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## **A New Vision and Platform to Enhance the Progress of Research and Dissemination of Knowledge in Natural and Social Sciences**

*By Bartolomeo Sammartina, Francesco Cappello, Everly Conway de Macario and Alberto Macario*

**Prof. Bartolomeo Sammartina (left)**  
Istituto Euro-Mediterraneo di Scienza e Tecnologia  
**Alberto J. L. Macario, M.D. (right)**  
University of Maryland, Baltimore, USA



### **Abstract**

*A New Vision and Platform to Enhance the Progress of Research and Dissemination of Knowledge in Natural and Social Sciences*

The mission of IEMEST is to generate, transfer, share, and spread knowledge and technological innovation. One of the most important works published in 2011 deals with chronic obstructive pulmonary disease (COPD). The paper focuses on molecules recently found to be implicated in the induction and maintenance of the inflammation that underlies the obstruction of the airways characteristic of COPD.

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The Istituto Euro-Mediterraneo di Scienza e Tecnologia (IEMEST) or, in English, Euro-Mediterranean Institute of Science and Technology was established in 2009 in Palermo, Sicily (Italy), which is centrally located in the Euro-Mediterranean region. The mission of IEMEST is to generate, transfer, share, and spread knowledge and technological innovation. The Institute is committed to endorse high-level research by, among other means, providing training for graduate and post-doctoral students from the Euro-Mediterranean region and by supporting career improvement of those involved in a broad range of scientific and academic activities. In order to foster interaction and collaboration among research groups active in different areas of science, the Institute also aims to provide extensive technical and logistic support to its members.

IEMEST is an institution that operates independently with no administrative ties to any private (foundations, industries, or any other enterprise) or official (municipal, provincial, federal, or any other

government branch or agency) entity. Thus IEMEST maintains its freedom for decision making in every direction even when receiving funds from outside sources, public, private, or governmental. The funders have no role in study design, data collection and analysis, decision to publish, or preparation of manuscripts or any other document for publication in any form.

IEMEST now encompasses seven Departments and twenty-five Sections (Table 1) but this number is expected to grow in the near future. More than 50 researchers are currently involved in the scientific activities of the Institute. In addition, IEMEST is assisted by an international Advisory Board, composed of distinguished experts, which oversees and guarantees the application and maintenance of high standards for personnel appointments and research projects. IEMEST encourages cooperation of its members with other research and academic institutions by, for example, organizing conferences, seminars, and scientific meetings. IEMEST has already established cooperation agreements with important Institutions, as for Going International Information Services 3 example the Consiglio Nazionale delle Ricerche (CNR), the Italian National Research Council of Rome (Italy); the Institute of Marine and Environmental Technology (IMET) of Baltimore (USA); and the Vinca Institute of Nuclear Sciences, Belgrade (Serbia). ). For a complete view of IEMEST partners, see Table 2.

Moreover, collaborations are active with groups of other institutions, such as the University of Malta, Malta (Department of Physiology and Biochemistry); the Universidad Politecnica de Valencia, Spain (Instituto de Biologia Molecular y Celular de Plantas); and the University of London, UK (Institute of Hepatology). For a complete view of IEMEST international collaborations, see Table 3.

Because of its mission and objectives, the Institute is involved in fundraising activities from public and private sources, including established funding agencies. IEMEST has already obtained funds from EU projects, in particular on Intervention 4.1.1.1 of the Regional Operative Program 2007/2013 in the Sicily region, co-funded by the European Regional Development Fund (ERDF); and the Intervention 4.1.1.4 of the National Operative Program 2007/2013, co-funded by the Ministero Istruzione, Università e Ricerca (MIUR), the Italian Ministry of University and Research. Other international agencies are currently supporting research activities led by IEMEST researchers in the fields of Neuroscience, Regenerative Medicine, and Hepatology.

