

# ***SCIENCE AND TECHNOLOGY IN THE REPUBLIC OF MACEDONIA***

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# *Republic of Macedonia*

*Landlocked country in SEE*

*1991 – Independence*

*Area 25,333 sq. km*

*Population 2.038.059*

*Capital city – Skopje*

*Language –Macedonian*

*Currency – MK Denar*

*GDP US \$ 3.7 billion*

*GDP/capita US \$ 1830*

# *Science and Technology in Macedonia*

## *Ministry of Education and Science (Department of Science and Technology)*

- the **governmental body in charge** for the S & T policy
- responsibility to **organize, finance, develop and promote** the science, technology development, technical culture, information system and international cooperation

## *Other Ministries with activities in the field of S & T*

- Ministry of **Economy**
- Ministry of **Agriculture, Forestry and Water Management**
- Ministry of **Health**
- Ministry of **Environmental protection**
- Department for **European Integration**

# ***SCIENTIFIC INSTITUTIONAL INFRASTRUCTURE***

- **Macedonian Academy of Sciences and Arts**
  - **Members (40)**
  - **Departments (5)**
  - **Research Centers (5)**
- **Universities (2 public and 1 private)**
  - **Faculties (34)**
  - **Public Scientific Institutes (14)**
  - **Colleges (3)**
- **RTD units within industry (20)**

# ***SCIENTIFIC HUMAN RESOURCES IN MACEDONIA***

## ***Number of researchers in R. Macedonia***

<i><b>No. researchers / Year</b></i>	<i><b>1998</b></i>	<i><b>1999</b></i>	<i><b>2000</b></i>	<i><b>2001</b></i>	<i><b>2002</b></i>
<b>FTE</b>	<b>1892</b>	<b>1838</b>	<b>1786</b>	<b>1630</b>	<b>1574</b>
<b>FTE/1000 Labour Force</b>	<b>2.3</b>	<b>2.3</b>	<b>2.2</b>	<b>1.9</b>	<b>1.7</b>
<b>Total</b>	<b>3275</b>	<b>3168</b>	<b>3094</b>	<b>2909</b>	<b>2838</b>

## ***Full-time equivalence by sectors of performance***

<i><b>Sector / Year</b></i>	<i><b>1998</b></i>	<i><b>1999</b></i>	<i><b>2000</b></i>	<i><b>2001</b></i>	<i><b>2002</b></i>
<b>Business enterprise</b>	<b>345</b>	<b>290</b>	<b>234</b>	<b>205</b>	<b>185</b>
<b>Governmental sector</b>	<b>800</b>	<b>828</b>	<b>862</b>	<b>734</b>	<b>671</b>
<b>Higher education</b>	<b>748</b>	<b>720</b>	<b>690</b>	<b>691</b>	<b>667</b>
<b>Total</b>	<b>1892</b>	<b>1838</b>	<b>1786</b>	<b>1630</b>	<b>1523</b>

# *Research and development in GDP*

*Share of R & D in national GDP (1998-2002) - 0.2%*

*Structure of Gross Domestic Expenditure on R&D by sector of performance*

<b>Sector of performance</b>	<b>1998</b> <b>(%)</b>	<b>1999</b> <b>(%)</b>	<b>2000</b> <b>(%)</b>	<b>2001</b> <b>(%)</b>	<b>2002</b> <b>(%)</b>
<b>Business enterprise</b>	<b>11.6</b>	<b>12.5</b>	<b>5.7</b>	<b>6.2</b>	<b>4.5</b>
<b>Government sector</b>	<b>35.7</b>	<b>45.7</b>	<b>34.1</b>	<b>51.5</b>	<b>50.8</b>
<b>Higher education</b>	<b>52.7</b>	<b>41.8</b>	<b>60.2</b>	<b>42.4</b>	<b>44.7</b>
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

# *R & D in Macedonia - problems*

- unsatisfactory level of **budgetary, public funds** for R & D
- insufficient **S & R infrastructure**, equipment & materials
- inefficient **institutional infrastructure**
- unsatisfactory **transfer of knowledge** and research results in the business sector
- inconvenient distribution of researchers by sectors (the number of **researchers in the business sector** is very low)
- small investments in **applied research** and **innovation**
- low level of **private investments** in R&D sector
- unsatisfactory level of **young researchers** ratio in the total number of researchers
- serious **brain-drain** problems.

