

**Project Title: QMED**



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### **Report on Q-med Applications**

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#### **Abstract:**

*This work package aims at exploring how new technologies could generate and promote new applications, and at specifying the needs that need to be addressed of a limited user group of the region.*

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## 0. INTRODUCTION

This document contains a list of projects that involve joint research as conducted via network services which have been put in place as a result of the Q-Med project. These services link Greece, Cyprus, Italy and Israel. Some of the projects (#7 and #11) are missing some informational details, due to a lack of response on behalf of the researchers as well as the other European countries which are connected to the TEN-155 network

### 1. OPAL COLLABORATION (ISRAEL AND ITALY)

#### 1.1 Activity leaders

Prof. Gideon Alexander from Tel Aviv University [alex@lep1.tau.ac.il](mailto:alex@lep1.tau.ac.il) and Prof. Giorgio Giacomelli from INFN [Giorgio.Giacomelli@bo.infn.it](mailto:Giorgio.Giacomelli@bo.infn.it)

#### 1.2 Description

The project is part of framework of the OPAL collaboration at LEP, CERN, Geneva, Switzerland. The project concerns correlation in elementary particle reaction leading to multi-hadrons.

#### 1.3 Links

<http://lep1.tau.ac.il>

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### 2. MOLECULAR PLASTIC SOLAR CELLS (ISRAEL AND ITALY)

#### 2.1 Activity leaders

Prof. David Faiman from Ben Gurion University [faiman@bgumail.bgu.ac.il](mailto:faiman@bgumail.bgu.ac.il) and Dr. Michele Maggini (Univ of Padova) [maggini@mail.chor.unipd.it](mailto:maggini@mail.chor.unipd.it) and Dr. Maurizio Prato (Univ of Trieste) [prato@univ.trieste.it](mailto:prato@univ.trieste.it)

#### 2.2 Description

This EC-funded project involves an attempt to produce large-area plastic solar cells by embedding fullerenes in polymers. The polymers are synthesised in Italy and Spain. The fullerenes are produced in Holland. The solar cells are fabricated in Austria and Sweden. The final products are characterised in Israel.

#### 2.3 Links

[http://profiler.bgu.ac.il/site/main.cfm?file\\_name=show\\_user.cfm&user\\_id=244](http://profiler.bgu.ac.il/site/main.cfm?file_name=show_user.cfm&user_id=244)

### **3. TRACKING THE GLOBAL TILT USING THE TAILS OF RADIO GUIDED STARS (ISRAEL AND ITALY)**

#### **3.1 Activity leaders**

Dr. Erez Ribak from the Technion - [eribak@physics.technion.ac.il](mailto:eribak@physics.technion.ac.il) and Dr Roberto Rigatoni ([ragazzoni@pd.astro.it](mailto:ragazzoni@pd.astro.it)) from the Padua Observatory.

#### **3.2 Description**

This research presents a novel technique to alleviate the problem of the global tilt in artificial guide stars for adaptive optics. This technique is based on the registration of trails of radio-excited plasma spots caused by the atmospheric tilt. Following the time trace of the trails one can find and measure the tilt produced by atmospheric turbulent layers. Different methods are applied to estimate the extent of the trails. The research describes the results of computer simulations run between Italy and Israel, showing the performance of the proposed approach.

#### **3.3 Links**

[http://physics.technion.ac.il/~eribak/SPIE4007\\_135.pdf.zip](http://physics.technion.ac.il/~eribak/SPIE4007_135.pdf.zip)

## **4. LIMITS TO STABILITY AND MINIATURIZATION OF OPTOELECTRONIC DEVICES (ISRAEL AND CYPRUS)**

### **4.1 Activity leaders**

Prof. David Cahen of the Weizmann Institute of Science [david.cahen@weizmann.ac.il](mailto:david.cahen@weizmann.ac.il) and Prof. Constantinos Christophides of Cyprus University [costasc@ucy.ac.cy](mailto:costasc@ucy.ac.cy)

### **4.2 Description**

To explore down to which scale the classical concept of diffusion coefficient is a valid and useful one for atoms and ions.

