SUMMARY OF ACTIVITIES AT THE INSTITUTE OF NUCLEAR SCIENCES OF EGE UNIVERSITY TURKEY

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EGE UNIVERSITY
INSTITUTE OF NUCLEAR SCIENCES

HISTORICAL, FOUNDATION AND STRUCTURE

The Institute of Nuclear Science of Ege University was first founded in 1977 and re-established in March 1983. At present, the Institute comprises three main departments

- Department of Nuclear Sciences
- Department of Nuclear Technology and
- Department of Nuclear Applications

The main purpose of the activities of the Institute is to offer graduate education and training in nuclear sciences and to realize pure and applied research in the field.

Education and training activities of the Institute are carried out with 29 academic staff and part time academic staff from other faculties. Furthermore, the administration consists of 11 members.

PURPOSES

Due to the interdisciplinary nature of nuclear science, the education and the research activities of the three Departments cover several fields.

Theoretical and applied research have been conducted in nuclear physics, nuclear chemistry, nuclear electronics, nuclear fuel technology, health physics, nuclear spectroscopy, radioanalytical chemistry, radiopharmacy, radiobiology and radiation dosimetry.

The Institute collaborates with universities and the other establishments (Turkish Atomic Energy Authority (TAEK), Cekmece Nuclear Research and Training Center (CNAEM), IAEA, The Scientific Technological Research Council of Turkey (TUBITAK) both in its research and training activities.

NUCLEAR SCIENCES DEPARTMENT

- 2 professors, 2 associated professor, 2 assistant professors and 6 research assistants work in the Nuclear Sciences Department.

Research fields of the Nuclear Sciences Department are:

- Application of nuclear techniques (e.g. earthquake prediction, determination of sedimentation rates in seas and lakes, measuring the rate of soil erosion, analyzing trace elements
- Developing nuclear spectroscopy techniques and counting systems
- Measuring indoor and outdoor radon gas concentration
- Investigating radiation-matter interactions by simulation
- Determining natural and artificial radionuclides in environmental samples
- Application of luminescence techniques in personnel dosimetry and archaeological and geological dating.

NUCLEAR TECHNOLOGY DEPARTMENT

- 3 professors, 2 associated professors, 2 assistant professors and 2 research assistants and 1 expert are officiating in the Nuclear Technology Department.

Study areas of study within the Nuclear Technology Department are;

- Extraction, concentration and purification of uranium and thorium from mines and different sources
- Preparation of several nuclear fuel complexes and characterization studies
- Recovery of radioactive elements by using natural and synthetic adsorbents and synthesizing new adsorbents, examination of their usage for radioactive waste management
- Determination of some natural radionuclides in environmental samples
- Separation and determination of rare earth elements by using different separation methods

NUCLEAR APPLICATIONS DEPARTMENT

- 1 professor, 1 associated professor, 3 assistant professors and 2 research assistants are officiating in the Nuclear Applications Department.

  Research fields of the department are;

- Designing and synthesizing new radiopharmaceuticals labelled with radioiodine and technetium

- Quality controls for radiopharmaceuticals; investigating radiopharmaceutical potential by biodistribution studies on animals; dosimeter and microdosimeter studies for radionuclides used in nuclear medicine; counting stability constants of actinide complexes; designing and troubleshooting of nuclear spectroscopy systems; designing and developing microcontroller aided radiation detection and dose measurement systems; medical imaging