In the first three years of activity, IEMEST researchers published more than 20 papers on international journals with impact factor. One of the most important works published in 2011 deals with chronic obstructive pulmonary disease (COPD). This is one of the most severe conditions caused primarily by cigarette smoke and characterized by a progressive airway obstruction. Many people each year die from complications of this disease worldwide. This study on COPD was conducted by IEMEST researchers in collaboration with colleagues from the "S. Maugeri IRCCS" Foundation of Veruno, Italy; the Universities of Palermo, Ferrara, Torino, and Padova (Italy); and the University of Maryland at

Baltimore (USA), and was published in the journal PLoS ONE. The paper focuses on molecules recently found to be implicated in the induction and maintenance of the inflammation that underlies the obstruction of the airways characteristic of COPD. These molecules are called "chaperones" or "heat-shock proteins," and while they are physiologically devoted to protect cells from stress induced by various factors (e.g., cigarette smoking), in COPD some of them are overexpressed and are most likely responsible for increasing the activity of inflammatory cells. In this paper, the authors describe for the first time a molecular mechanism involved in chaperone overexpression and, hopefully, the results will lead to the development of new treatments for COPD more effective than those currently available.

In a study published in the EMBO Journal, an international group of researchers, including the IEMEST group of Computational and Statistical Methods for Data Analysis, showed how in higher eukaryotes, the activity of the evolutionarily conserved nucleosome remodeling factor ISWI regulates gene expression and chromosome organization genomewide. In order to study if the chromatin condensation and gene expression defects observed in ISWI mutants are directly correlated with ISWI nucleosome spacing activity, they conducted a genome-wide survey of ISWI binding and nucleosome positioning in wild-type and ISWI mutant in the higher eukaryote *Drosophila melanogaster*. The analysis revealed that ISWI binds both genic and intergenic regions, including sequences near the promoters, causing specific alterations in nucleosome positioning at the level of the Transcription Start Site. Interestingly, differences in nucleosome spacing between wild-type and ISWI mutant chromatin tend to accumulate on the X chromosome for all ISWI bound genes analysed.

The group of researchers of the Department of Neuroscience is involved in studying the cellular mechanisms underlying typical absence seizures, which characterize various idiopathic generalized epilepsies. In 2010 they published their research on Nature Medicine; the paper reported that extrasynaptic GABAA receptor-dependent 'tonic' inhibition is increased in thalamocortical neurons in diverse genetic and pharmacological models of absence seizures. Increased tonic inhibition is due to compromised GABAA uptake by the GABA transporter GAT-1 in some genetic models, and GAT-1 is crucial in governing seizure genesis. These results showed an apparently common cellular pathology in typical absence seizures that may have epileptogenic importance and highlight potential therapeutic targets for the treatment of absence epilepsy.

Other important research projects are currently steered by IEMEST groups. For example, scientists of the Department of Stress Biology and Medicine have developed the concept of chaperonopathies, a group of pathological conditions encompassed within a new field of Medicine. This new concept will have a significant impact on the teaching and learning of Medicine and related Health Sciences, which in turn will improve diagnosis and treatment of the pertinent diseases (see Medicine & Health 2012, pp. 202-204,

2012;

[http://www.goinginternational.eu/pdfs/fachartikel/macario\\_the%20chaperonopathies\\_neu.pdf](http://www.goinginternational.eu/pdfs/fachartikel/macario_the%20chaperonopathies_neu.pdf))

Other studies by IEMEST members go beyond Medicine and Health Sciences. For example, a member of the Department of Human Sciences has made an amazing discovery. He found at Gurfa (Sicily) the largest Tholos in the Mediterranean region, a large chamber completely carved into the rock, which may be the legendary tomb of Minos mentioned by Diodorus. This discovery that could place Sicily as the caput mundi of archaeology will attract not only archaeologists, but also historians and, certainly, visitors of all kinds interested in the mythical times of ancient civilizations. By entering this monumental Tholos visitors will be astonished at such an impressive structure, surely the scenario of countless momentous events of the past, now hidden in an unspoiled natural landscape that only a region like Sicily, with a mild and dry climate, can preserve for centuries.

The Institute's activities also include: a) participating in European research projects by providing scholarships and in international exchange programs; b) promoting advanced professional training; c) organizing national and international meetings; and d) supporting publication of technical and scientific materials.

Social and cultural activities include those focused on preservation, appreciation, and promotion of the cultural, natural, and environmental heritages of Sicily and the Mediterranean region. Outreach activities and technical assistance are aimed to private companies and organizations and to civil services, according to needs and opportunities. Such activities include providing training, information, counselling, and assistance to those Institutions that participate in the exchanges pertinent to the integration with EuroMediterranean and Arab regions.