As device sizes shrink, diffusional intermixing becomes an ever more pressing problem. Furthermore the increased electric fields that are the result of the smaller device dimensions can lead to lattice distortions which can influence ion diffusion.

Any knowledge that can minimize drift and diffusion across interfaces, will be of great importance to the optoelectronic device industry.

### **4.3 Links**

<http://www.weizmann.ac.il/material/people.shtml>

<http://www.weizmann.ac.il/material/>

<http://www.weizmann.ac.il/material/transistor.shtml>

<http://www.weizmann.ac.il/material/dopants.shtml>

## **5. ELECTRIC FIELD-ASSISTED, LOW TEMPERATURE TAILORING OF SI PROPERTIES AND DEVICES (ISRAEL AND ITALY)**

### **5.1 Activity leaders**

Prof. David Cahen of the Weizmann Institute of Science [david.cahen@weizmann.ac.il](mailto:david.cahen@weizmann.ac.il) and Prof. Franco Decker of University of Roma "La Sapienza" [DECKER@axrma.uniroma1.it](mailto:DECKER@axrma.uniroma1.it)

### **5.2 Description**

The general aim of this work is to dope in a controlled manner thin epitaxial films of Silicon with Li atoms and to create devices in the resulting doped micron-thick Si epilayer by means of solid state electric field-assisted migration of Li dopant atoms.

Dr. Francesca Varsano was the Italian scientist involved in this project.

### **5.3 Links**

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<http://www.weizmann.ac.il/material/>

<http://www.weizmann.ac.il/material/transistor.shtml>

<http://www.weizmann.ac.il/material/dopants.shtml>



## 6. ITALIAN RAIN ENHANCEMENT PROJECT (ISRAEL AND ITALY)

### 6.1 Activity leaders

Prof. Zev Levin of Tel Aviv University [zev@hail.tau.ac.il](mailto:zev@hail.tau.ac.il) and Prof. Franco Prodi of FISBAT in Bologna [prodi@rain.fisbat.bo.cnr.it](mailto:prodi@rain.fisbat.bo.cnr.it)

### 6.2 Description

Joint research was done between Israel and Italy and was entitled the Italian Rain enhancement project. The **shortage of water** supplies in the Mediterranean region has only **increased** in recent years related to some decrease in rainfall and mainly due to the increasing demand from the rapidly growing population and industrialisation in the region. This outcry for finding new sources of water supplies has been echoed in a recent meeting of the Ministers from the Euro-Mediterranean countries in Torino, Italy (October 1999) which specifically mentioned the role Rain Enhancement can play as an additional source of unconventional water supply.

A Survey of the meteorological conditions in each area and identification of the microphysical characteristics of the clouds is being performed. This involves the compiling of the available data, then supplementing them with additional measurements, integrating them in a common format and making them available to all the countries.

Franco Prodi was assigned as the co-ordinator of future experiment in this area.

### 6.3 Links

<http://www.tau.ac.il/geophysics/>

## 7. THE TECTONIC FRAMEWORK OF EASTERN SICILY AND ITS COMPARISON TO THE LEVANT AREA (ISRAEL AND ITALY)

### 7.1 Activity leaders

Prof. Zvi Ben-Avraham of Tel Aviv University [zvi@terra.tau.ac.il](mailto:zvi@terra.tau.ac.il) and Professor Mario Grasso at the University of Catania, [grassom@mbox.unict.it](mailto:grassom@mbox.unict.it)

### 7.2 Description

### 7.3 Links

[http://emidius.itim.mi.cnr.it/GNDT/P511/UNI\\_CT/rel990721.html](http://emidius.itim.mi.cnr.it/GNDT/P511/UNI_CT/rel990721.html)  
<http://www.tau.ac.il/geophysics/staff/zvi/zvi.htm>

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## 8. NEURAL AUTONOMOUS LEARNING SYSTEM (ISRAEL AND ITALY)