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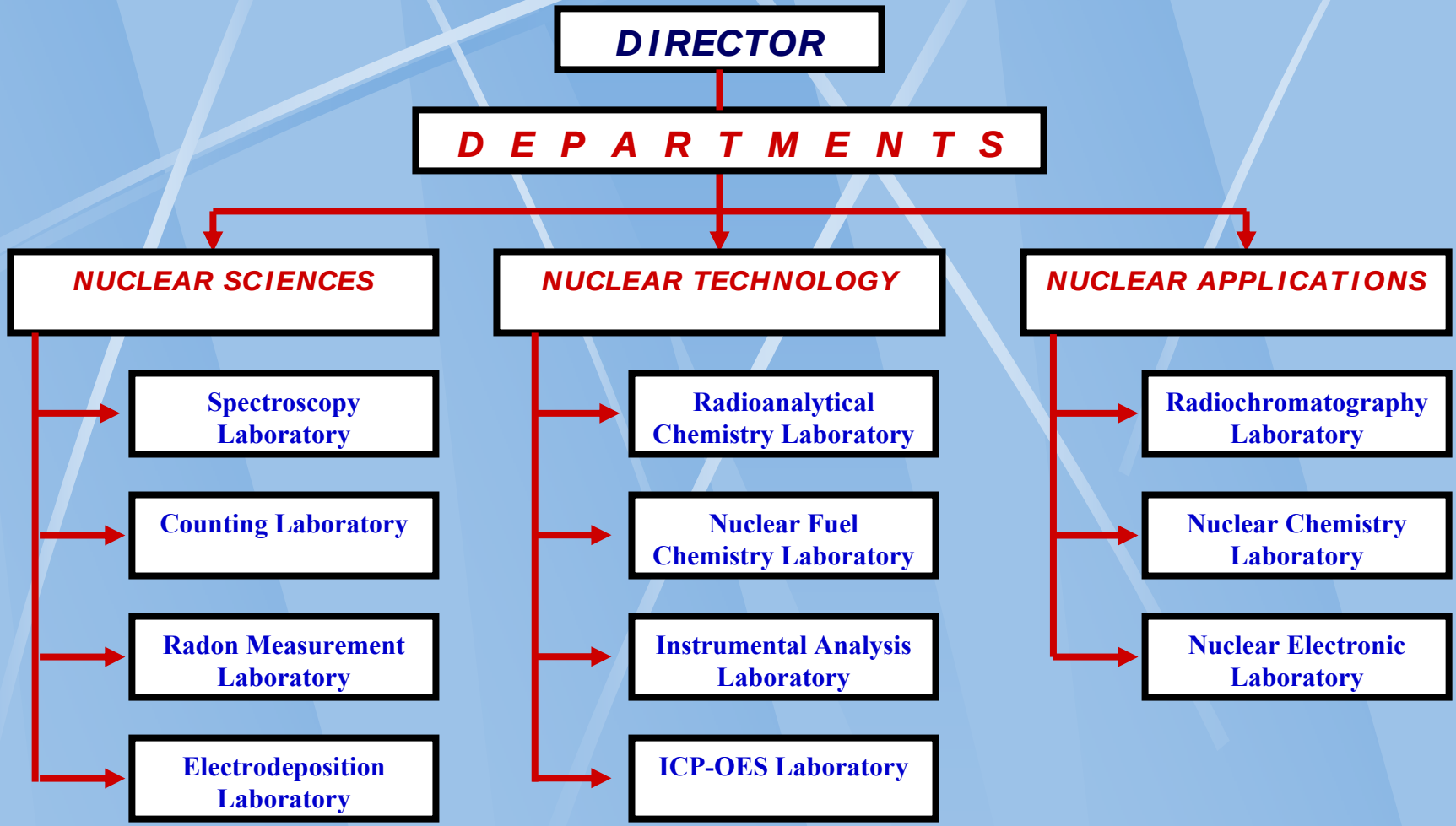


Luminescence Laboratory

- Luminescence measurement systems located at the laboratory can be used for both Thermoluminescence and Optically Stimulated luminescence measurements (TL, OSL). Luminescence from natural and artificial materials can be read and characterized for personal dosimetry, geological and archaeological dating purposes.

- Furthermore, the luminescence properties of samples following excitation by UV, X-ray and beta irradiations, are used to gain insights into their defect structures.

- Systems at the laboratory are;

  Harshaw TLD Reader
  Bausch and Lomb monochrometer
  PM tubes with cooled housing
  Edwards rotary and diffusion pumps
  Temperature controller unit
  Band pass, cut off and heat absorbent filters, several light sources
  Various TL dosimeters (LiF, $CaSO_4$, Al_2O_3 etc.)

