Energy and Environmental Engineering Series
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ENERGY PLANNING, ENERGY SAVING, ENVIRONMENTAL EDUCATION

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Corfu, Greece, October 26-28, 2008

Proceedings of the 2nd WSEAS/IASME International Conference on
ENERGY PLANNING, ENERGY SAVING, ENVIRONMENTAL
EDUCATION (EPESE'08)

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Preface

This book contains the proceedings of the 2nd WSEAS/IASME International Conference on ENERGY PLANNING, ENERGY SAVING, ENVIRONMENTAL EDUCATION (EPESE'08) which was held in Corfu, Greece, October 26-28, 2008. This conference aims to disseminate the latest research and applications in Energy planning studies, Energy saving and emissions reduction in industries, Environmental management, Traffic and transportation, Cultural heritage, Education for Ecological modeling and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Plenary Lecture I

Thermal Behaviour and Entropy of Living Organisms through Examples

Professor Imre Benko
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Abstract: Natural and biological examples have become increasingly important in the technical science and practice. Introductory biology has more impacts on the lives of modern people than any other kind of science. Thermal engineering research has also discovered and uses a lot of phenomena existing in nature. Each such example announces that biology is an exciting field of intellectual experience. It is clearly and interestingly seen and illustrated how much could be learned from nature. The paper has chosen its subjects thoughtfully, and selected only durable, memorable, and often novel examples that readily show how the newly acquired knowledge can be applied. The nature is one of the sources of the progress in thermal technics.

Brief Biography of the Speaker: Prof.Dr.techn. Imre BENKŐ was born on August 14, 1936 in Budapest, Hungary. He obtained his MSc in 1961 on thermal engineering at the Budapest University of Technology and Economics(BME), Engineer-Professor in 1968 and Dr.techn. in 1972 in Mechanical Engineering from BME. Since 1961, he has been working in BME, Faculty of Mechanical Engineering, currently at the Department of Energy (DoE) as a lecturer and head of the research work on infrared thermogrammetry (IR-TGM).

He has done pioneering works on IR-TGM in Hungary , in the field of engineering problems since 1972 and also in thermo-biological diagnostics since 1980. and mainly he was responsible between 1980 and 1990 for the national research project on 'Development of Thermal Measurements and Automation'.

Since 1980 he has been the president of the Branch of Thermal Engineering and Thermogrammetry (TE and TGM) at the Scientific Society of Measurements, Automation and Informatics (MATE) and since 1977 he is the scientific organizer of the international THERMO conference on TE and TGM. He is a member of the European Association of Thermology (EAT) Committee and of the Editorial Board of the Journal 'Measurement and Automation' and 'Thermology International.

He is an expert of conductive and radiative heat transfer problems, of heat transfer in composite devices, of the application of numerical (Thermo-CAD) and experimental methods (IR-techniques) in solving Heat and Mass Transfer problems, of the development of new measurement methods and devices.

He has been the professor of six university courses ('Thermodynamics', 'Heat Transfer', 'Heat Exchangers', 'Infrared Thermogrammetry', 'Industrial furnaces' and 'Energy Management') and author or co-author of over 120 books, articles, research papers, reports and owner of eight patents. He is a distinguished inventor(1986) and holder of MTESZ (1990) and MATE (1983) prizes. . He was invited professor and researcher in France, Belgium, Czech Republic, Slovakia, Russia and has travelled on lecture trips all over the world.

Plenary Lecture II

Sun, Energy, Light, Temperature, Plantation in Design

Professor Taeke M. de Jong
Department Urbanism,
Faculty of Architecture,
University of Technology Delft,
THE NETHERLANDS

Email: T.M.deJong@tudelft.nl,
Website: http://team.bk.tudelft.nl,

Abstract: Sun, Energy, Light, Temperature, Plantation, Climate change are subjects studied in different disciplines of astronomy, geophysics, thermodynamics, building physics, physical geography, archaeology, landscape ecology. However, in urban design they have to be combined with many other factors. How to make a partial integration of these subjects relevant for testing designs? This paper gives references to these disciplines and their suppositions simulated in applications to test designs at these subjects:

- ENERGY
- SUN, LIGHT AND SHADOW
- TEMPERATURE, GEOGRAPHY AND AND HISTORY
- PLANTATION
- CLIMATE CHANGE
- INTEGRATION IN DESIGN.