**Table 1. An overview of the Departments of the IEMEST and their principal aims**

Department	Number of Sections	Number of Researchers	Aims
Advanced Molecular Research	3	10	To develop new drugs through bioinformatics and computational methods
Biotechnology, Bioengineering and Biomaterials	3	7	To develop innovative technologies in the field of regenerative medicine
Communication, Interactive Graphics and Augmented Reality	3	6	To develop innovative technologies of communication applied to several areas of research

Human Sciences	3	6	To develop new knowledge for protection of human heritage and rights
Neuroscience	2	6	To develop new tools for diagnosis and therapy of neurological diseases
Renewable Energy, Land and Environment	5	14	To develop new strategies for the preservation of the environment and territory
Stress Biology and Medicine	6	15	To develop new tools for diagnosis and therapy of stress-induced diseases

**Table 2. IEMEST institutional partners**

Name of the Organization/Center	Nation
<a href="#">The Institute of Marine and Environmental Technology, Baltimore (MD)</a>	U.S.A
<a href="#">The Vinča Institute of Nuclear Sciences, Belgrade</a>	Serbia
<a href="#">Consiglio Nazionale delle Ricerche, Roma</a>	Italy
<a href="#">Consiglio Nazionale dei Geologi, Roma</a>	Italy
<a href="#">Istituto Neurologico Mediterraneo IRCCS "NEUROMED", Pozzilli (IS)</a>	Italy
<a href="#">Università degli Studi di Palermo, Palermo</a>	Italy
<a href="#">Università degli Studi di Catania, Dipartimento di Scienze del Farmaco, Catania</a>	Italy
<a href="#">Consorzio Universitario della Provincia di Trapani, Trapani</a>	Italy
<a href="#">Consorzio Multi-Ente per la promozione e l'adozione di Tecnologie di calcolo Avanzato (COMETA), Catania</a>	Italy

**Table 3. IEMEST international collaborations**

Name of Deartment/Institute	Nation
<a href="#">Libera Università degli Studi di Scienze Umane e Tecnologiche, Istituto "Paolo Sotgiu" per la Ricerca in Psichiatria e Cardiologia Quantitativa e Quantistica, Lugano</a>	Switzerland
<a href="#">Universidad Politecnica de Valencia, Instituto de Biología Molecular y Celular de Plantas, Valencia</a>	Spain
<a href="#">University Hospital of Zurich, Division of Endocrinology, Diabetes &amp; Clinical Nutrition, Zurich</a>	Switzerland

<a href="#">University of Cardiff, School of Biosciences, Cardiff</a>	U.K.
<a href="#">University of London, Institute of Hepatology (Birkbeck College), London</a>	U.K.
<a href="#">University of Malta, Department of Physiology and Biochemistry, Msida</a>	Malta
<a href="#">University of Maryland, School of Medicine, Department of Microbiology and Immunology, Baltimore (MD)</a>	U.S.A
<a href="#">University of Southampton, School of Medicine, Division of Infection, Inflammation and Immunity, Southampton</a>	U.K.

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## About the authors

Bartolomeo **Sammartino**<sup>a</sup>, Francesco **Cappello**<sup>a</sup>, Everly **Conway de Macario**<sup>b</sup>, and Alberto J.L. **Macario**<sup>a,b</sup>

<sup>a</sup>Istituto EuroMediterraneo di Scienza e Tecnologia (IEMEST)

Via Emerico Amari 123

90139, Palermo, Italy

Phone: +39/091/7816506

Fax.: +39/091/6622514

e-mail: [segreteria@iemest.eu](mailto:segreteria@iemest.eu)

web: [www.iemest.eu](http://www.iemest.eu)

<sup>b</sup>Department of Microbiology and Immunology

School of Medicine, University of Maryland at Baltimore;

and IMET, Columbus Center

701 East Pratt Street

Baltimore MD 21202, USA

Telephone FAX: 240-631-9594/ 410-234-8886; FAX: 410-234-8896

e-mail: [Ajlmacario@som.umaryland.edu](mailto:Ajlmacario@som.umaryland.edu) and [econwaydemacario@som.umaryland.edu](mailto:econwaydemacario@som.umaryland.edu)

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