Nuclear Spectroscopy Laboratory

- At the laboratory, distributions of the natural and artificial radionuclides originated from the terrestrial and aquatic ecosystems are investigated by gamma and alpha spectrometers, and atmospheric fluxes of natural radionuclides are observed periodically.

Other study areas;

- determining soil-erosion rate
- dating sediments,
- monitoring environmental radioactivity using bio-indicators
- developing nuclear spectroscopic techniques

Systems at the laboratory;

- HPGe 56cc, Tennelec detector,
- 3"x3" NaI(Tl) detectors (solid and well types),
- Thin berilium windowed 38mmx19mm NaI(Tl) detector (for low energized gamma rays),
- Silicon surface-barrier detector for alpha spectroscopy
- Multi channel Analyzer with its electronic accessories
- Mechanical pressure system to produce pellet

Deposition Laboratory

- For monitoring the origin, interactions and distribution of naturally occurring radionuclides (210Pb and 210Po) in samples collected from the atmosphere, terrestrial and aquatic ecosystems,
- Radiochemical separation, electrodeposition and alpha particle spectroscopy

Equipments available in the Laboratory;

- Electrodeposition systems
- ZnS (Ag) scintillation alpha counting system

Radium - Radon Laboratory

In the laboratory, determination of the activity concentration of radium and radon in air, water and soil samples is carried out. In order to predict the earthquakes, variations of radon concentration in soil gas and thermal water is regularly monitored as pre-cursors and investigate the possible correlation with seismological data.

Systems at Radium-Radon Laboratory are;

- Two RD 200 Radon counter and accessories
- A survey- gamma counter
- Air Tubes and vacuum pumps
- Collector systems

