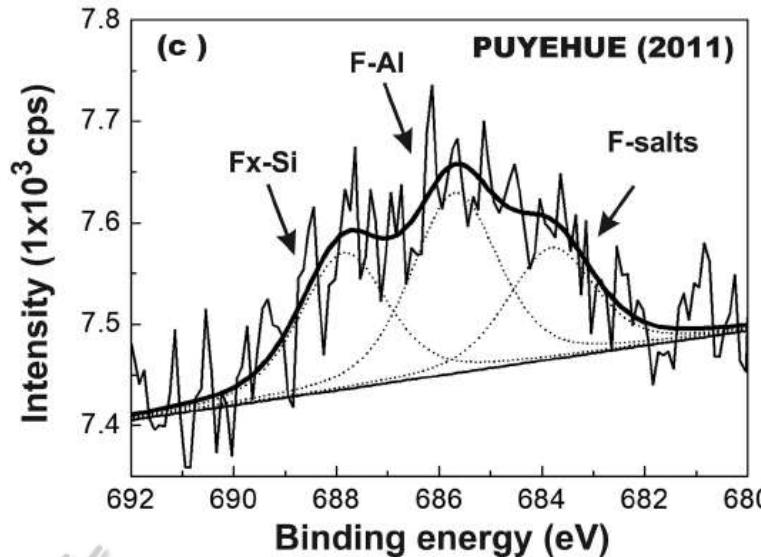
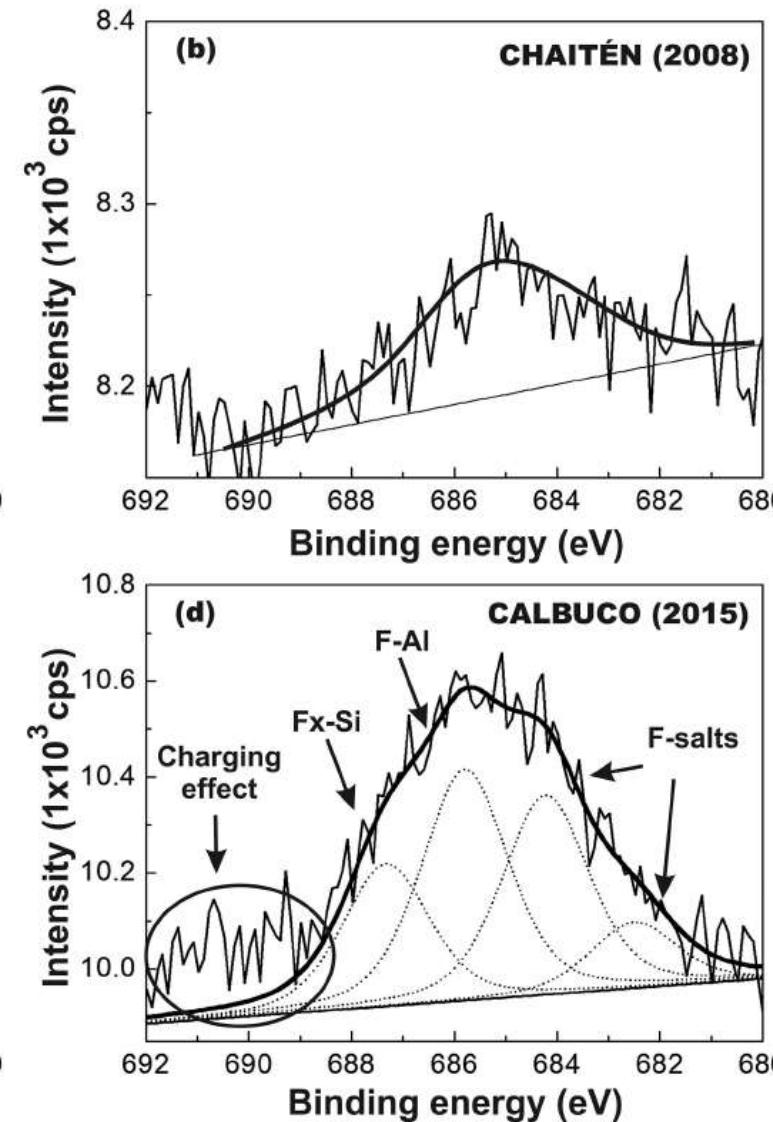
