EDITION 2019

science
research
technology
education
innovation

EXCELLENCE

FORTH

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ORGANIZATION: FOUNDATION FOR RESEARCH AND TECHNOLOGY - HELLAS

ADDRESS: 100 NIKOLAOU PLASTIRA STR., VASSILIKA VOUTON • GR 700 13, HERAKLION CRETE, GREECE

TEL.: +30 2810 391500-2 • **FAX:** +30 2810 391555 • **E-MAIL:** central@admin.forth.gr • **WEB SITE:** www.forth.gr

Foundation for Research and Technology - Hellas

@FORTH.ITE | @FORTH_ITE | FORTH_ITE

Description

The Foundation for Research and Technology - Hellas (FORTH) was founded in 1983. It is one of the largest Research Centers in Greece with well-organized facilities, highly qualified personnel and a reputation as a top-level Research Institution worldwide.

FORTH comprises 8 Research Institutes conducting specialized scientific research in strategic high-added value sectors, focusing on interdisciplinary research and development (R&D) activities in areas of major scientific, societal and economic interest, such as: Lasers and Photonics, Microelectronics, Advanced Materials/Nanotechnology, Molecular Biology and Genetics, Biotechnology, Computer Science, Bioinformatics, Precision Medicine, Systems Biology, Robotics, Telecommunications, Applied and Computational Mathematics, Chemical Engineering Sciences, Energy, Environment, Human and Social Sciences, Astrophysics and Astronomy.

FORTH cooperates closely with prestigious Academic and Research Institutions in Greece and abroad and takes a significant interest in the education and training of young scientists.

Today, FORTH plays a substantial role in the planning and implementation of Smart Specialization Strategies (RIS3) in Greece.

A Research Center of Scientific Excellence

Research Institutes

in Heraklion

- Institute of Electronic Structure and Laser (IESL)
- Institute of Molecular Biology and Biotechnology (IMBB)
  - Biomedical Research Division **in Ioannina**
- Institute of Computer Science (ICS)
- Institute of Applied and Computational Mathematics (IACM)
- Institute of Astrophysics (IA)

in Rethymnon

- Institute for Mediterranean Studies (IMS)

in Patras

- Institute of Chemical Engineering Sciences (ICE-HT)

in Chania

- Institute of Petroleum Research (IPR)

Units

- Crete University Press (CUP)
- PRAXI Network
- Science and Technology Park of Crete (STEP-C)

FORTH in Numbers

FORTH researchers have received major Awards and Distinctions from International Scientific Societies, indicatively:

European Research Council, American Physical Society, Optical Society of America, Royal Society of Chemistry, Russian Optical Society, European Society of Rheology, European Science Foundation, FENS-Kavli Network of Excellence, AXA Research Fund, Academia Europea, European Molecular Biology, Helmholtz Association, Bodossakis Foundation, Empirikion Foundation, American Association for Aerosol Research, American Institute of Chemical Engineers, Euroscience, Association for Computing Machinery, European Association for Artificial Intelligence, European Institute for Health Records, Society for Medical Innovation and Technology, Galien Foundation, Alexander von Humboldt Foundation, Hellenic Federation of Enterprises, IBM, Getty, Ericsson, Microsoft.

- **8 Institutes in 5 cities of Greece**
- **3 Units**
- **31 ERC Grants**
- **150 Marie Curie Excellence Awards**

1st

- **among the Research Centers in Greece, in all comparative evaluations conducted by international committees**
- **in Nature INDEX, among the top Research Institutions in Greece** *(1/1/2018 - 31/12/2018)*
- **in Greece in the Ranking Web of Research Centers, Webometrics 2018**
- **in Greece and 17th among the 50 top European Research Centers in attracting competitive Funding** *(H2020 Monitoring Report, 2014)*

The People (2018)