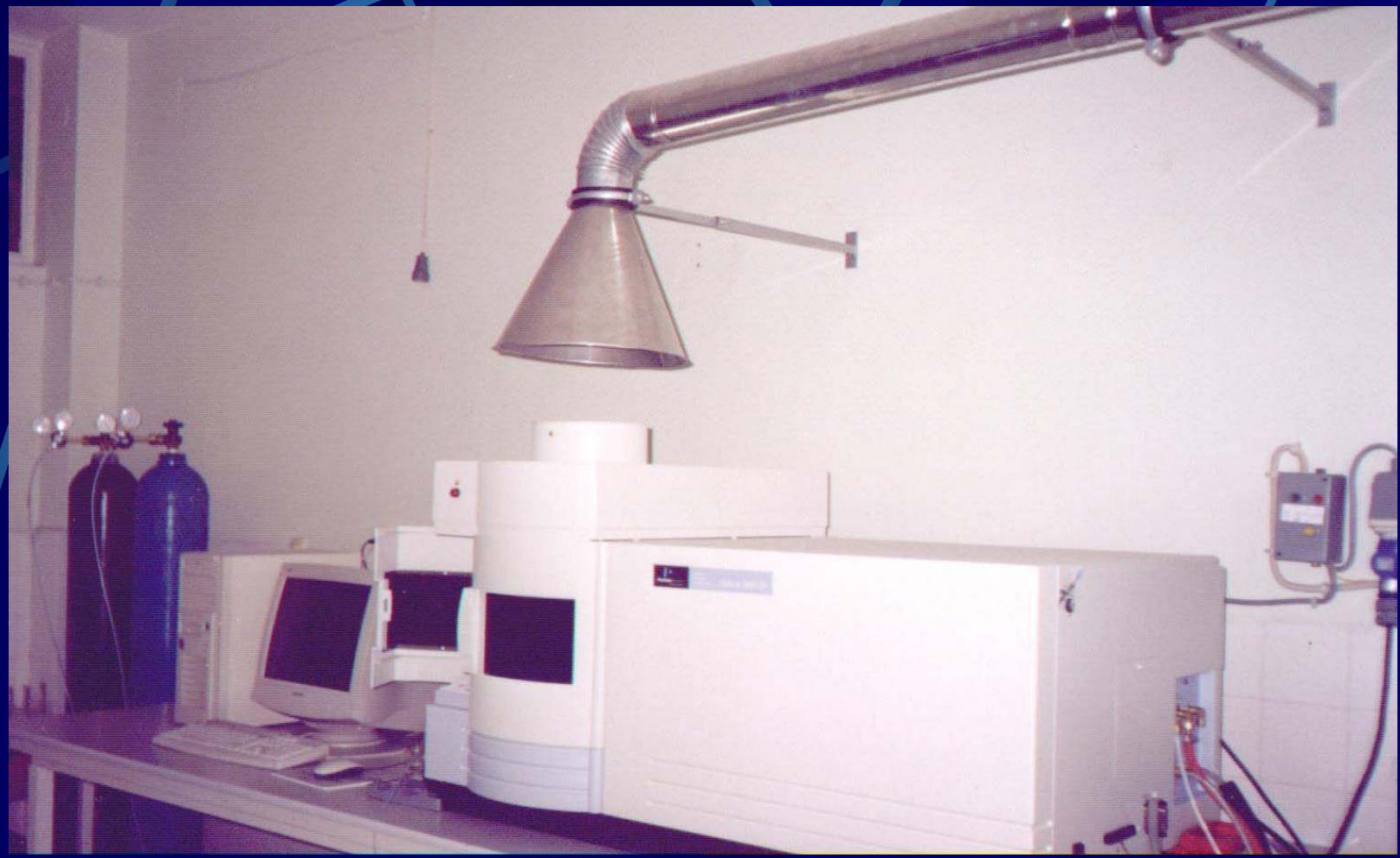
ICP - OES Laboratory

- The ICP-OES is a rapid technique which can simultaneously analyze about 70 chemical elements at trace, minor, major concentration levels. ICP-OES is used in many research areas.

- It is very suitable for environmental analyzes because it can measure lots of samples rapidly. It has a very wide calibration range (from ppb to % grade).

- In the laboratory, there is an ICP-OES equipment (Perkin Elmer Optima 2000 DV) available with its components

ICP-OES Laboratory



Nuclear Fuel Laboratory

- extraction, concentration and purification of uranium and thorium from mines and different sources;
- preparation of several nuclear fuel complexes and characterization studies;
- recovery of some radioactive elements by using natural and synthetic adsorbents
- and synthesizing new adsorbents, examination of their usage for radioactive waste management
- separation and determination of rare earth elements
- samples can be digested by microwave digestion system
- (Berghof-Speed wave)

Radioanalytical Chemistry Laboratory

- In the Radioanalytical Laboratory,
- several separation techniques have been used for concentrating and recovering of some radionuclides,
- adsorption behaviors and thermodynamic properties of some radionuclides from aqueous solution using by preparing natural, synthetic and biological adsorbents
- characterization of adsorbents
- Determination of several radionuclides in environmental samples using the radioanalytical techniques

Instrumental Analysis Laboratory

- Spectrophotometric, gross alpha and gross beta analysis of several samples prepared by wet chemical dissolution and after radiochemical separation
- Determination of uranium concentration in the various natural water samples by uranium analyser, and titroprocessor- dosimat systems

Present systems in the Instrumental Analysis Laboratory:

Uranium Analyzer (Scintrex)
Scintillation Alpha Counter System, ZnS (Ag) (Eberline)
Uv-Vis Spectrophotometer (Shimadzu)
Alpha-beta sample counter system Thermo-Eberline)
Titroprocessor and dosimat systems (Metrohm)

Radiochromatography Laboratory

- Radio High Performance Liquid Chromatography (Shimadzu) present in the laboratory

- High Performance Liquid Chromatography technique is suitable for materials used in industry and scientific applications such as amino acids, proteins, nucleic acids, carbohydrates, drugs and pestisics compounds. HPLC depends on interaction of sample analytics with the stationary phase and the mobile phase (methanol, water, acetonitrile and buffer solution) to effect a separation.

