



E.C. Nest Contract n. 012380



## General Integration of the Applications of Complexity in Science

Co-ordinate actions

NEST-2003-Path-1

Tackling Complexity in Science

### WP 7 – Deliverables 7.1, 7.2, 7.3, 7.4

No.	Name
D7.1	BASIC courses
D7.2	ADVANCED introductions
D7.3	ADVANCED courses
D7.4	Thematic Research Schools

Due date: months 1 to 36

Submission date: 2008-12

Start date of project: 2005-07-15

Duration: 36 months

Organisation: ISI  
Fondazione ISI, Torino, Italy

Revision 0

Project co-funded by the European Commission with the 6 <sup>th</sup> Framework programme (2002-2006)		
Dissemination Level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

**GIACS Schools Committee Membership**

Felix Reed-Tochas (*Chair*)

Marcel Ausloos, Carmen Costea, Jeffrey Johnson, Mark Salmon, Gerard Weisbuch, Frederik Zohm

The purpose of Work Package 7 of GIACS was to support different types of seasonal schools with an interdisciplinary focus on complex systems research. The types of seasonal schools for which support were envisaged are:

- Basic courses
- Advanced Introductions
- Advanced Courses
- Thematic Research Schools

The motivation behind these different types of courses was the same - to make available training in the emergent field of complex systems research with a focus on the needs of doctoral students and early stage post-docs. The point of this initiative was that many European universities and research institutions were at the time still building experience and capacity in this new area, and hence could not provide such training in house. Also, interdisciplinary research in particular often needs to draw on knowledge and resources that cannot be found in any one institution. The summer (or winter) school format is an effective way to address these issues.

The three key objectives that GIACS Schools addressed were:

1. To augment existing research training for early stage researchers by the provision of new interdisciplinary courses.
2. To help integrate NEST Pathfinder STREP themes and researchers.
3. To seed new research collaborations and training arrangements (such as co-supervision of doctoral students).

Our activity in the first stage concentrated on insuring a minimum of coherence within certain sections of the NEST community. We found that the degree of preparedness and the profile of the young scientists in the various STREPs did not favour the "Basic" format.

Courses and schools, covering these deliverables, were organized in this WP. While some of these activities are clearly basic courses and others advanced, no distinction has been drawn of their respective contributions between these deliverables. The topics covered are given below. Their location and participation are summarised in the Table below. Some further information can be obtained from the GIACS archive site at [http://www.giacs.org/past\\_events](http://www.giacs.org/past_events). For some events further information, sometimes including the presentations themselves, is still available directly from the WWW sites listed.

**Table of Advanced Courses and Schools for WP 7**

<b>Dates</b>	<b>Title</b>	<b>Location</b>	<b>Speakers</b> *	<b>Partici- pants*</b>	<b>Partners</b>
5-10 March 2006	Advance Introduction on Agent based models: from analytical models to real life phenomenology	ISI, Torino, Italy	21	25	ISI
5-7 July 2006	Advance Course on Experimental and computational finance	ISI, Torino, Italy	10	45	ISI
8-13 July 2006	Advance Course on Agent-based modeling of socio-economic systems	ISI, Torino, Italy	15	45	ISI
3-9 Sept. 2006	Double Triplet on Applications of complex systems to social sciences	Kazimierz Dolny, Poland			ISI
2-6 Oct. 2006	Advance Introduction to Genomical Biology	Evry, Paris	10	38	ISI
10-14 April 2007	1 <sup>st</sup> European Complexity PhD School: agent-based studies of social, economic and industrial systems	ISI, Torino, Italy	20 (6)	31 (6)	ISI
30 April - 4 May	Thematic research school on Modeling complex biological systems	Evry, France	11 (6)	93 (13)	ISI CNRS
7-11 May 2007	Advanced course on Complexity of biological networks	Evry, France	21 (6)	36 (8)	ISI CNRS
25 June to 1 July 2007	First EU-India-China summer school on Aspects of complexity in computational neuroscience	ISI, Torino, Italy	7 (4)	31 (8)	ISI
3-12 Sept. 2007	Advanced School on Extreme events: nonlinear dynamics and time series analysis	Comorova, Rumania	13 (6)	43 (22)	ISI
17-22 Sept. 2007	Agent based models for spatial systems in the social sciences and economics	La Londe les Maures, France	26 (10)	63 (11)	ISI
22-27 Nov. 2007	2 <sup>nd</sup> European PhD Complexity School: stochastic effects in differential nonlinear models	ISI, Torino, Italy	29 (11)	28 (5)	ISI
4-8 Feb. 2008	3 <sup>rd</sup> European PhD Complexity School: evolution in biological systems	ISI, Torino, Italy	13 (6)	35 (11)	ISI
23 April 2008	International Workshop on Complexity, policy and agents	Manchester, UK	6 (3)	18 (5)	ISI
26-29 May 08	International workshop on Sociophysics: status and perspectives	ISI, Torino, Italy	34	46	ISI
1-4 June 2008	EU-China summer school on Internet, science and society	Warsaw, Poland	7 (6)	33 (7)	ISI, WU
10-14 Sept. 08	4th European PhD Complexity School	Jerusalem, Israel	31 (8)	95	ISI, HUJI
13-17 Oct. 08	Facing the challenge of infectious diseases	ISI, Torino, Italy	42	75	ISI
	<b>TOTAL</b>		<b>227</b>	<b>659</b>	

***Advance Introduction on Agent Based Models: from Analytical models to real life phenomenology***

At ISI Torino Italy, from 5 to 10 March 2006.