*Research Center for Genetic Engineering and Biotechnology*

*Macedonian Academy of Sciences and Arts*

*Skopje, R. Macedonia*

- *Founded in 1986 as a research unit of MASA*
- *the National Reference Laboratory for Hemoglobinopathies has become a part of this Institution.*





- *500 m<sup>2</sup> laboratory space, 200m<sup>2</sup> offices, library*
- *Scientific staff of 12 and technical staff of 4 persons*

# *RCGEB -Equipment*



**The RCGEB is equipped with modern and sophisticated equipment. The current value of the scientific equipment of the institution is app. 1.2 million US\$. The equipment has been purchased continuously in the past 25 years, primarily from the funds supplied by research grants and funds provided by the Government of the R. Macedonia.**

# ***RCGEB ACTIVITIES***

## **RESEARCH**

**25 projects**  
**>100 papers**

## **EDUCATION**

**Postgraduate studies**  
**Specialization**  
**Training courses**

## **APPLICATION**

**Molecular diagnosis of**  
**inherited, infectious &**  
**malignant diseases**  
**Forensic identification**

# ***RCGEB - Research***

***25 research projects were performed***

- **Molecular characterization of *monogenic diseases***  
(*Hemoglobinopathies, cystic fibrosis, hemophilia, muscular dystrophy, Fragile X syndrome, cystinuria, male infertility etc.*)
- **Molecular epidemiology of *infectious diseases***  
(*Hepatitis C, Human papilloma virus, Chlamidia trachomatis etc.*)
- **Molecular basis of the most common *malignant diseases***  
(*Colon cancer, cervical cancer, lung cancer etc.*)
- **Molecular characterization of common *chromosomal aneuploidies***
- **DNA markers for *human identification***
- **Genetic studies of the *Ohrid trout***

***Financed by:***

- **Macedonian –American Joint Funds for Scientific & Technological cooperation**
- **National Institute of Health of the USA**
- **American Ministry of Agriculture**
- **ICGEB – Trieste, Italy**
- **Ministry of Science of the R. Macedonia**
- **Science funds of the Macedonian Academy of Sciences and Arts**

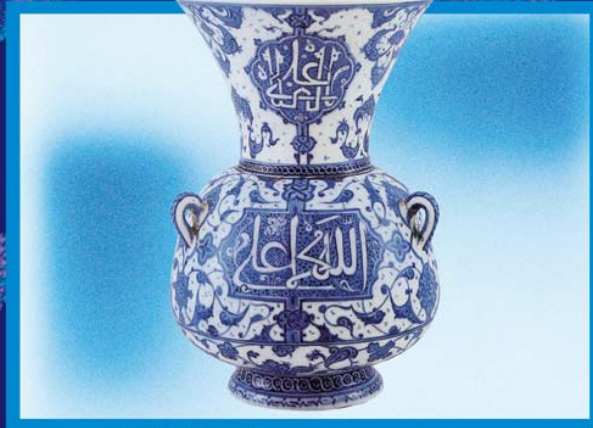
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# ***RCGEB - Education***

## ***Postgraduate studies***

- **Postgraduate studies in molecular genetics on several Faculties (Medicine, Biology, Technology, Agriculture)**
- **Coordinator of the Interdisciplinary postgraduate studies in Molecular Biology and Genetic Engineering**

## ***Specialization and training***

- **Specialization in Medical Genetics**
- **Short and long-term training to domestic and foreign scientists**

## ***Short advanced theoretical/practical courses***

- **sponsored by UNESCO, FEBS, ICGIB-Trieste**

# *RCGEB -Application*

## *Diagnosis and prevention of monogenic diseases*

~1000 cases/year for diagnosis

~30 prenatal diagnosis

## *Diagnosis of common chromosomal aneuploidies*

~200 prenatal diagnosis/year

## *Detection and characterization of infectious diseases*

~3000 cases/year

## *DNA Identification (paternity, criminal cases, missing persons)*

~30 cases/year

Participates in *quality control programs* for DNA testing of the common inherited diseases and forensic DNA analysis

# INSTITUTE OF EARTHQUAKE ENGINEERING AND ENGINEERING SEISMOLOGY (IZIIS)

University “Ss. Cyril and Methodius”  
Skopje, Republic of Macedonia





# IZIIS – General information

The Institute is *established in 1965* within the University "Ss. Cyril and Methodius", Skopje, upon recommendation of the United Nations International Consultative Board for Repair and Reconstruction of Skopje, following the 1963 Skopje earthquake, and *with substantial support from the United Nations and its specialized agencies, UNDP and UNESCO*