Members: 1,404

Permanent staff: 347

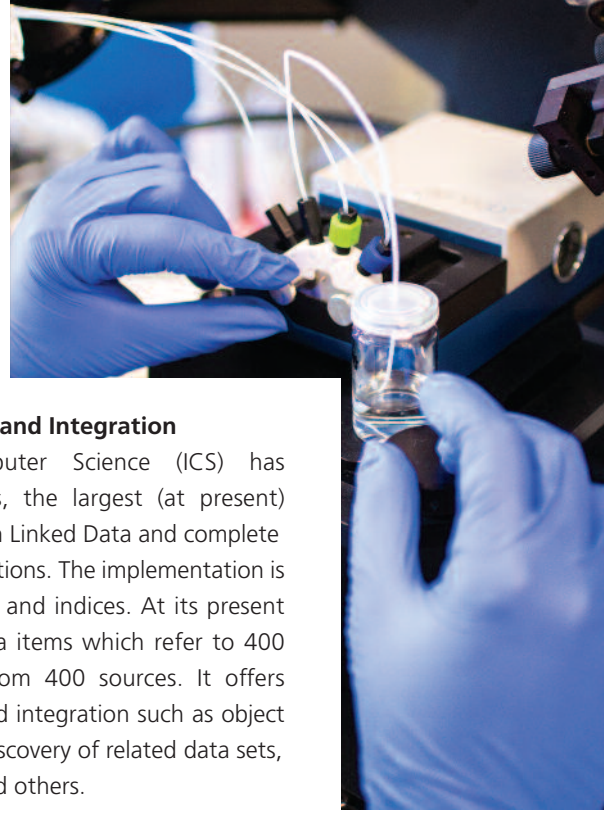
Researchers: 100

Collaborating Faculty Members: 147

Fellowships/year (incl. postdoctoral): 568

Research associates, technical and administrative personnel: 589

significant **Innovations**



Laser in Cultural Heritage

The Institute of Electronic Structure and Laser (IESL) has developed a novel laser-based system –a worldwide innovation– for the cleaning of the Parthenon West Frieze and the Acropolis sculptures, which received the 2012 Keck award by the International Institute for Conservation of Historic and Artistic Works (IIC). The laser system utilizes two different beams, one in the UV and one in the IR, with a controlled intensity ratio. The system is both effective and safe for the ancient masterpieces, without any undesirable side effects. This innovative technology led to the establishment of a common research lab with the Palace Museum of the Forbidden City in Beijing.

Portable Molecular Diagnostic System

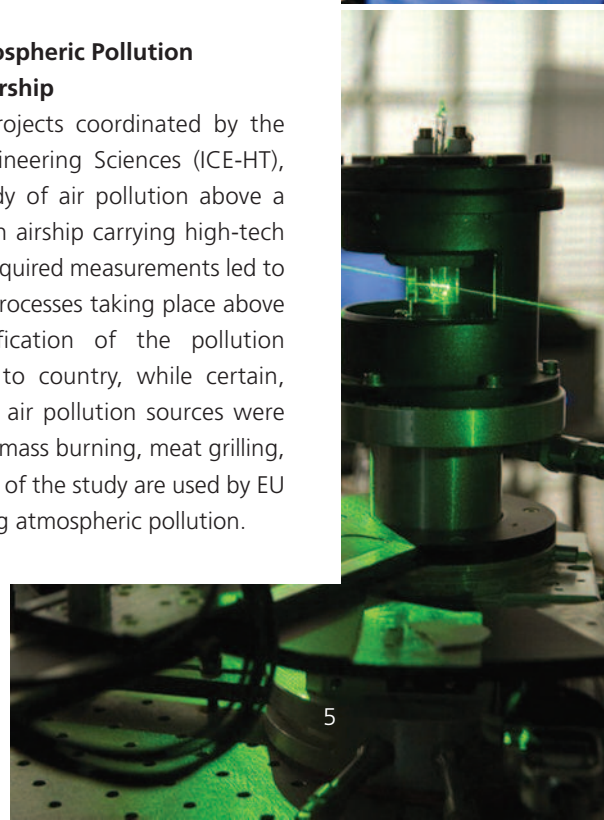
The Institute of Molecular Biology and Biotechnology (IMBB) has pioneering work related to the development of a portable molecular diagnostic system for performing DNA tests, with application in the fields of healthcare and agro-food safety. Based on this patented technology, nucleic acid detection can take place in a simple, rapid and cost effective manner, thanks to the use of acoustic biochips and 3D-printing technology. The system is currently used for the detection of viruses, pathogens and genetic mutations in a variety of samples, i.e. blood, saliva, nasal swabs, food and plants. It has also been shown to operate at the point-of-care or in the field by using a smart phone for detection.

