

*TURKISH NONLINEAR SCIENCE*

*WORKING GROUP*

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**XIII. International Symposium on**

**“Disorder Systems: Theory and Its Applications”**

**21 - 28 August 2013**

**Karaburun - İzmir - Turkey**

Sponsors

Celal Bayar University

Karaburun Municipality

Turkish Nonlinear Science Working Group

**Programme & Abstract Booklet**

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**XIII. International Symposium on “Disorder Systems:  
Theory and Its Applications”**

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# *SYMPOSIUM PROGRAMME*

### **21 August 2013 – Wednesday**

14.00-18.00      Registration  
Welcome Meeting and  
Assignment Member of Workshops

### **22 August 2013 – Thursday**

09.00-11.00      Registration  
11.00-13.00      Workshop Meetings  
13.00-14.30      Symposium Lunch  
15.00-18.00      Workshop - I: “Nonlinear Quantum Systems”  
Coordinator: **Hasan Tatlıpınar**, *Yıldız Technical University, İstanbul, Turkey*

### **23 August 2013 – Friday**

11.00-13.00      Workshop - II: “Complexity in Medicalphysics”  
Coordinator: **Tamer Zeren**, *Celal Bayar University, Manisa, Turkey*  
13.00-14.30      Symposium Lunch  
16.45-17.00      Opening  
17.00-18.00      “Modelling Memory Associativity in Conscious and Unconscious Mental Behavior with Artificial Neural Networks-I”  
**Roseli Wedemann**, *Imperial College, London and Universidade do Estado do Rio de Janeiro*  
18.00-19.00      Mayor of Karaburun Municipality Cocktail

### **24 August 2013 – Saturday**

11.00-12.00      “The Emergence of Order from Disorder as a Form of Self Organization”  
**Rüştü Murat Demirer**, *Kültür University, İstanbul, Turkey*

- 13.00-14.30 Symposium Lunch
- 15.00-16.00 *"Modelling Memory Associativity in Conscious and Unconscious Mental Behavior with Artificial Neural Networks-II"*  
**Roseli Wedemann**, Imperial College, London and Universidade do Estado do Rio de Janeiro
- 16.00-16.30 Coffee break
- 16.30-17.30 *"Reversibility and Irreversibility in Shape Memory Alloys"*  
**Osman Adıgüzel**, Fırat University, Elazığ, Turkey
- 20.00- Symposium Party

### **25 August 2013 - Sunday**

- 11.00-12.00 *"Entropy and Reality"*  
**Hasan Tatlıpınar**, Yıldız Technical University, İstanbul, Turkey
- 13.00-14.30 Symposium Lunch
- 15.00-16.00 *"New Anarchy in Simulation World"*  
**K.Gediz Akdeniz**, Istanbul University, Istanbul, Turkey
- 16.00-16.30 Coffee break
- 16.30-17.30 *"My Impressions on the 2013 Gordon Research Conferences"*  
**Oktay Kaynak**, Urla, Turkey
- 17.30-18.30 *"Superstatistics: from High Energy Physics to Environmental Aspects"*  
**G.Cigdem Yalcin** (Istanbul University)  
**Christian Beck** (Queen Mary University of London)

### **26 August 2013 - Monday**

- 11.00-12.00 The results of the Workshop Meetings - I
- 13.00-14.30 Symposium Lunch

17.00-18.00    The results of the Workshop Meetings - II  
18.00-19.00    *"Recent Urban Insurrections: A Case of Global  
Emergence?"*  
**Nicholas Anastasopoulos**, *National Technical  
University of Athens*

## **27 August 2013 - Tuesday**

Trip - Karaburun Peninsula

20.00-21.00    *"The 2013 Utopian Studies Society Conference  
highlights in New Lanark"*  
**Nicholas Anastasopoulos**, *National Technical  
University of Athens*

## **28 August 2012 - Wednesday**

11.00-13.00    The results of the Workshop Meetings - II  
13.00-14.30    Symposium Lunch  
14.30-16.30    Closing Remarks

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# *ABSTRACTS*



# **Modelling Memory Associativity in Conscious and Unconscious Mental Behavior with Artificial Neural Networks (I and II)**

**Roseli S. Wedemann**

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In the last decades, much work has been done to study properties of the topologies and dynamics of neuronal systems, to understand brain and mental processes, based on connexionist models [1, 2, 3]. It is possible to study how global emergent behavior arises from the interactions among neurons of the parallel processing neuronal networks, with computer simulations.

We will discuss neural network models, whereby some interplay of conscious and unconscious activities may be described by associative memory mechanisms [3]. Knowledge from areas such as neurophysiology, psychiatry, psychology, computer science, mathematics and statistical mechanics can be combined, so we can better understand mechanisms which underlie brain and mental processes [1-8]. This knowledge may contribute to the understanding of therapeutic procedures and to the development of models of artificial machines and cognitive devices [1].