Brief Biography of the Speaker:

Engineer, PhD, professor; studies in urban design, ecology, regional design, methodology, philosophy, computer programming.

Academic positions
Chair 'technical ecology and methodology' (1986), chair 'regional design' shared with Schrijnen; department Urbanism, Faculty of Architecture, University of Technology Delft, The Netherlands.

Scientific activities

- Projects/research

Most recently:

Low-risk design scenario for the Turkish municipality of Adapazari, destroyed by Earthquake in 1999.

Earlier higlights:

Ecological comparison of urban extension plans Almere; Image quality plan Baarsjes Amsterdam; Environmental impact analyses; Regional scenarios Westland and The Netherlands; Energy and Windtunnel research; Urban Design Zwolle; PHD research 'Environmental differentiation' (1978).

- Publications/Education

Most recently:

'Landscape ecology in the Dutch context: Nature, Town and Infrastructure' chief editor and author (2007, 30 authors).

Earlier highlights:

'Ways to Study urban, architectural and technical design' chief editor and author (2002, 50 authors); decisive (1992): 'Short methodology of study by design'; Many other publications downloadable from http://team.bk.tudelft.nl like extended lecture notes and computer programs on Sun, Wind, Water, Traffic, Earth, Life, Ecology, Living, Density, Methodology, Urban Design techniques.

- Formalities

Member of the Board for doctorates University of Technology Delft (TUDelft).

Chairman of more than 200 PHDsessions TUDelft.

Foundation day orator TUDelft (1995) 'Systematic transformations in design and their impact'.

Others:
Secretary of the Royal Dutch Association for Field Biology (KNNV) Zoetermeer since 1992, quarterly reporting the ecological development of this New Town as chief editor of its local periodical.

Plenary Lecture III

Sustainable Architecture: Reasons, Examples, Goals

Professor Ulrike Heine
Assistant Professor - Clemson University
School of Architecture
172 C Lee Hall,
Clemson, SC 29634-0503
U.S.A.

Email: E. ulheine@clemson.edu,

Abstract:
"Sustainable building does not have to be considered a new architectural language as far as style is concerned. It can be applied to any style."

Ulrike Heine

Our slow incorporation of sustainability is leading to many irreversible environmental and societal problems.

Our lives are defined by energy. We need high energy levels to maintain our technology-driven high standard of living. In addition, we are now faced with the challenge of repairing environmental and community damage done over 200 years of industrialization, while at the same time finding ways of producing large amounts of energy without causing further damage. Population explosion, pollution and depletion of natural resources are the three most critical factors causing these pressures on our society. As resources become scarce, fossil fuel prices will become prohibitively expensive, making middle class life unaffordable for many. These factors bear direct influence on our human living space, both privately and publicly. Investigation into alternative energies and more efficient buildings is indispensable if we are to reduce our dependency on fossil fuels and avoid an inevitable societal disaster.

Within this context, what is sustainability? And how can we define the task of a designer or user regarding sustainability? On a faster moving, more densely-populated planet, new design and organizational challenges emerge at an ever-increasing rate and with potentially momentous consequences.

We have three options for reducing our consumption of fossil-based energy:

- Developing and exploiting renewable sources of energy
- Increasing the efficiency of our machines and buildings
- Reducing our level of comfort

If we don't implement the first two strategies in good time, the last will follow inevitably.

Sustainable design and maintenance of buildings is requisite in order to stave off pending energy and societal disasters. This involves the reintegration of our civilization into natural energy cycles. To be clear, this doesn't mean turning the clock back to the time before industrialization, but rather using technology to optimize energy consumption and increase the efficiency of renewable forms of energy such as wind, geo-thermal, solar, water, tidal,

biomass and waste energy. All of these forms of technology are sufficiently established today to be commercially viable. The broad variety of energies available and their geographical dispersion can ensure adequate stability despite fluctuations in the power-supply network.

Sustainable building does not have to be considered a new architectural language as far as style is concerned. It can be applied to any style. It is, rather, energy efficient, has intelligent facades, uses materials optimally and has balanced and adequate building services. The secret of a well-balanced energy efficient building resides in equilibrium between retaining and acquiring, always with respect to local conditions.

Neither sustainability nor ecology is necessarily a matter of technically expensive solutions.