Large-scale Data Linking and Integration

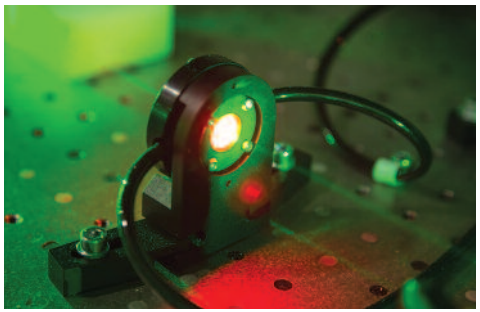
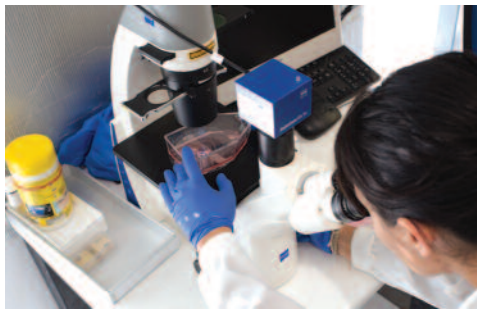
The Institute of Computer Science (ICS) has implemented LODSyndesis, the largest (at present) Knowledge Graph for Open Linked Data and complete in terms of equivalence relations. The implementation is based on novel algorithms and indices. At its present state, it links 2 billion data items which refer to 400 million distinct entities from 400 sources. It offers services for data linking and integration such as object co-reference verification, discovery of related data sets, connectivity assessment and others.

Characterization of Atmospheric Pollution Sources with Zeppelin Airship

Among large European projects coordinated by the Institute of Chemical Engineering Sciences (ICE-HT), there is the first ever study of air pollution above a continent, using a Zeppelin airship carrying high-tech research equipment. The acquired measurements led to the discovery of chemical processes taking place above ground and the quantification of the pollution transferred from country to country, while certain, currently under-estimated, air pollution sources were identified as significant (biomass burning, meat grilling, forest fires etc.). The results of the study are used by EU to establish rules for limiting atmospheric pollution.



innovations

Institute of Electronic Structure and Laser

IESL, founded in 1983, has established its international presence by performing high quality fundamental and applied research in the areas of Laser Science and Photonics, Micro/nano-electronics, Polymer Science, Materials Science and Astrophysics-Astronomy (the latter until 2018).

IESL is an active partner within the European Programme of Research Infrastructures: since 1990, IESL has been operating the Ultraviolet Laser Facility, part of LASERLAB EUROPE, participates in the infrastructures IPERION CH and PARTHENOS (Cultural Heritage Science), EUSMI (Soft Matter), NFFA (Nanoscience), ACTFAST (Photonics for SMEs). Moreover, IESL participates in the Extreme Light Infrastructure (ELI) and in the European Research Infrastructure for Heritage Science (E-RIHS), in the framework of the Roadmap of the European Strategy Forum for Research Infrastructures (ESFRI).

Institute of Molecular Biology and Biotechnology

IMBB was founded in 1983. It is one of the most prominent life science Research Institutes in Greece, with an outstanding record of scientific achievements, state of the art infrastructure and a broad range of research, innovation and educational activities.

IMBB Research Directions

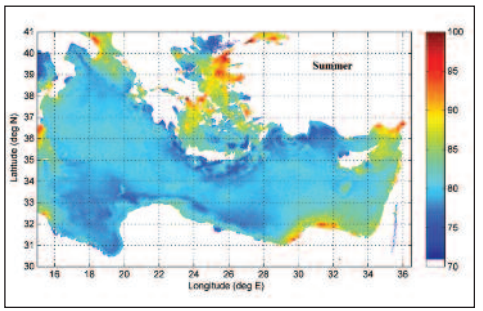
Hypothesis driven research: Mechanisms of regulation of gene expression, Cellular integration, Mechanisms of developmental processes, Neurobiology - neurodegeneration and ageing.