### 8.1 Activity leaders

Prof. Daniel of Hebrew University [damita@ilios.fiz.huji.ac.il](mailto:damita@ilios.fiz.huji.ac.il) and Dr. Stefano Fusi [fusi@jupiter.roma1.infn.it](mailto:fusi@jupiter.roma1.infn.it)

### 8.2 Description

Neural architecture consists of a large number of single computation cells connected in a network. In VLSI technology many thousands of simple elements (transistor MOS), able to control electric current, are implanted on a silicon chip. Large number of computation cells require a minimalist implementation to save space and to reduce power consumption.

aVLSI use the "natural" properties of MOSes and charge fluxes to implement, approximately algebraic functions without a clock with a small number of transistors. MOS transistors operating in the weak-inversion regime reduce power consumption.

### 8.3 Links

<http://www.fiz.huji.ac.il/staff/acc/faculty/damita/>  
<http://jupiter.roma1.infn.it/>  
<http://www.roma2.infn.it/inf/NALS/welcome.html>  
<http://jupiter.roma1.infn.it/bottom.html>

## 9. NEMCA (ISRAEL AND GREECE)

### 9.1 Activity leaders

Prof. Ilan Riess of the Technion [riess@techunix.technion.ac.il](mailto:riess@techunix.technion.ac.il) and Prof. Constantinos G. Vayenas of University of Patras, Greece [cat@zeus.chemeng.upatras.gr](mailto:cat@zeus.chemeng.upatras.gr)

### 9.2 Description

Research in the area of NEMCA (Non-faradaic Electrochemical Modification of Catalytic Activity) with silver ion conductors and the question of the work function interpretation in NEMCA experiments.

### 9.3 Links

<http://physics.technion.ac.il/~riess/pub.html>

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## 10. NESSIE: NEW EUROPEAN SCHEMES FOR SIGNATURE, INTEGRITY, AND ENCRYPTION (ISRAEL AND ITALY)

### 10.1 Activity leaders

William Wolfowicz ([ww@fub.it](mailto:ww@fub.it)) and Renato Menicocci ([rmenic@fub.it](mailto:rmenic@fub.it)) of [Fondazione Ugo Bordon](#), Italy, and Eli Biham of the Technion [biham@cs.technion.ac.il](mailto:biham@cs.technion.ac.il)

### 10.2 Description

NESSIE is a 3-year project, which started on January 1st 2000. The main objective of the project is to put forward a portfolio of strong cryptographic primitives for a number of different platforms. These primitives will be obtained after an open call and evaluated using a transparent and open process. . The project will develop an evaluation methodology (both for security and performance evaluation) and a software toolbox to support the evaluation. The project goal is to widely disseminate the project results and to build consensus based on these results by using the appropriate fora (a project industry board, [5th Framework programme](#), and various standardisation bodies). A final objective is to maintain the strong position of European research while strengthening the position of European industry in cryptography.

### 10.3 Links

<http://cryptonessie.org>  
<http://www.cs.technion.ac.il/~biham/>  
<http://www.cordis.lu/ist/projects/99-12324.htm>

## **11. PROTECTOR: PREVENTIVE SAFETY FOR UN-PROTECTED ROAD USER (ISRAEL AND ITALY)**

### **11.1 Activity leaders**

Prof. David Mendlovic ([mend@eng.tau.ac.il](mailto:mend@eng.tau.ac.il))

### **11.2 Description**

The analysis of accident figures in Europe reports a huge number of collisions between pedestrian and vehicle; these collisions are the cause of about 12% of the accidents and about 15% of the total number of dead. The sum between pedestrian figures and the number of cyclists and motorcyclists dead in collision against vehicles (6% and 5% respectively) goes over 26% of the total number of dead and about 25% of the injured. Starting from this scenario, the project aims to define, develop and validate sensorial and communication systems necessary to improve the safety of vulnerable road users (pedestrian, cyclist and motorcyclist), and to contribute to the reduction of the accident percentage. Finally, supporting completely the driver in all environment situations, the project will contribute to a positive and remarkable social impact in terms of quality of life and sustainable mobility.