Instead, they are about tapping into the specific potential of a location using systems that intelligently adapt to local and climatic conditions. This is always different because there is rarely a single correct solution. Sound sustainable and ecological strategies are based more on integrating existing natural processes than incorporating additional technically sophisticated systems. Strongly self-regulating natural processes include:

- utilizing thermal mass to buffer temperature fluctuation
- exploiting thermal effects and aerodynamics for ventilation
- generating coolness through water evaporation

The Architecture firm, Hascher Jehle Architektur, in Berlin, Germany, is one of the most sought-after German architecture practices for sustainability with respect to climate sensitive design. The projects, Dvg Office Building, Stuttgart Museum Of Art and LSV Office Building received numerous national and international awards and are examples of adapting to the local climatic conditions and dealing with them in a self-regulating way. Professor Heine participated in the design and administration of these projects.

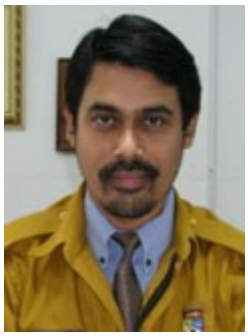
Brief Biography of the Speaker:

Ulrike Heine is Assistant Professor of Architecture, Clemson University, since August 2007. Her approach to architecture with respect to teaching and research is based on sustainability, specifically, ways of applying simple natural laws in response to climatic conditions. She teaches architectural design as a process of integration focusing on creative assessment of the interrelationships between materials, construction techniques, lighting, acoustics and energy saving technologies. Her research has a focus on roof an exterior wall construction (cladding), especially the specific materials properties and how the various materials involved can be joined appropriately.

Ulrike Heine graduated with a Master of Architecture from the Brandenburg Technical University in Cottbus, Germany, in 1999. She also spent a period of her studies at the School of Architecture in Barcelona, Spain. She worked as a practicing architect inter alia for the German architectural practice of Hascher Jehle Architektur in Berlin. Prior to joining Clemson's faculty, she spent three years teaching Design, Construction and Energy Responsible Planning at the Technical University, Berlin, Germany.

Plenary Lecture IV

Advances in Photovoltaic Thermal (PVT) Solar Collectors



Professor Kamaruzzaman Sopian
Solar Energy Research Institute
Universiti Kebangsaan Malaysia
43600 Bangi Selangor
MALAYSIA

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Abstract: The application of solar energy can be broadly classified into two categories; thermal energy systems which converts solar energy into thermal energy and photovoltaics energy system which converts solar energy into electrical energy. The vital component in solar energy system is the solar collections systems. Two solar energy collection systems commonly used are the flat plate collectors and photovoltaic cells. Normally, these two collection systems are used separately. It has been shown that these two systems can be combined together in a hybrid photovoltaic thermal (PVT) energy system. The term PVT refers to solar thermal collectors that use PV cells as an integral part of the absorber plate. The system generates both thermal and electrical energy simultaneously. The number of the photovoltaic cells in the system can be adjusted according to the local load demands. In conventional solar thermal system, external electrical energy is required to circulate the working fluid through the system. The need for an external electrical source can be eliminated by using this hybrid system. With a suitable design, one can produce a self-sufficient solar collector system that required no external electrical energy to run the system. The different options in the development in PVT systems have been categorized by the heat transfer fluid used i.e. air, water, refrigerant. The choice of the heat transfer fluid is fundamental to the design of PVT systems. In this paper, the PVT systems used air cooled for removal of heat from the photovoltaic panels. The paper also describes the trends in the research and development of air-cooled and water cooled PVT concepts and identifies the possible promising systems for further research and development.

Brief Biography of the Speaker: Prof. Dr. Kamaruzzaman Bin Sopian obtained his BSc in Mechanical Engineering from the University of Wisconsin-Madison in 1985, MSc in Energy Resources from the University of Pittsburgh in 1989 and PhD. in Mechanical Engineering from the Dorgan Solar Laboratory, University of Miami in 1997. He is presently the Professor in Renewable Energy at the Department of Mechanical and Material Engineering, Universiti Kebangsaan Malaysia. Currently, he is the Director of the Solar Energy Research Institute, a center of excellence for the research and development in solar energy technology. He has been involved in the field of solar energy for more than twenty years. His main contributions are in solar radiation modeling, alternative material for solar absorber, solar water heating system with integrated storage system, solar desalination, solar cooling, daylighting using solar light pipes, solar assisted drying systems, grid-connected photovoltaic system, thin film silicon solar cells, combined photovoltaic thermal or hybrid collector and solar hydrogen production system.