Discovery driven research: Proteomics, Post genomics.

Interdisciplinary research: Computational Biology, Optics and Biology, Biosensors.

Technology development: Functional genomics, Environmentally friendly pest control.

Products & services: Enzymes, Proteins, Microorganisms fermentation.



Research institutes

Institute of Computer Science

Since its establishment in 1983, ICS has been conducting basic and applied research in Information and Communication Technologies (ICTs). A major activity of ICS is the study, design and implementation of systems in the broader spectrum of ICTs for the development of the Information Society, and the advancement of science for the benefit of Society, Economy and Public Administration. The main directions of research in ICS are the following:

Computer Architecture, Distributed Systems, Computer Networks & Telecommunications, Systems and Network Security, Information Systems, Human-Computer Interaction, Signal Processing, Computational Vision, Robotics, Artificial Intelligence, Computational Biomedicine.

Cross-disciplinary research directions include Ambient Intelligence, Data Science and Advanced Hybrid Imaging Systems, whereas application areas of strategic importance comprise Cultural Informatics and E-health applications and services. ICS is a member of ERCIM and W3C.

Institute of Applied and Computational Mathematics

IACM was established in 1985 and it is the only Research Institute on Applied and Computational Mathematics in Greece. It focuses on the development of mathematical and computational methods to address interdisciplinary problems.

IACM research groups are active in the areas of Complex Systems (Applied Analysis and Modelling), Wave Propagation, Regional Analysis, Geographical Information Systems and Remote Sensing, Computational Neurosciences, Socio-Educational Research and Innovation, Numerical Analysis and Computational Science.

Current cutting edge horizontal activities include: Biomedical applications, Geosciences applications and Data Science Programme.

Institute for Mediterranean Studies

IMS was founded in 1985 to promote research in humanities, social sciences and the application of science and technology to cultural heritage. It has been distinguished for its historical research as well as for the application of new technologies in archaeological research. It has a specialized library and archive material.

IMS research is organized on the following thematic axes:

Mediterranean Economic and Social History, Mediterranean and Black Sea History of Cities, Diaspora and Immigration, Ottoman History, Maritime History, History of Technology, History of Art, History of Theatre, Image, Sound and Movement, Ancient Greek, Byzantine and Modern Literature, Geographical Information Systems and Remote Sensing in Archaeology and Environment.

Institute of Chemical Engineering Sciences

ICE-HT, was established in 1984 at Rio-Patras, as an independent Research Institute (initially under the name Institute of Chemical Engineering and High Temperature Chemical Processes). In 1987 it became one of the founding Institutes of FORTH.

ICE-HT conducts basic, applied and technological research in a wide range of fields in chemical engineering sciences, and provides specialized services to academia and industry, in the context of three main Research Areas:

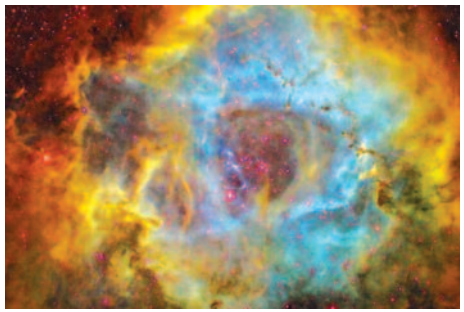
- Advanced Materials / Nanotechnology,
- Energy / Environment,
- Biosciences / Biotechnology

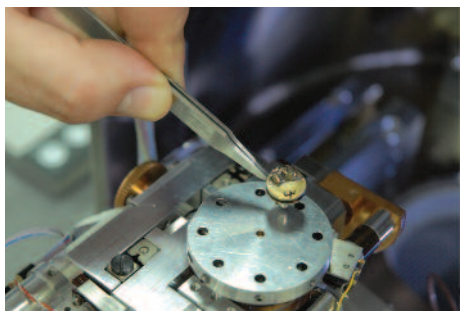
and their interfaces (e.g. nanobiotechnology, materials for energy technologies and environmental applications, biofuels, metabolic engineering / systems biology).