- System can be used for different purposes by upgrading with the following apparatuses;

  UV-VIS Detector
  Spectrofluorometric Detector
  Cd(Te) solid State Detector

Radiochromatography Laboratory

[HPLC and CdTe Solid State Detector (Radio-HPLC)]

Nuclear Chemistry Laboratory

In the Nuclear Chemistry laboratory:

- design and synthesis of radiopharmaceuticals labelled with I-131 and Tc-99m
- quality controls and investigation of radiopharmaceutical potentials
- dosimetry and microdosimetry of radionuclides
- iodine determination by isotope dilution analysis
- calculation of stability constants of actinides complexes

Nuclear Electronic Laboratory

- Designing, maintaining and troubleshooting of Nuclear Spectroscopy Systems
- Designing microprocessor boards (microprocessor Emulator, Eprom Programmer equipments)
- Designing microprocessor controlled radiation detection and dose measurement systems
- Power supply, oscilloscope, electronic boards and many circuit devices also available in Nuclear electronics laboratory

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RESEARCH INTERESTS

- Determination of natural and artificial radionuclides in environmental samples using different methods
- Measurement of indoor and outdoor radon concentration
- Use of different nuclear techniques in several fields (prediction of earthquake, determination of sedimentation rate in sea and lake sediments, erosion rate, trace elements analyses etc.)
- Development of nuclear spectroscopic techniques and the counting systems
- Recovery of some radionuclides using natural and synthetic adsorbents and synthesizing new selective adsorbents

EGE UNIVERSITY, INSTITUTE OF NUCLEAR SCIENCES

- Recovery, concentration and purification of uranium and thorium from ore or different sources
- Preparation and characterization of nuclear fuel compounds
- Studies on determination and recovery of rare earth elements by chromatographic methods
- Design and synthesis of radiopharmaceuticals labelled with radioactive iodine or Tc-99m and determination of their radiopharmaceutical potentials
- Thermoluminescence (TL), application of TL dosimeters, TL mechanism of dosimeter, luminescence dating
- Microdosimetry and dosimetry of radionuclides used in nuclear medicine
- Actinide complexes and calculation of their stability constants
- Nuclear Imaging

CURRENT AND RECENT RESEARCH PROJECTS

- **Researching of Geochemical Distribution of Radioactivity in the Van Lake and Van Lake Basin Surface Waters in the Aspect of Public Health**
- **Application of Environmental Radiation Measurements and Luminescence Techniques for Age Determination of Geological and Archeological Samples**
- **Determination of Total Alpha and Total Beta Activities in the Lakes Around Izmir-Turkey**
- **Determination of Ra-226 and Po-210 Activity Concentrations in some Agricultural Soils by Radiochemical Methods and Investigation of their Environmental Distribution**
- **Investigation of Distribution of Cs-137 in Agricultural Soils in the Buyuk Menderes Basin**
- **Determination of Soil Movements by using Radioactive Lead and Caesium Profiles in Agricultural Lands in the Yatagan Region formed by Separate Slope Surfaces and Percent Declivities**
- **Correlating earthquake activities to variations in radon concentrations in soil gas and thermal waters Doganbey Fault Zone, Izmir-Turkey**
- **Investigation of Correlation Between Earthquakes and Radon Concentrations in Soil Gas and Underground Water along Gediz Fault in Western Anatolia**

- Labeling of Benzodiazepin Drug (clordiazepoxide) with I-131 and Determination of Radiopharmaceutical Potential
- Preparing of Estrogen-Derivative Compounds Labelled with Tc-99m and Determination of Radiopharmaceuticals Potential
- Iodide Determination in Urine and Drinking Water Samples in Ege Region by Isotope Dilution Analyses
- Development of a Stand-Alone and Enhanced Digital Bus Controlled Single Channel Analyzer
- Development of Computer Based Troubleshooting Tools and Instruments