He has published over 400 research papers in journals and conferences. He has delivered keynotes speeches at national and international conferences on renewable energy. He is the founding member of the Malaysian Institute of Energy, member of the World Renewable Energy Network based in the United Kingdom and is an associate editor of the Renewable Energy published by Elsevier Ltd. He heads several national subcommittees on renewable energy by the Malaysian government to promote awareness, market enhancement, policy studies and the applications renewable energy.

Plenary Lecture V

Electricity Generation and Climate Change Policies

Professor Christos D. Papageorgiou
National Technical University of Athens
GREECE

Email: chrpapa@central.ntua.gr

Abstract:

- We are in an energy and global economy transient period
- End of Fossil fuels (oil and natural gas) is not too far
- Climate change indications due to global warming threat are accelerating
- Climate change policies should be agreed and urgent measures should be taken
- Green world economy plans should be agreed and states should start immediately their implementation
- Academia, industry and politicians should be tuned for the war against the unconventional enemy threatening human and living species on earth and our civilisation

For year 2010 an estimated quantity of 29,055 Mt carbon dioxide, will be spread to the environment by fossil fuels (weto-h2 report of European Commission) of which:

36.4 % for electricity generation
20.8 % for the industry
18.8 % for transport and
14.2 % for household, service and agriculture
9.8 % in international bunkers

An ideal solution to stop or limit the climate change process below a safe threshold it should be based on a carbon free electricity generating technology that could supply (the fossil fuelled covered) 50% of electricity demand, including electricity for transportation.

A realistic assessment of the electricity generating technologies is necessary in order to design a successful policy to eliminate the global warming threat.

Cost, quality of electricity, pollution and water demand are the most serious factors in the choice of the best electricity generating technology mixture and its time evolution in order to secure sustainable development, to eliminate the global warming threat and protect the biosphere and life quality for humans and all living species on earth.

An ideal electricity generating technology should have the following characteristics:

- Continuous high quality electricity generation
- Simple technology that can be applied in all continents
- Low construction cost of its PPs and low direct cost of the produced KWh
- Easy and fast deployed technology, based on existing material and using local personnel for construction, operation and maintenance of its PPs

- Zero CO2 emissions and any other forms of pollution
  • Zero water demand
- Zero thermal energy generation to the biosphere
- Recycling construction material
- Originated from renewable source in order to secure sustainability

A low cost alternative of solar chimney technology the floating solar chimney technology is an electricity generating technology that is close to the ideal.

All the proposals and technologies by the academia and industry should be taken very seriously by the decision makers because their responsibilities and the expectations of the people are high, due to threatening time limits related to the accelerating climate change indications.

Brief Biography of the Speaker:

Prof. Christos D. Papageorgiou (19/04//1943)

1. Studies
   1961-1966 Electrical and Mechanical engineer of National Technical University of Athens (NTUA).
   1976-1979 Obtained his PhD by the Imperial College of London University
2. Academic carrier
   1970-1976 Professor in the Technological University of Piraeus
   1979- Associate Prof in the school of Electrical and Computer Engineering of National Technical University of Athens in electromechanical systems of Thrust and Power.
3. Most Important Management activities
   -In his professional carrier held several top managerial positions the most important of which are:
   - 1981-1983 Deputy president of HELLENIC RAILWAYS (O.S.E.)
   - 1983-1985 Chairman and president of OLYMPIC AIRWAYS
   - 1986-1987 Chairman of PYRKAL (the major Greek defense industry)
   - 1988-1989 Managing director of HELLENIC RAILWAYS (O.S.E.)
   - 1994-1995 Chairman of "GENERAL WAREHOUSES" OF NATIONAL BANK OF GREECE
   - 1996-1997 Chairman of HELLENIC RAILWAYS (O.S.E.)
   - 2000-2002 Chairman of VERAVIA (Private Express freight commuter airline)
4. Research and academic interests
   - Inventor of the "Floating Solar Chimney" (Patented on 2003)
   - Research on the Solar Chimney technology (www.floatingsolarchimney.gr)
   - His academic interests are including:
   - Renewable energy
   - Electromagnetism and Quantum Mechanics
   - Philosophy and History

Author Index