Institute of Astrophysics

In 2018, IA, the only Institute in Greece dedicated exclusively to Astrophysics, was established at FORTH, as an evolution of the successful research activities of the Astrophysics Group, taking place in Crete for more than 30 years, in strong collaboration between the University of Crete and FORTH-IESL.

The basic research infrastructures have already been operating in Crete at the Skinakas Observatory since 1986 when it was founded jointly by FORTH, the University of Crete and the Max-Planck Institut für Extraterrestrische Physik in Germany. The Observatory is located in the Psiloritis area and is recognized internationally for the excellent observing conditions of the site, as well as the state-of-the-art available instrumentation.





Institute of Petroleum Research

The Institute of Petroleum Research (IPR) was founded in January 2019 in Chania, in cooperation with the Technical University of Crete, combining the knowledge, expertise and infrastructures of both Institutions. IPR focuses on basic and applied research related to the detection, extraction and enhanced oil recovery, as well as oil recovery with simultaneous CO2 storage and exploitation of hydrocarbon deposits, activities with a significant economic and geopolitical imprint for the country.

FORTH has been carrying out internationally recognized research on oil recovery and remediation technologies for the removal of petroleum contaminants from subsoil and monitoring of atmospheric pollution, for the last 35 years.

Crete University Press

CUP was founded in 1984, initially financed by a grant from the Pancretan Association of America, and has since been operating, under the umbrella of FORTH, as a non-profit, self-funded publishing house.

It publishes books for students, scientists and the average reader, covering the fields of natural, formal and social sciences, arts and humanities. Furthermore, since 2015, CUP has been providing free online courses through the Mathesis programme, placing emphasis on the joy of learning and insisting on the highest quality standards, with a view to keep Greece abreast of the evolving changes in worldwide education. It is based in Heraklion, Crete, while maintaining offices and a bookshop in Athens.

PRAXI Network

PRAXI Network started out in 1991, assisting small and medium-sized Greek enterprises (SMEs) and research organisations in their technology transfer and innovation related endeavours. It links research and industry, promotes innovation, entrepreneurship and transnational cooperation.

Established in 5 cities (Athens, Thessaloniki, Heraklion, Volos, Patras), with 30 years of know-how, PRAXI Network operates the Technology Transfer Office of FORTH, it is a member of the European Technology Transfer Offices Circle, member of the Enterprise Europe Network, National Contact Point for Horizon2020 and coordinator of the European node of ASEM.

It also contributes to the design and implementation of national and regional policies, mechanisms and tools to support and finance innovation.

Science and Technology Park of Crete

STEP-C was established in 1993 as an initiative of the Foundation for Research and Technology Hellas (FORTH). The Park has a total of 4000 sq.m floor space with more than 100 offices and labs, accommodating small technological and service companies in two buildings. Particularly, the main objectives of the Park are:

Technology transfer and commercial exploitation of mature research outcomes, assessment, management and exploitation of intellectual property rights, promotion and support of innovative entrepreneurship, hosting and support of innovative start-up & spin-off companies, training seminars, collaborations with local and regional authorities and business associations.

STEP-C is a member of the International Association of Science Parks and Areas of Innovation (IASP) and of the European EURAXESS Network.

State-of-the-art Research Facilities and Activities

Highly specialized Research Facilities in Forefront Technologies, which participate actively in the European Research Infrastructures Programme, in the areas of Ultraviolet Lasers, Cultural Heritage Science, Soft Matter, Nanosciences and Photonics innovation solutions for SMEs. We have provided more than 3,500 days of access to more than 500 researchers from all over the world within LaserLab Europe alone.

"Skinakas" Observatory, which operates in collaboration with the University of Crete and the Max Planck Institute of Extraterrestrial Physics in Germany, providing the best observing conditions in the Mediterranean Basin. The Skinakas Observatory offers open days to the public during the summer months.