- Thanks for your kind attention

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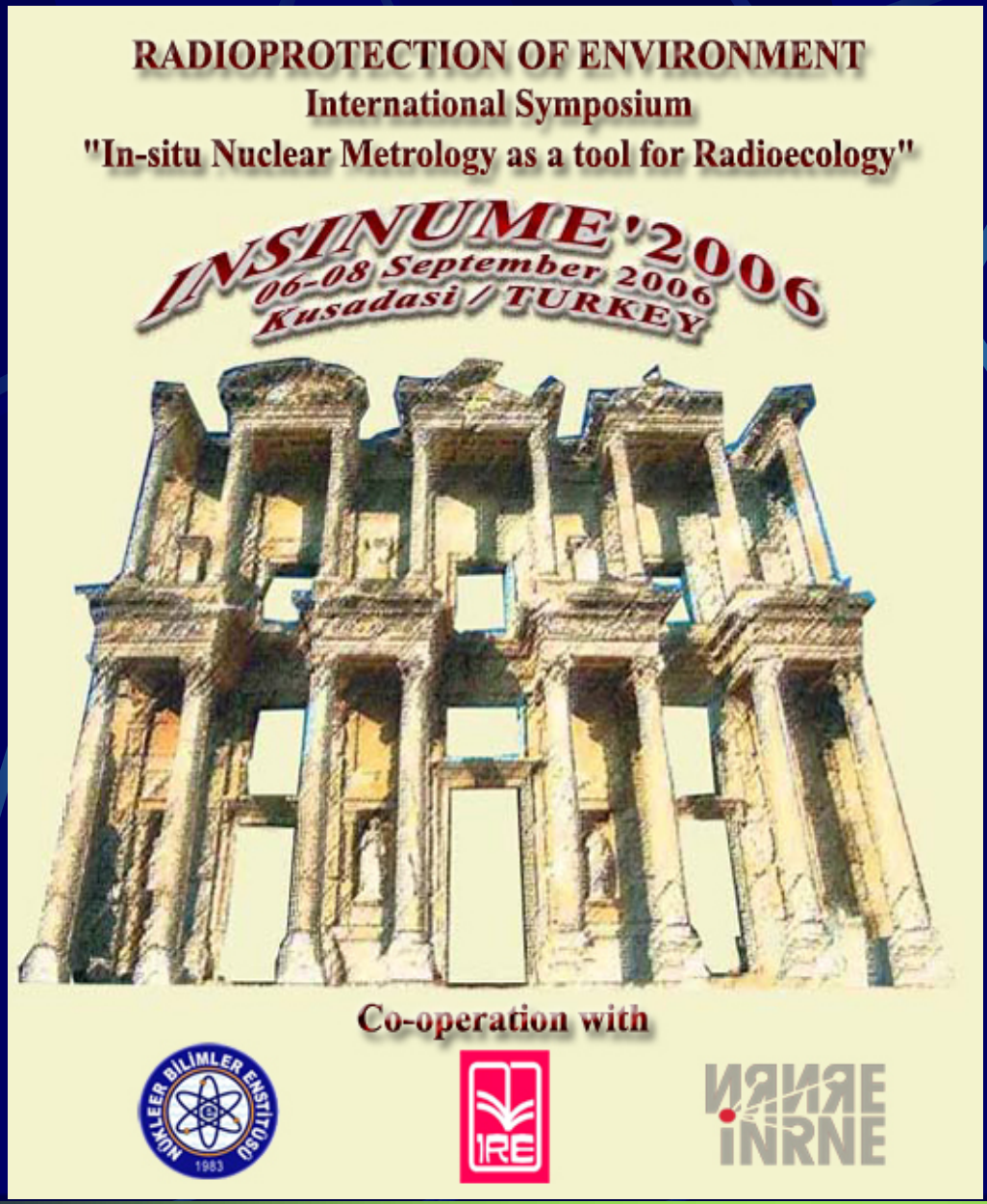

ANNOUNCEMENT

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