### **11.3 Links**

<http://www.cordis.lu/ist/projects/99-10107.htm>

<http://www.eng.tau.ac.il/~mend/mendelov.html>

## 12. ACQUIRE: ATOMIC CHIPS FOR QUANTUM INFORMATION RESEARCH (ISRAEL AND ITALY)

### 12.1 Activity leaders

Israel Bar-Joseph of Weizmann Institute of Science [Hbar@wis.weizmann.ac.il](mailto:Hbar@wis.weizmann.ac.il), Tommaso Calarco and Barbara Curro Dossi of ECT, Italy [barbara@ect.it](mailto:barbara@ect.it); David Vitali ([david@camcat.unicam.it](mailto:david@camcat.unicam.it)) and Irene Marzoli ([marzoli@camcat.unicam.it](mailto:marzoli@camcat.unicam.it)) of Unicam, Italy; Stefano Giorgini of UNITN, Italy [giorgini@science.unitn.it](mailto:giorgini@science.unitn.it)

### 12.2 Description

This project will develop a novel and very promising approach to quantum information processing (QIPC): Neutral-atom manipulation using integrated micro-devices, combining the best of both worlds: The tools of quantum optics and the long coherence times and very high precision of neutral atom manipulation for the quantum part of the information processing with the vast technology of integrated optical and electronic elements for classical part of the atom manipulation. Together it will be integrated in one single ATOMICS chip which can be produced using nanofabrication technology. This project expects this new technology to have a large impact also for other quantum optics approaches, to QIPC and moreover enable new fundamental experiments and novel devices using neutral atoms.

### 12.3 Links

<http://www.cordis.lu/ist/projects/99-11055.htm>

<http://acquire.uibk.ac.at/>

<http://www.weizmann.ac.il/physics/smc/>

<http://camcic.unicam.it/dimatfis/tombesi.htm>

<http://www.ect.unitn.it/>

<http://www-phys.science.unitn.it/>

## 13. INVITE - INTELLIGENT DISTRIBUTED VIRTUAL TRAINING ENVIRONMENT (ISRAEL AND GREECE)

### 13.1 Activity leaders

Dr. Roni Aviram ([roniav@inter.net.il](mailto:roniav@inter.net.il)) and Dr. Gal Shahaf ([shahaf\\_g@netvision.net.il](mailto:shahaf_g@netvision.net.il)) of Ben Gurion University; Dr. Vaggelis Kapoulas ([Kapoulas@cti.gr](mailto:Kapoulas@cti.gr)), Dr. Vassilis Triantafillou ([triantaf@cti.gr](mailto:triantaf@cti.gr)) and Dr. Thrasyvoulos Tsiatsos ([Tsiatsos@cti.gr](mailto:Tsiatsos@cti.gr)) of Computer Technology Institute, Greece

### 13.2 Description

INVITE - Intelligent Distributed Virtual Training Environment - is a project under negotiation in the framework of the Information Society Technology (IST) Programme of the European Commission. It started in February 2000 it will run for almost 3 years. The INVITE project is aimed at the development of a collaborative learning environment for distance education via distributed and shared virtual environments. Companies who are cooperating very closely from different locations are typical user groups of the system. INVITE will be an innovative system for synchronous telelearning providing users with the functionality which supports social learning processes through distributed virtual environments including real avatar representations of the users. The approach is to build a platform which can be interfaced with existing learning environments such as content management systems and asynchronous services.

### 13.3 Links

<http://invite.fh-joanneum.at>  
<http://www.bgu.ac.il/educate/staff/aviram.html>

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## 14. AN EXPLORATORY STUDY OF THE HARD X-RAY VARIABILITY PROPERTIES OF PG QUASARS WITH RXTE (ISRAEL AND ITALY)

### 14.1 Activity Leaders

Ari Laor ([Laor@physics.technion.ac.il](mailto:Laor@physics.technion.ac.il)), M. Guainazzi, F. Fiore, E. Giallongo from Osservatorio Astronomico di Roma, Italy

### 14.2 Description

This project has been involved with monitoring with the RXTE PCA the variability pattern of the 2-20 keV flux in four PG quasars (QSOs) from the Laor et al. (1994) sample. Six observations of each target at regular intervals of 1 day were performed. The sample comprises objects with extreme values of Balmer line width (and hence soft X-ray steepness) and spans about one order of magnitude in luminosity. The most robust result is that the variability amplitude decreases as energy increases.