Joint Research Laboratory with the Palace Museum of the Forbidden City in Beijing, for technology transfer on the conservation of monuments and Art masterpieces.

International Associated Laboratory "MINOS" in collaboration with CNRS and Aix-Marseille University.

The 1st Ancient DNA Analysis Lab in Greece, one of the few in Europe.

Genomics Analysis Center with applications in Biomedicine, in Cultural Heritage and in Agrifood sector.

Biomedical Imaging Unit equipped with PET/CT (unique in Crete), in collaboration with the Medical School of the University of Crete and the University Hospital of Crete.

FORTH Graphene Centre, the main pillar for graphene research in Greece, which actively participates in the Graphene FLAGSHIP - selected as Future and Emerging Technology (FET) by the European Commission.

Computational-Mathematical Intense Data Modelling unit for Materials science and Bio-Medical applications in collaboration with the National Technical University of Athens.

The first Metabolomic Analysis in Systems & Network Biology Laboratory in South-Eastern Europe, contributing to technologies & applications in Precision Medicine and Agriculture.

Micro-PET facility in the context of the research taking place in the advanced hybrid imaging systems programme.

The first Laboratory in the Eastern Mediterranean area offering ground based & satellite remote sensing, prospection and GIS management of cultural heritage monuments, sites protection and environmental resources.

The only research unit in Greece exclusively dedicated to the systematic study of Ottoman history.

The only El Greco Centre of Art History in the Mediterranean.

The Largest archive for Neohellenic Theatrical performances in the Eastern Mediterranean from 1830s to 1930s.

The only Centre of Maritime History in Eastern Mediterranean.

World-class center for air quality and climate change research, serving as a consultant and providing atmospheric chemical transport models to several countries and international authorities.

1st AXA Chair Grant in Greece, in Epigenetics research.

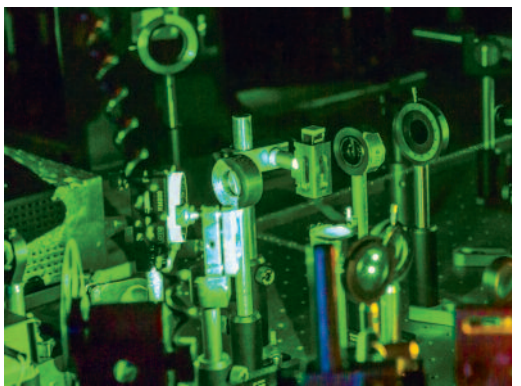
Ambient Intelligence (AmI) Programme, a long term horizontal interdisciplinary RTD Programme, aiming at developing and applying pioneering human centric AmI technologies and Smart Environments in everyday life.

Data Science Programme for addressing challenges related to the management and analysis of very large volumes of heterogeneous data in various domains.

Computational predictive-modelling activities for geophysical and environmental flows.

Cutting-edge technology & expertise in fuel cells, soil pollution monitoring and remediation, clean hydrogen production and CO2 capture.

Developing processes for waste biotransformation to useful chemicals.



Employment and Entrepreneurship

••• FORTH:

has directly or indirectly created >1,400 highly skilled jobs through its activities.

has contributed to the "brain gain" by hiring or collaborating with new scientists who currently work as University Professors and Collaborating Faculty Members at FORTH.

has established and developed the first Technology Park in the country, located in Patras, currently supervised by GSRT.

has established the Science and Technology Park of Crete which hosts and supports start-up companies.

has established the PRAXI Network and contributed to more than 500 research and technology contracts with Greek and International companies and Organizations.

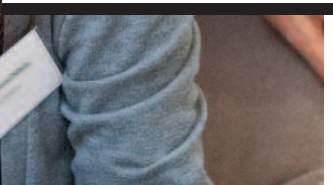
has created and operates business clusters in various technology sectors (Hellenic Bio Cluster, Hellenic Photonics Cluster, Innovation Greece).

has developed scientific and technological collaborations with more than 300 companies.

has developed and supported several spin-off companies.

promotes conference tourism: ~30.000 overnight stays per year.

directly supports the market of the Regions of Crete and Western Greece with ~ 3 M€ per year.



