UNITWIN/UNESCO Chairs Programme

Progress report

UNESCO Chair in Life Sciences

Report established by: Prof. Sinerik Ayrapetyan, UNESCO Chairholder, President of the Life Sciences International Postgraduate Educational Center

I. Activities

1. Education/Training/Research

Education
During the reporting period the UNESCO Chair established courses and workshops. This Education Program assembled 40 students and researchers.

- MS and Ph.D. courses in Biophysics, Neuroscience and Pain, Biotechnology and Biomedical engineering
This Programme was held between September 2008 and July 2009 and conducted according to the specialization program credits.

The UNESCO Chair staff was actively involved in the preparation and the organization of Theoretical and practical courses in Magnetobiology and Neuroscience in October 2008. These courses involved 65 students and 61 researchers.

Training
- Methodological trainings
This Programme consisted of whole seminars to teach students the necessary methods for their research studies and was held between December 2008 and June 2009.
- English language training
This Programme was held between December 2008 and June 2009

Research
Research projects and titles of the works:

- “The study of the molecular and cellular mechanisms of nonthermal biological effect of Microwaves”
This research Project was founded by the Armenian Government.

- “The study of the molecular and cellular mechanisms of biological effect of Electromagnetic fields and Acoustic Waves from the point of their application and environmental protection”
This research Project was founded by the Armenian Government.
• “Synthesis of new organic semiconducting polymer materials having high radiowave absorption rate”
This research Project was founded by European Office of Aerospace Research and Development (EOARD) through ISTC (# 1571P partner project).

• “The comparative study of the effects of extremely low frequency electromagnetic fields and infrasound on water molecule dissociation and generation of reactive oxygen species”
This research was founded by European Office of Aerospace Research and Development (EOARD) through ISTC (# 1592P partner project).

All of this research Project intended use of results like development and construction of research equipment. They also try to find new methods for environmental control and dosimetry of non-ionizing radiation from the point of public health, Physiotherapeutic treatment of various diseases, sperm motility activation, water purification, EMF-antitumor treatment and stimulation of plants seed germination.

2. Conferences/Congresses/Meetings
The UNESCO Chair held several important events in its most recent period of activity:

• International Seminar: IBRO/UNESCO SYMPOSIUM on “Non- Conducting Membrane Mechanisms of Under-Threshold Signal Transduction in Neurons”
  Date: 21-23 October 2008, Yerevan, Armenia

• International Seminar: IBRO/UNESCO WORKSHOP on “Animal issues in Scientific Research”
  Date: 22-23 October 2008, Yerevan, Armenia

• International Seminar: UNESCO/ONRG SEMINAR on “Electromagnetic Fields: Mechanisms of Action and Health Effect”
  Date: 24-26 October 2008, Yerevan, Armenia

• National Congress: “All-Armenian Life Sciences Congress”
  Date: 17-19 October 2008, Stepanakert, the Republic of Nagoni Karabakh (NKR)

During the international meetings organized in the framework of the UNESCO Conference, 55 lectures were presented by leading scientists in different fields of Life Sciences representing 23 countries (Asia/Pacific, namely Iran, Japan; Eastern and Central Europe, namely Poland, Slovak Republic, Russia, Ukraine, Georgia, Latvia; Western Europe and North America, namely USA, Austria, Switzerland, Germany, Finland, Italy, Spain). During the Poster Sessions of the Conference, 17 young scientists and Ph.D. students from Armenia, Georgia and Germany presented posters. More than 100 young and adult scientists as well as Ph.D. students from different scientific institutions of Armenia attended the lectures.

3. Publications/Interuniversity Exchanges/ Partnerships
During the reporting period the UNESCO Chair published several researches articles and established several Interuniversity Exchanges and one Partnership.

**Publications**

**Title:** “Exogenous Hydrogen Peroxide as a messenger for stimulation effect of magnetized physiological solution on heart contractility”
Author(s): Ayrapetyan G., Dadasyan E., Hayrapetyan H., Ayrapetyan S.
publisher(s): Bioelectromagnetics
Year: 2008
Language(s): English
Number of pages: 7

Title: “On the Metabolic Nature of Non-thermal Effect of Millimeter Waves on Heart Muscle Contractility”
Authors: Ayrapetyan G., Hayrapetyan H., Ayrapetyan S.
publisher: Bioelectromagnetics
Year: 2008
Language: English
Number of pages: 6

Title: “Cell Hydration as a Universal and Extra-Sensitive Biomarker for Determination of the Functional State of the Organism” (Report at the Conference)
Author: Ayrapetyan S.
publisher: Abstract Book of EHRLICH II –2nd World Conference on Magic Bullets
Year: 2008
Language: English
Number of pages: 1