### 14.3 Links

<http://xxx.lanl.gov/abs/astro-ph/0005131>  
<http://wave.xray.mpe.mpg.de/conferences/nls1-workshop>  
<http://physics.technion.ac.il/~laor/pub.html>

## **15. DITIS (CYPRUS AND GREECE)**

### **15.1 Activity Leaders**

University of Cyprus: Dr Andreas Pitsillides ([Andreas.Pitsilides@cs.ucy.ac.cy](mailto:Andreas.Pitsilides@cs.ucy.ac.cy)), Dr. George Samaras, Dr. Marios Dikaiakos; PASYKAF (Cypriot Association of Cancer Patient and Friends): Georgia Orphanou ([ditis@ucy.ac.cy](mailto:ditis@ucy.ac.cy)); University of Crete: Dr. Stelios Orphanoudakis, Dr. Manolis Tsiknakis

### **15.2 Description**

DITIS is a system that supports Collaborative Virtual Healthcare Teams dealing with the home-healthcare of cancer patients in Cyprus. Through a pilot project DITIS will support the activities of the home healthcare service of the Cyprus Association of Cancer Patients and Friends (PASYKAF), using a patient centric philosophy. It is based on the Internet (web) and on GSM mobile communications.

### **15.3 Links**

<http://www.ditis.ucy.ac.cy>

## 16. CJIS: CULTURAL JOURNEYS IN THE INFORMATION SOCIETY (CYPRUS AND GREECE)

### 16.1 Activity Leaders

Christos N. Schizas (Project Coordinator) - [schizas@ucy.ac.cy](mailto:schizas@ucy.ac.cy)  
Constantinos Constantinou - [C.P.Constantinou@ucy.ac.cy](mailto:C.P.Constantinou@ucy.ac.cy)  
Antonis Kakas - [antonis@ucy.ac.cy](mailto:antonis@ucy.ac.cy)  
Savvas Katsikides - [savvas@ucy.ac.cy](mailto:savvas@ucy.ac.cy)  
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Constantinos Pattichis - [pattichi@ucy.ac.cy](mailto:pattichi@ucy.ac.cy)  
Andreas Pitsillides - [andreas.pitsillides@ucy.ac.cy](mailto:andreas.pitsillides@ucy.ac.cy)  
George Fakas - [fakas@ucy.ac.cy](mailto:fakas@ucy.ac.cy)  
Stella Economidou - [economid@ucy.ac.cy](mailto:economid@ucy.ac.cy)  
NTUA - Greece  
Stefanos Kalias - [stefanos@softlab.ece.ntua.gr](mailto:stefanos@softlab.ece.ntua.gr)  
George Mosxovitis - [gmosx@softlab.ece.ntua.gr](mailto:gmosx@softlab.ece.ntua.gr)  
Kostas Karpouzis - [KKarpou@softlab.ntua.gr](mailto:KKarpou@softlab.ntua.gr)  
IG - Greece  
George Drossopoulos - [gdrosop@compulink.gr](mailto:gdrosop@compulink.gr)  
Chrissos Bamiatzis - [info@compulink.gr](mailto:info@compulink.gr)

### 16.2 Description

To study the problems of building effective distributed and interactive multimedia systems and at the same time learn how to exploit and evaluate their impact in the development of our society at large. The general objective of this project is to contribute to the development of these systems as well as to study the social impacts of a state-of-the-art prototype. More specifically, an interactive, distributed multimedia system will be developed, which will take advantage of recent advances in the areas of multimedia modelling and development, middleware platforms and coordination models, parallel and distributed software engineering, digital libraries, and networking techniques. This prototype will be tailored to the specific needs of cultural exploration; furthermore, it will be particularly suitable for areas such as education, training, cultural integration, tourism, and electronic commerce. Thus, the overall objective of this project is to set up a framework to support Electronic Roads, by means of developing cross-national links of them, and use them for cultural and historical exploration in several countries of the Euro-Med region. In other words, the general aim of the project is to offer a concrete contribution to the creation (and evaluation of its impact) of the Information Society in the Euro-Med region.

