

**ESR 15****Name:** Alexakis Emmanouil (Manolis)**Your credentials:** Applied Physicist and Engineering in Sustainable Energy Technology**Start day:** 01/07/2014**End day:** 31/08/2016**Involved in WP:** WP1, WP2, WP4, WP5**Hosting Institution:** NTUA**My Research Training Activity in ITN-DCH****A. Summary of the Career Development Plan:**

In a short term base, I am involved in the Research Activities of my laboratory (more details in Section B), acquiring the needed experience – information and developing the foundation that will support my research activity and eventually will give me the opportunity to expand the existed Research Framework with the creation of new knowledge. The objectives of my work is mainly focused on:

- Development of Innovative methodologies for computer aided cultural heritage preservation and protection
- Documentation of monuments including all the necessary information about materials, structural mechanics, historical records, storytelling: enrichment of metadata

The mentioned, even from the first months of my elaboration with the project, has started to be realized; publications and oral presentations in Conferences and Workshops, future Secondments (Training within ITN-DCH; more details in Section C), Seminars attendance (more details in Section D) etc. having as a result: 1) Disseminate my research work and give access to a broad and multidisciplinary scientists' network and 2) Acquire new Research Skills and Technical Expertise through training in specific new scientific areas. In a long term base, following the described research pattern, my expectation is my work to result in a PhD degree.

**B. Core Research Training Activity:**

Laboratory of Material Science and Engineering, in the School of Chemical Engineering where I conduct my Research, has provided me the means (instruments, data etc.) and the knowledge (methodology and scientific approach etc.) to acquire a complete and thorough training in the following:

**1) Non-Destructive Testing Diagnostic Methodology Monuments' Materials Decay**

Data Acquisition training with Non-Destructive Techniques

Digital Image Processing, Infrared Thermography and Fiber Optic Microscopy, Ultrasounds, Ground Penetrating Radar

Measurements Interpretation and knowledge extraction

Field trips and Hands-on training

2) Knowledge Base Database Enrichment with data concerning:

Structural Materials Types

Types of Decay

Consolidation Materials

3) Three Dimensional (3D) Representation of the Monuments (Macro level) and the Materials Decay (Micro level)

Integrate the technique in the diagnostic methodology

**Future goal:** Incorporate the scientific disciplines in an Integrated Information Technology System for a sophisticated and efficient way of Data and Knowledge management.

**C. Secondments:**

I will start my Secondment activity after the September 2015:

- FORTH
- CNRS
- KAAK
- ARCTRON3D
- 7REASONS

**D. Dissemination & Outreach:**

***Researcher's night (26.09.2014)***

The particular event is under the call of Horizon 2020, is a Marie Skłodowska Curie Action (MSCA) and takes place every year on the last Friday of month September in many cities around Europe. It was organized by the Laboratory of Material Science and Engineering of the School of Chemical Engineering of National Technical University of Athens, with Scientific Responsible and Coordinator Professor Antonia Moropoulou. The project is dedicated on the promotion of researchers' work and the significance, especially in time of global economic crisis, of research results to Greece and to the European society in general. Through a number of scientific exhibits, the necessity of research in the development of the society and demonstrates that research is used as a reliable solution to overcome crisis. During the night researchers will present their achievements to the general public through experiments, demonstrations of portable equipment, simulations etc. In this event there was a great participation not only from Elementary/High School Professors and Students but there were also University students, Researchers, Academics who were interested in our Technical University Research activities. As a Marie Skłodowska Curie Fellow, I had undertaken the responsibility to inform interested participants, coming to his desk, about the ITN-DCH project; Involved Universities, Research Institutes and private sector companies around Europe, why such a project is important, what the impact of its outcomes on society are and what are the future prospects. Additionally, I exhibited part his work through demonstrating the Non Destructive Techniques (1 Ground Penetrating Radar, 2 Fibre Optic Microscopy and 3 Infra-Red Thermography) for material characterization for Cultural Heritage Protection and Conservation.

### ***Church of Asinou Documentation for ITN-DCH***

As representatives of Laboratory of Material Science and Engineering (LMSE), Professor Antonia Moropoulou (LMSE Head) and I, conducted an on-site inspection and non-destructive characterization of monument materials and of their conservation state aiming for 1) A diagnostic study-survey regarding materials decay on Architectural Surfaces (Frescoes) and Historic Structures (Masonries, Arches etc.) and 2) Assessing and evaluating incompatible materials and conservation interventions. The Non Destructive Techniques employed to make the measurements were the Infra-Red Thermography (IRT) and the Fiber Optic Microscope (FOM). Both techniques are widely used to study the murals' surface for the detection/identification of initial wear or decay and potential incompatibility concerning intervention materials.

### ***Scientific Visit to the Monuments of Acropolis***

In collaboration with the Interdisciplinary Postgraduate Program "Protection of Monuments" – Direction of Materials and Conservation Interventions", participation in the scientific visit co-organized by the Acropolis Restoration Service (YSMA). The particular offices-laboratories visited were:

- Technical office and work-site for the conservation and restoration of the Parthenon
- Technical office and work-site for the conservation and restoration of the Propylaea
- Office and laboratory of surface conservation
- Documentation office
- Photographic laboratory

### ***University Engineering Education and Skills for Innovation, Entrepreneurship and Creativity Workshop (16/12/2014)***

Organized by: SEFI (European Society for Engineering Education), OECD (Organization for Economic Cooperation and Development), HCTP (Hellenic Construction Technology Platform), Technical Chamber of Greece, Municipality of Athens and DASTA NTUA (Employment and Career Structure Program of the National Technical University of Athens) Leading experts from Engineering Education, International Associations, Technical Chambers, Industry, Construction Sector and local authorities will discuss on global problems, trends and policies on "University Engineering Education and Skills for Innovation, Entrepreneurship and Creativity", aiming at strengthening and fostering Academia connection with the local labor market and the knowledge alliance with industry, by integrating Education and Employability of Engineers with Sustainable Development requirements.

### ***Presence in the forthcoming conferences-events with a Poster/Abstract/Paper:***

- 1) **MCAA** in Greece, Athens (24/04/2015)

Poster: *Description of my Research Activities*

- 2) **8th National Conference of Non Destructive Testing in Athens** (8-9/05/2015).

Paper Title: *3D Representation of Decay Processes on Cultural Heritage Assets as a Diagnostic Tool*

- 3) **6th Conference on Emerging Technologies in Non-Destructive Testing in Brussels** (27-29/05/2015).

Paper Title: *Digital Cultural Heritage - A Challenge for the Chemical Engineering: Contextualizing Materials in a Holistic Framework*

- 4) **SEAHA Conference 2015** (14-15/07/2015).

Abstract Title: *A Diagnostic Survey for Cultural Heritage Protection, Preservation and Documentation based on Non Destructive Techniques*



E. Added Value to my Future Research Career:

As a multidisciplinary and intersectorial research and training programme, ITN-DCH manages to bring together fourteen leading European partners in a transnational network, providing me not only networking opportunities but also potential future cooperation in the academic or/and the industrial sectors in the fields of Digital Heritage Documentation and Protection. Training activities included in the ITN-DCH framework (e.g. Secondments) could provide the ideal circumstances for acquiring supplementary (but needed) knowledge for the completion of my work and create the potential of novel research fields that participants could lead. Last but not least, all mentioned activities accounting the participation in International Conferences and the visits to the case studies of the project result in improved communication and scientific skills very important for a successful Future Research Career.