Title: “The Frequency-Dependent Effect of Infrasound on Bull Sperm Velocity” (Report at the Conference)
Authors: Baghdasaryan N, Ayrapetyan S.
publisher: Abstract Book of EHRLICH II –2nd World Conference on Magic Bullets
Year: 2008
Language: English
Number of pages: 1

Title: “The Effect of 4Hz (30dB) Infrasound on Heart Muscle Contractility” (Report at the Conference)
Authors: Dadasyan E, Ayrapetyan S.
publisher: Abstract Book of EHRLICH II –2nd World Conference on Magic Bullets
Year: 2008
Language: English
Number of pages: 1

Title: “Low Intensity Millimeter Wave as a Potential Tool in Treatment of Diabetic Sensorymotor Polyneuropathy”
Authors: Moazezi Z., Masood S.M., Ayrapetyan S
publisher: International Dental and Medical Disorders
Year: 2008
Language: English
Number of pages: 6

Title: “Tissue Hydration as a Universal and Extrasensitive Marker for the Functional State of Organism”
Authors: Ayrapetyan S, Hekimyan A., Mushegyan G., Deghoyan A., Narinyan L.
publisher: Herald of the Academy of Medical Sciences of Russia
Year: 2008
Language: Russian
Number of pages: 3
Interuniversity Exchanges

- **Dr. Arsen Hunanyan**, Ph.D. a researcher from UNESCO UNESCO Chair-LSIPEC was awarded a postdoctoral fellowship to be conducted at New York State University at Stony Brook (host professor: Prof. Victor Arvanian, Dep. of Neuroscience and Behavior).

- **Erna Dadasyan**, PhD student at UNESCO UNESCO Chair-LSIPEC, is awarded a fellowship to be conducted at the 10th International Summer School on Biophysics “Supramolecular Structure and Function” to be held in Rovinj, Croatia, from September 19 to October 1, 2009.

Partnerships

- **Andranik Sanoyan**, Ph.D. a researcher from UNESCO UNESCO Chair-LSIPEC is awarded a fellowship in the Graduate Partnerships Program (GPP) in the Office of Intramural Training & Education (OITE).

II. Outcomes

During the reporting period in the framework of a governmental grant was elucidated the nature of metabolic pathway responsible for biological effect of EMF and IS on neuronal and heart muscle function. The subject of the study of the effect of EMF and IS on water physicochemical properties served as a subject of investigation also for a research grant provided by EOARD (through ISTC) in framework of which the effects of low Frequency Electromagnetic Fields and Infrasound on generation of reactive oxygen species (ROS) were studied. The data obtained in this project could serve as a preliminary step for biological study of the EMF and IS-induced changes of water dissociation and ROS effects on living organisms from the point of public health and environmental protection.

Within the framework of the IBRO/UNESCO symposium was elucidated the role of different metabolic non-conducting systems in regulation of under-threshold signal transduction in neuromembrane, as well as the molecular biological nature of this system.

The primary goal of the UNESCO/ONRG Seminar was to conduct a multidisciplinary discussion of the data obtained by different laboratories on the mechanisms whereby EMF of various frequencies alter function of biological systems, what are the public health implications of these actions, and what are the dangers and potential of use of EMF as a terrorist weapon. It was specifically focused on the physicochemical properties of extra- and intracellular water and on the possibility to use cell hydration as a marker for estimation of the hazardous effects of EMF on biological organisms.

The participants of IBRO/UNESCO Workshop found the analysis of strengths, weaknesses, opportunities and threats (SWOT) conducted during the workshop very useful. The results of the SWOT analysis will serve as ground for more detailed analysis and basis to fill the critical gaps in the country and the whole region.

In the framework of the second research grant awarded by EOARD (through ISTC) a method of synthesis of new polymers and co-polymers having high absorption properties was developed. These polymers could be used for protection of living organisms (including human beings) from Microwave radiation. The results of the project would be of interest for companies producing mobile phones and, generally, radio electric equipment for increasing the safeness of their production from the point of public health.

The Memorandum of Understudying signed between the UNESCO UNESCO Chair and the National Institute of Health (NIH) Graduate Partnership Program (GPP), and the National Institute of Deafness and other Communication Disorders (NIDCD) would allow the UNESCO Chair to adopt the NIH M.S. and Ph.D. educational programs in Life Sciences and organize an exchange visit by faculty and
students from one institution to the other. This MOU would enable the UNESCO Chair to realize it mission, i.e. to supplement the reformation of postgraduate educational system in Life Sciences, thus to promote the research and education in Armenia and the Region according modern demands.