In a first presentation, we will describe a neural network model, whereby some mental processes in neurotic pathology and psychoanalytic working-through may be understood as associative memory functioning, according to the findings of Freud [2,3]. We will describe an algorithm based on known mechanisms that control synaptic properties, whereby the neural networks self-organize to a hierarchically structured, clustered organization. The networks consist of two modules, corresponding to sensorial and symbolic memory, which interact representing unconscious and conscious

mental processes. We will describe some topological properties of these complex networks.

In a second presentation, we will discuss how memory retrieval can be achieved through simulated annealing, which is a phase space sampling technique. We analyse the behavior of the network under different assumptions on the way simulated annealing is performed on the model [7, 8]. We will show some properties of the dynamics of memory access, obtained from measurements of quantities such as frequencies of access of configurations and avalanche sizes, in computer simulations.

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# **The Emergence of Order from Disorder as a Form of Self Organization**

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Detecting of phase synchronization and transitions in EEG recordings are difficult task because of non-neural signals like artifacts and muscle activity and S/N ratio is low. The most difficult problem is that the cut-off frequencies of the band-pass filters are very sensitive and not easy to separate real transitions from phase slips. There are some phase synchronization and transition analysis methods developed. We will briefly discuss those methods. We first investigate a very powerful phase transition analysis method based on Freeman model and then we propose an efficient digital filtering which will help to improve Freeman's approach for the capturing abrupt phase transitions in cortical states defined in in the delta, theta and alpha ranges (Freeman and Rogers, 2000). Phase transitions occurring on the surface of cortex can cover an area ranging from a few hyper columns to the entire hemisphere. Our goal is to develop an accurate and adaptable digital filter which is robust to variations in the bandpass filter characteristics and able to separate real transitions from artifacts caused by phase slips.

# **Reversibility and irreversibility in shape memory alloys**

**Osman Adıgüzel**

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Shape memory alloys have a peculiar property to return to a previously defined shape or dimension when they are subjected to variation of temperature. This behavior is evaluated by the structural changes caused by internal stresses in microscopic scale depending on the external conditions. Shape memory effect is based on martensitic transformation, and shape memory properties are intimately related to the microstructures of the alloy. Martensitic transformations are first order lattice-distorting phase transformations and occur with the cooperative movement of atoms by means of lattice invariant shears in the materials on cooling from high temperature parent phase region.

Thermal induced martensite occurs by means of a shear-like mechanism as multivariant martensite in self-accommodating manner and consists of lattice twins. Also, this martensite is called twinned martensite or multivariant martensite.

Shape memory alloys can be deformed plastically in low temperature martensitic condition, and recover the original shape on heating over the austenite finish temperature. The material cycles between the deformed and original shapes on cooling and heating in reversible shape memory effect. By applying external stress, the martensitic variants are forced to reorient into a single variant leading inelastic strains, and deformation of shape memory alloys in martensitic state proceeds through a martensite variant reorientation or detwinning of twins. The twinning occurs with internal stresses, while detwinning occurs with the external stresses. On the other hand, the deformed material recovers the original shape on heating over the austenite finish temperature. Meanwhile, the material returns to the multivariant martensite structures (thermally induced martensite

structure) in irreversible shape memory effect on cooling below to martensite finish temperature; in contrast, the material returns to the detwinned martensite structure (deformed martensite) in reversible shape memory effect. Shortly one can say that the microstructural mechanisms responsible for the shape memory effect are the twinning and detwinning processes as well as martensitic transformation. Twinning and detwinning processes can be considered as elementary processes activated during the transformation, and the reorientation of self-accommodated martensite structures is essential as well as martensitic transformation in reversible shape memory effect.

Copper based alloys exhibit this property in metastable beta phase region which has B2 or DO3 -type ordered structure at high temperature parent phase. On cooling from high temperature, these structures martensitically turn into layered complex structures, like 3R, 9R or 18R, depending on the stacking sequences on the basal plane. In the present contribution; x-ray diffraction and transmission electron microscopy and differential scanning calorimetry (DSC) studies were carried out on two copper based CuZnAl and CuAlMn alloys.

Key words: Shape memory effect, martensitic transformation, lattice invariant shear, twinning, detwinning.

## **Entropy and Reality**

**Hasan Tatlıpınar**

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Every age of human history has its own scientific vision and according to that has reality paradigm. In our age the scientific vision mostly based on rigorous mechanical laws and physical nature is explained by these laws. Although entropy is not rigorous theory but it has important role to explain behavior of ensembles and probabilistic

character of nature. Since entropy is an important mathematical tool via probability theory this concept of entropy has application in many fields apart from natural science such as literature, art, social science act. In this presentation taking entropy on the center physical laws and reality are discussed.