### 16.3 Links

<http://www.cs.ucy.ac.cy/project/cjis/index.html>



## **17. EMERGENCY-112: AN INTEGRATED PORTABLE MEDICAL DEVICE FOR EMERGENCY TELEMEDICINE (CYPRUS AND GREECE AND ITALY)**

### **17.1 Activity Leaders**

National Technical University of Athens, Greece -Sotiris Pavlopoulos ([spav@biomed.ntua.gr](mailto:spav@biomed.ntua.gr)); ESAOTE SpA, Italy - Maurizio Fusilli ([maurizio.fusilli@esaote.com](mailto:maurizio.fusilli@esaote.com)); R&S Informatica, Italy, CPR - Pisa Hospital, Italy, Epsilon Software, Greece, Medical Diagnosis & Treatment L.T.D, Greece, PANAFON Hellenic S.A., Greece, AMBULANCIAS ALVAREZ, S.L, Spain, University of Cyprus - Christos Schizas ([schizas@ucy.ac.cy](mailto:schizas@ucy.ac.cy)), Ministry of Health, Cyprus.

### **17.2 Description**

The objective of this project will be to develop an integrated portable medical device for emergency telemedicine. This device will facilitate the reduction of treatment time, improve medical diagnosis, and reduce costs. The transmission of critical biosignals (ECG, BP, HR, SpO2, Temperature) and Images to an emergency call center will enable physicians to direct pre-hospital care more effectively, leading to a reduction in mortality.

### **17.3 Links**

<http://www.biomed.ntua.gr/emergency112/>

## **18. EVIDENCE FOR TRENDS TO EXTREMES IN OBSERVED DAILY RAINFALL CATEGORIES OVER THE MEDITERRANEAN (ISRAEL AND ITALY AND CYPRUS)**

### **18.1 Activity leaders**

Prof. Pinhas Alpert ([pinhas@cyclone.tau.ac.il](mailto:pinhas@cyclone.tau.ac.il)) Tel Aviv University; Dr. Silas Michalides [cssilas@turing.cs.ucy.ac.cy](mailto:cssilas@turing.cs.ucy.ac.cy); Prof. Michele Colacino [colacino@atmos.ifa.rm.cnr.it](mailto:colacino@atmos.ifa.rm.cnr.it)

### **18.2 Description**

This project involves the calculation of the percentages of rainfall as collected by several hundred stations selected in Spain, Italy, Tunisia, Cyprus and Israel. These rainfalls were analyzed in exactly the same methodology in order to study potential trends in the contribution of the various categories to the total rainfall in each country. A similar analysis was performed also for the percentages of the number of days in each category and their recent 45 years' trends. The global greenhouse gas warming was recently suggested to strengthen the heavier rainfall categories but was not examined earlier with similar detail over the Mediterranean.

Results show, in Israel, for instance, that about 45-50% of the rainy days belong to the Light-A rainfall category but contribute only about 8% of the total rainfall. About 12% (4%) of the days belong to Heavy -C1 (C2) categories but contribute over 30% of the total annual rainfall.

As to the categories' trends, the study shows in all Mediterranean countries in the study, a significant increasing trends of some heavy/torrential rainfall categories while decrease of the lighter ones. In Spain and Italy, for instance, a significant increasing trend is found for the torrential categories along with a significant decrease in weaker categories. These results seem to support the trends suggested due to global greenhouse gas warming.

### **18.3 Links**

<http://www.tau.ac.il/geophysics/>

<http://www.nasa.proj.ac.il>