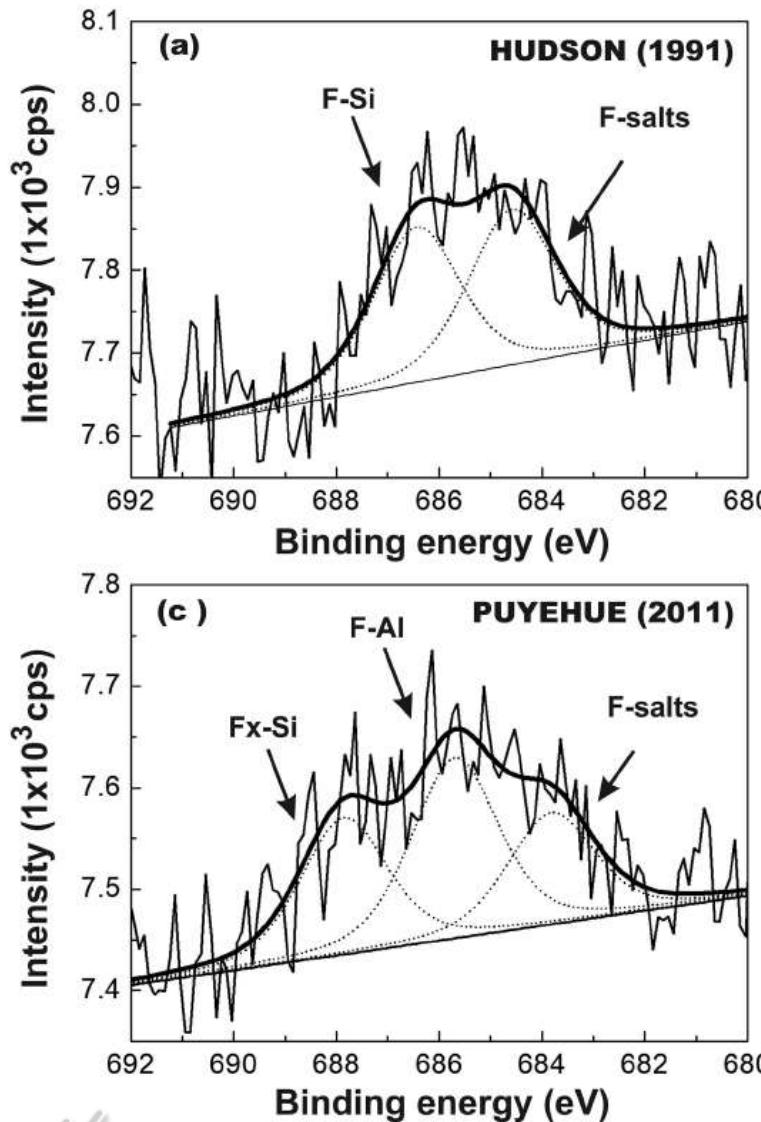
# EARTH SCIENCES