Contributions to the societal and regional Development

provides support to the local regional and municipal authorities; has contributed to the design of the Research and Innovation Strategies for Smart Specialization (RIS3) in the Regions of Crete, Western Greece and Epirus.

implements the pilot program "Crete Innovation Initiative" (CrInI) in cooperation with the local Academic and Research Institutions for the development of a knowledge-based economy in Crete.

has established health information infrastructures in hospitals and medical units in various Greek Regions.

has developed interactive systems, online services and smart environments that contribute to the improvement of urban quality of life, as well as specialized systems and services for the elderly and disabled people.

has participated in the development and operation of the Greek "Safeline" which responds to reports for illegal online content.

has contributed to the analysis, diagnosis and conservation of Cultural Heritage objects and monuments.

is involved in projects for the evaluation of the effects of climate change on Monuments like Knossos and Castello a Mare ("Koules") in collaboration with Heraklion Ephorate of Antiquities.

cooperates widely with cultural Institutions for the promotion of Greek culture, history, traditional products.

provides air pollution measurement services and electromagnetic radiation measurement services from mobile phone antennas in urban environments.

participates in the Agrifood Cooperation and is a member of the respective Scientific Committee in the Region of Western Greece.

actively participates in the Entrepreneurship and Development Alliance in Western Greece.

creatively cooperates with the Patras Science Park for the exploitation of research results and promotion of innovation.

has carried out research on the history of the cities of the Eastern Mediterranean and the Black Sea Aegean and Ionian island communities (18th-20th centuries) and has formed large databases on agricultural and industrial production, on trade, shipping and population structure.

has developed IoT infrastructure and intelligent technologies contributing to the smart city vision of the Municipality of Heraklion.

organizes open events and lectures communicating its scientific accomplishments to the public.

Education & advanced Training

••• FORTH:

awards more than 500 fellowships per year to undergraduates, Master's and Doctoral students, Postdocs and trainee scientists.

participates in interdisciplinary graduate programs:

> ***"Photonics and Nanoelectronics"***, ***"Bioinformatics"***, ***"Brain and Mind"***, ***"Ottoman History"*** and ***"Theatrical and Cinema Studies"*** (with the University of Crete)
>
> ***"Nanotechnology for Applications in Energy"*** (with the University of Crete and the Technological and Educational Institute of Crete)
>
> ***"Biomedical Engineering"*** (with the University of Crete & the Technical University of Crete)
>
> ***"Microsystems and Nanostructures"*** (with the National Technical University of Athens and Demokritos Research Centre)

FORTH Researchers teach in many graduate programs offered by Greek Universities.

organizes an annual series of advanced seminar lectures, on cutting-edge research fields in Physics, Chemistry, Biology, Mathematics and Computer Science, in collaboration with the Alexander S. Onassis Public Benefit Foundation, providing advanced education and training to Greek and International undergraduate students.

supports secondary education initiatives for student career advising and interaction with research labs in Greece. Each year, more than 1,100 high school students visit FORTH premises and become acquainted with its scientific activities.

is visited by 2,500 people every year, for the last 12 years, at "Researcher's Night", an initiative of the European Commission taking place in parallel in 300 European Cities, celebrated on the last Friday of September.

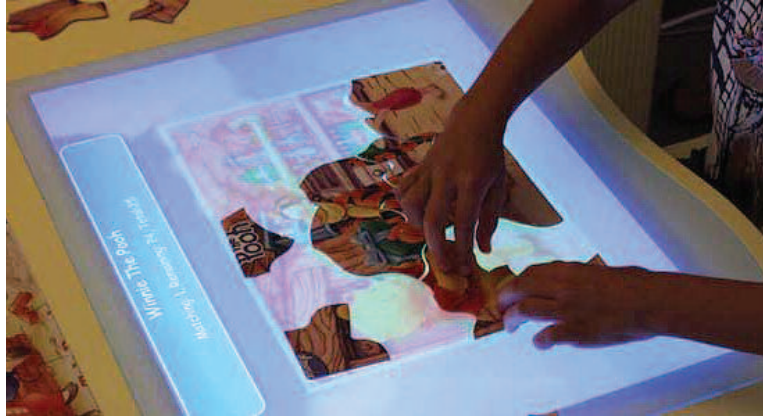
has trained more than 15,000 scientists in new technologies.