During the reporting period, the UNESCO UNESCO Chairholder continues his responsibilities as a Member of International Advisory Committee of WHO for Electromagnetic Fields and Radiation Protection.

III. Forthcoming Activities

The immediate plans of the UNESCO Chair for the next two years:

1) Research project:

- The UNESCO Chair has prepared and submitted to ISTC a project: “The Application of Hydrogel as Non-Ionizing Radiation Sensor”. The local collaborators are: Yerevan State University, Department of General Physics. International collaborators are: Department of Bioengineering, University of Washington (Prof. Gerald H. Pollack); Department of Chemistry, Oklahoma State University (Prof. Barry Lavine); Research Group of BioNanoTechnology, Department of Chemical and Environmental Engineering, University of California, Riverside (Prof. Ashok Mulchandani).

- The UNESCO Chair has prepared and submitted to ISTC a project: “The study of the mechanisms of carbon dioxide-induced elevation of hydrogen peroxide toxicity on microbes and the possibility of using these phenomena as an innovative tool for water purification”. International collaborators are: Department of Biological Engineering, University of Missouri-Columbia (Prof. Fu-hung Hsieh); Department of Chemical Engineering, University of South Carolina (Prof. Michael A. Matthews, P.E.).

- The UNESCO Chair has prepared and submitted to ISTC a project: “The study of metabolic pathway of Microwaves effect on calcium-dependent potassium channels in neurons and T lymphocytes”. International collaborators are: Research International (Prof. Marko S. Markov); Department of Pharmacology, School of Medicine, Yale University (Prof. Leonard K. Kaczmarek).

- The UNESCO Chair has prepared and submitted to NineSigma a project: “The Study of Caffeine and Caffeine Plus FeCl2 as a Tool for Deceasing Aging-Induced Memory Loss”.

2) Conferences/Congresses/Meetings

- On July 11-15 UNESCO Chairholder Prof. Sinerik Ayrapetyan will visit Genoa (Italy) as a speaker in the VIIth European Biophysics Congress.

- On August 18-21 UNESCO Chairholder Prof. Sinerik Ayrapetyan will visit the Moscow State Institute of Radio Engineering, Electronics and Automation (MIREA) for the participation in the the 26th Progress in Electromagnetics Research Symposium (PIERS) as an invited speaker.

- On September 19 - October 1 Erna Dadasyan, the 3rd year PhD student of the UNESCO Chair will visit the 10th International Summer School on Biophysics “Supramolecular Structure and
Function” (Rovinj, Croatia) with oral presentation entitled “CELL HYDRATION AS A TARGET FOR BIOLOGICAL EFFECT OF 4 HZ INFRASOUND”.

- On September 28-30 UNESCO Chairholder Prof. Sinerik Ayrapetyan will visit Vouliagmeni Beach, Athens, Greece as an invited speaker for the 5th International Conference on ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD'09).

- On October 5 – 9 UNESCO Chairholder Prof. Sinerik Ayrapetyan, with a group of PhD students of the UNESCO Chair will visit The Central Congress Hall, Dicle University (Diyarbakır, Turkey) as an invited speaker at the 2nd International Biophysics and Biotechnology Congress at GAP & 21st National Biophysics Congress.

IV. Development prospects

During the reporting period the UNESCO Chair organized weekly seminars on modern problems of cellular and molecular biology for the lecturers, researchers and students of the Center and other Life Science institutions. Scientists from abroad, namely Japan, USA, Georgia and Iran had lectures during these seminars.

The UNESCO Chair organized Computer and English language courses for the students and researchers of the Center.

Considering the fact that the FSU educational system is still functioning in Armenia, which is not adequate to market economy, based on international experience the UNESCO Chair has developed a modern postgraduate educational program in Life Sciences. After discussing the program during the international meeting organized by the UNESCO Chair, the program was presented to the Ministry of Education and Science as a suggestion for modernization of postgraduate education in Armenia.

The UNESCO Chair has developed a new system of ranking of research institutes and universities on the basis of mean crude impact factor according to Scopus and Thomson Science Citation Index.

As the absence of PhD unique diploma acceptable for regional countries is the main barrier for broadening partnerships in postgraduate education between different countries, the UNESCO Chair plans to present to UNESCO Central Office a project on reorganization of the UNESCO Chair to UNESCO Regional Postgraduate Educational Center in Life Sciences which could significantly promote the development of this field in the Region.