## **New Anarchy in Simulation World**

**K.Gediz Akdeniz**

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Vezneciler, İstanbul, Turkey  
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“Disorder-Sensitive Human Behaviors (Chaotic Awareness) Simulation Theory” has been proposed as a critique theory to investigate social dynamics and societies as well as disordered human behaviors.

In this theory, non-modern society forms and disorder human behaviours in societies are also considered as a reality principle (Chaotic Awareness) in simulation world to complete Baudrillard Simulation Theory in non-modern society context. The emergence of this additional reality in simulation world is *zuhur*. *Zuhur* is different than simulacra. Because it can not play a role as hiper-realty, but it could transform system (society) to non-known forms like butterfly effect. For example, the communities in non-modern defination could be considered as chaotic awareness realties in today’s simulation world. In this simulaton case *zuhur* of such realties could transform society to non-predictable new state.

In this presentation I would like to review Chaotic Awareness Simulation Theory with some *zuhur* examples. And by this theory, I shall critique some most recently global events (like the Athena, Cairo

and İstanbul events) in the framework of communities movements really principle particular in socio-dynamics and political contexts.

## **My Impressions on the 2013 Gordon Research Conferences**

**Oktaý Kaynak**

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I have participated GRC conference held on 2-7 June 2013 titled "Biological Mechanisms in Evolution". My presentation was titled "Processes and Mechanisms of Human's Evolution towards the Intelligent Living Being Mentis Eversionis".

In this conference I will share with you my exciting impressions about; Biological Mechanisms in Evolution, Gordon Research Conferences, Stonehill College, Easton, MA, June 2-7, 2013

## **Superstatistics: from High Energy Physics to Environmental Aspects**

**G.Cigdem Yalcin<sup>a</sup>, Christian Beck<sup>b</sup>**

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*<sup>b</sup>School of Mathematical Sciences, Queen Mary, University of London, London E1 4NS, UK*

Superstatistical techniques are powerful tool to describe general classes of complex systems. They have been recently successfully applied to many complex systems. Examples are turbulence [1-4], defect turbulence [5], share price dynamics [6,7], random matrix theory [8,9], random networks [10], wind velocity fluctuations

[11,12], hydro-climatic fluctuations[13], the statistics of train departure delays [14], models of the metastatic cascade in cancerous systems[15] and scattering processes in high-energy physics [16].

More recently we have shown that superstatistical techniques could be also successfully applied to complex systems of solid state physics [17] and environmental aspects of superstatistics[18]

In this presentation, first of all we would like to review the role of superstatistical techniques, from high energy physics to environmental aspects. And as a particular application, we will discuss the superstatistical distributions  $f(\beta)$  relevant for a generalized statistical mechanics description of complex systems that are coupled to a changing temperature environment on planet earth.

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## **Recent Urban insurrections: A case of global emergence?**

**Nicholas Anastasopoulos**

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Canonical examples of emergence include traffic jams, the colonies of social insects, and bird flocks. For example, the V shape of the bird flock does not result from one bird being selected as the leader, and the other birds lining up behind the leader. Instead, each bird's behavior is based on its position relative to nearby birds. The V shape is not planned or centrally determined; it emerges out of simple pair-interaction rules. The bird flock demonstrates one of the most striking features of emergent phenomena (Keith R Sawyer, 2005)

Although one may claim that information travelling across the globe nowadays plays a significant part in generating synchronicity and inducing certain events to happen, there has to be something more that convincingly explains recent trends. The phenomenon seems to be taking global proportions: we observe similar collective behavior of societies in various urban environments over the past three years from disparate places around the world, including the Arab world and the insurrections collectively referred to as the Arab spring, European cities (Madrid, Athens, London) and more recently Istanbul, Stockholm and several Brazilian cities. Is it then a remarkable instance of synchronicity and a mere coincidence?

Or is it perhaps a trend relating to an emerging global consciousness despite the hugely different circumstances between these societies and locales? This presentation contemplates on cities, societies, buildings, streets and squares, systems of governance, the state of late neo-liberal globalized economy and capitalism and alternative scenarios for the future. Some of these thoughts draw upon the work and writings of David Harvey, Robert Gilman, Joanna Macy, Antonio Negri, Slavoj Žižek, Cornelius Castoriadis and Fritjof Capra as well as

readings in systems and complexity thinking, architecture and politics, in an attempt to connect the dots concerning global developments into a –hopefully- coherent narrative.

## WORKSHOPS

Workshop - I:

*“Nonlinear Quantum Systems”*

Coordinator: **Hasan Tatlıpınar,**

*Yıldız Technical University, İstanbul Turkey*

Workshop - II:

*“Complexity in Medicalphysics”*

Coordinator: **Tamer Zeren,**

*Celal Bayar University, Manisa, Turkey*