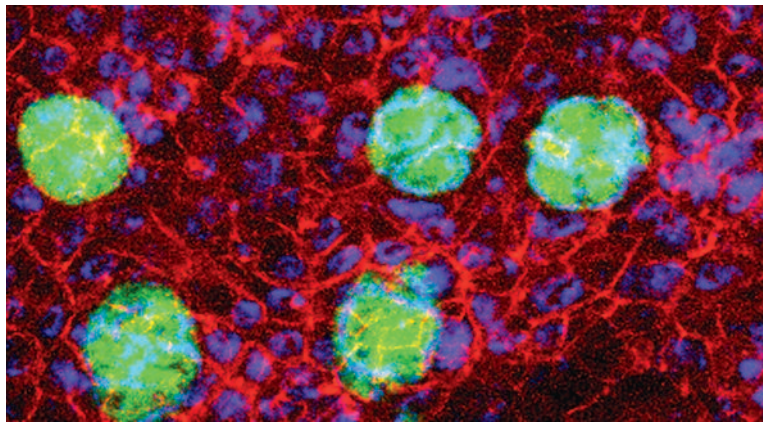
has established Crete University Press (CUP), with 600 titles published to-date (25 publications / year), 2,100,000 copies sold (100,000 / year) and 22 Awards. CUP Books have been adopted as textbooks in 1,700 university courses across the country. Crete University Press has established the "Mathesis" Open Online Courses (with 50,000 students to-date).

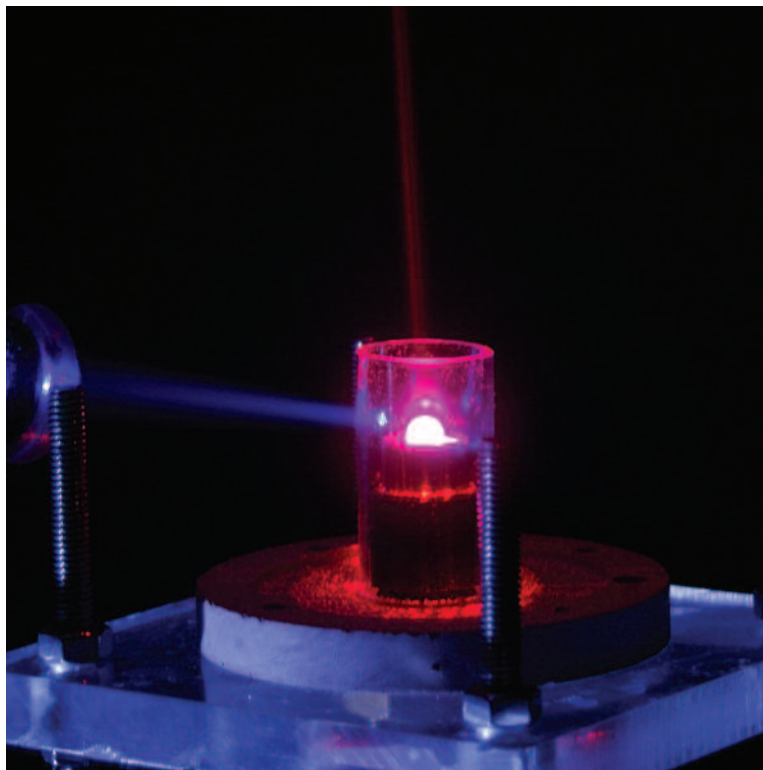
Dr. Venkatraman Ramakrishnan, Nobel Prize Winner
Keynote speaker, "The Onassis Foundation Science Lecture Series", 11/07/2012

Our Vision

To create and maintain
an environment that fosters
Learning, **Research** and
Innovation as pillars for
Regional, National and European
socio – economic growth.







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