*Space* 8500 m<sup>2</sup> of laboratories, offices, lecture rooms and other premises

*Staff* 73 employees of which 20 PhD and 10 MSc

*Financial input* 25% Ministry of Education and Science  
75% from research and education activities

**Education**

**Training**

**IZIIS**

**Basic  
Research**

**Applied  
Research**

**Scope of Activities**

# *IZIIS – Education and Training*

- Postgraduate Studies for *Master & Doctor of Technical Science*
- ✓ *IZIIS DAAD Course* -The Master of Science course lasts two years and admits candidates from all Balkan countries
- ✓ *IZIIS TEMPUS Course* -The study has been prepared within the frames of the regional cooperation projects mentioned in the national priorities of the beneficiary countries (Albania, Croatia and Macedonia), whose common field of interest is earthquake engineering.
- Long and short term courses

# *Course on Aseismic Design and Construction (CADAC)*

**Twelve-week course**

**Organized by Government of  
R. Macedonia and Royal  
Government of Netherlands**

**Transfer of knowledge to  
participants from  
developing countries**

**>400 participants from 69  
countries during its 23 years existence**

**Has played an enormous role in mitigation of risk pertaining  
to EQ in developing countries**

# *Important International Research Projects*

- 6 Bilateral scientific research projects financed by the *US-Macedonian Joint Board* on Scientific and Technological Cooperation
- *USA (Paul Getti Inst.)* “Conservation of cultural and historical monuments”
- *IDNDR financed project RADIUS*: “Estimation of the Seismic Risk and Diagnosis of the Behavior of the Urban Areas During Strong Earthquakes” – 9 cities from Ethiopia, Chile, Indonesia, Ecuador, Turkey, Macedonia, Uzbekistan, Mexico, China
- *Belgium (Royal Observatory of Belgium)* “Seismic Hazard Analysis and Mapping of Belgium”
- *UNESCO* “Expert Assessment of Land Subsidence Related to Hydrogeological and Engineering Geological Conditions in the Regions of Sofia, Skopje and Tirana (Bulgaria, Macedonia and Albania)”
- *PHARE* “Conservation of cultural and historical monuments”
- *EU INCO-COPERNICUS EUROQUAKE* Project (England, Slovenia, Macedonia, Romania, Slovakia, Italy)

## *Important International Research Projects (cont.)*

- *Geophysical Institute of Italy* “Site Model and Analytical Investigation of Seismic Safety of the Emperor Marcus Aurelius Column in Rome”
- *NATO Science for Peace Program* “Seismic Assessment and Rehabilitation of Existing Buildings (Turkey, Greece, USA and Macedonia)
- *NATO Sfp* Development of Low-cost Rubber Bearing for Seismic Safety of Structures in Macedonia and Balkan (Macedonia, Albania, Italy and USA)
- *EU (Imperial College-London and Dipartimento Di Scienze-Trieste)* “Strong Motion Data Base”
- *UNICEF* “Physical and Psychological Management of Earthquake Related Emergencies in Schools in Macedonia”
- *EU* “An Advanced Approach to Earthquake Risk Scenarios with Applications to Different European Towns” (contribution institutions from France, Italy, Romania, Spain, Greece, Bulgaria and Macedonia)
- *GERMANY - DAAD : DYNET Project* “ Academic Reconstruction of Southeast Europe” – Universities Bochum, Skopje, Sarajevo and Nish

# Small selection of Research Projects

**Shaking table test of 1/30 scale model  
of PalaSport in Bologna – Model  
with wooden roof, 1993**

**Seismic strengthening, Conservation  
and Restoration of churches dating  
from Byzantine period in Macedonia, 1992**

**Optimum design of passive con-  
trolled steel frame structures, 2001**

**Analysis of seismic risk of existing  
column monuments in Rome by  
seismic shaking table testing of  
a model, 1995**

**Dynamic testing of the Alma-Ata  
bank model in scale 1/11 on Shaking  
tables, 1996**

**Evaluation of seismic resistance  
Of the 105Storey Ryugyong Hotel  
In Pyongyang, Korea, 1992**