Ash cloud after the eruption of the Puyehue volcano (July 2011)



# EARTH SCIENCES



XPS Fluorine 1s spectra  
of volcanic ashes.  
Shirley background is shown  
as a solid curve



## LIATAN

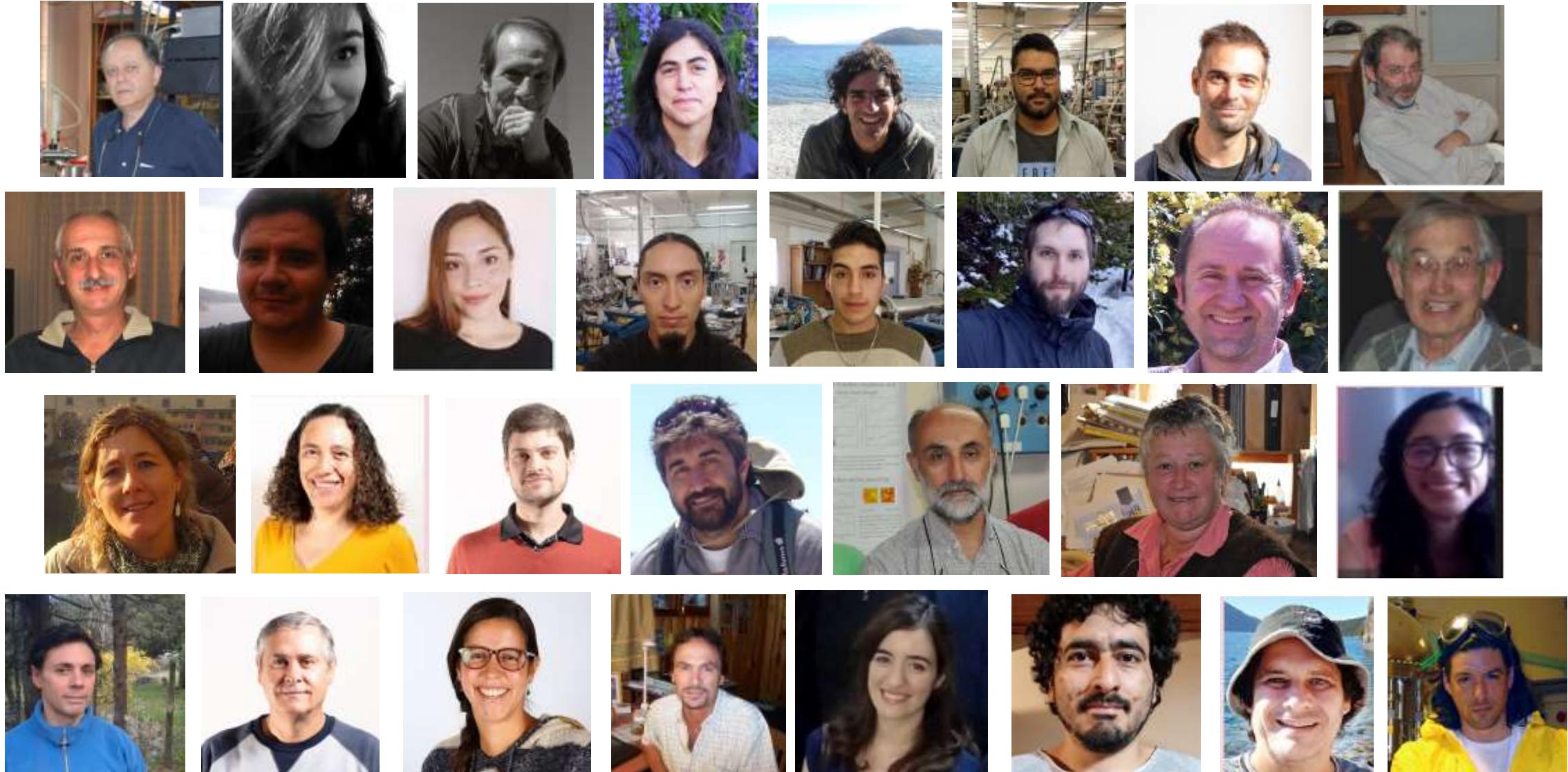
- ✓ Eugenio Miranda
- ✓ Andrés Humberto Sepúlveda
- ✓ Tabatha Rodríguez

Laboratorio de Investigaciones Aplicadas  
con Tecnologías Atómicas y Nucleares

Applied Research Laboratory  
with Atomic and Nuclear Technologies

First CRP visit: “Environmental pollution analysis in villages located close to highways”

# COME TO VISIT OUR LAB IN BARILOCHE...





Thank you

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**ACCELERATORS FOR RESEARCH  
AND SUSTAINABLE DEVELOPMENT**  
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