Topics covered included: emergence, dynamics in networks, evaluation, minority games, epidemics, ABM and financial markets, production networks, firms and regional economics. See

<http://www.complexity-research.org/page/6>.

***Advance Course on Experimental and Computational Finance***

At ISI Torino Italy, from 5 to 7 July 2006.

Topics covered included both experimental and computational finance. Particular attention was paid to continuous-time finance. Practitioners also gave talks. This course prepared students for the immediately following course. See

<http://www.giacs.org/node/496> and

<http://www.isi.it/main.php?liv1=news&liv2=past&news=PSBG6H6Q4BJM3MGH1KOTMJZH0DZMDF32>.

***Advance Course on Agent-Based Modeling of Socio-Economic Systems***

At ISI Torino Italy, from 8 to 13 July 2006.

This course followed on from the immediately preceding course, covering topics at a more advanced level. Topics covered included reducing perplexity through complexity, social dynamics and norms, firm growth models, and model validation issues: empirical evidence for theoretical models. See

<http://www.giacs.org/node/495> and

<http://www.isi.it/main.php?liv1=news&liv2=past&news=0K903ISK0JYN67HILBN8TQKUXWP0WPXW>.

***Double Triplet on Applications of Complex Systems to Social Sciences***

At Kazimierz Dolny, Poland from 2 to 9 September 2006.

Topics covered include scale-free networks, formation of hierarchies, firms, markets, opinion dynamics, social dynamics and urban growth. See

<http://www.giacs.org/node/484>.

***Advance Introduction to Genomical Biology***

At Evry, Paris, France, from 2 to 6 October 2006.

Topics included molecular genetics, structural biology, genomics and post-genomics, epigenomics, cell biology, animal and plant biology and evolution. A CD-ROM containing the slides of all the presentations is available to anyone who requests it from: sec AT epigenomique.genopole.fr. See

<http://www.giacs.org/node/491>.

***First European Complexity PhD School: agent-based studies of social, economic and industrial systems.***

At ISI, Torino, Italy from 10 to 14 April 2007.

Topics covered were: agent-based modeling (ABM), including social learning; minority and exchange games; ABM of the emergence of leadership in teams and structure in organisations; financial systems; economic modeling of business fluctuations and input-output analysis; migration modeling; modeling political conflicts, e.g. the gas-oil conflict in Europe. See

<http://www.giacs.org/node/534> and  
<http://www.isi.it/main.php?liv1=news&liv2=news&news=1CWQ61XWDJC4ZE4UHMXXM41QR7FWG6Y>.

***Thematic research school on modeling complex biological systems***

At Evry, France from 30 April to 4 May 2007.

The topics covered include: biological modeling, regulatory networks, meta-genome and synthetic biology, artificial cell evolution and the physico-chemistry of life. In the questionnaire at the end of the school the content was rated highly by about two thirds of the participants while the organisation was praised by all. See:

<http://www.giacs.org/node/539> and

Patrick Amar, François Képès, Victor Norris and Gilles Bernot, eds, *Proceedings of the Evry 2007 spring school on Modeling complex biological systems in the context of genomics*. EDP Sciences, 2007. ISBN: 978-2-7598-0019-3.

***Advanced course on Complexity of biological networks.***

At Evry France, from 7 to 11 May 2007.

The topics covered were the analysis of various networks: biological, neuronal, immunological, regulatory and metabolic. The questionnaire at the end rated the course very highly scientifically. See and

<http://www.giacs.org/node/539> and

<http://epigenomique.free.fr/cac07/>

***First triangular EU-India-China summer school on Aspects of complexity in computational neuroscience.***

At ISI, Torino, Italy from 25 June to 1 July 2007.

Topics covered included: models of the synapse and neuron, coding, timing and oscillations, the visual system and object recognition, sensory-motor tasks and short-term memory. See

<http://www.giacs.org/node/541> and

<http://www.isi.it/main.php?liv1=news&liv2=past&news=FPJZKH5A41RVS63JIT1ACMF3XS8V5V3L>.

***Advanced School on Extreme events: nonlinear dynamics and time series analysis.***

At Comorova, Rumania from 3 to 12 September 2007.

Topics covered were: theory of dynamic complex systems and social processes, spectral analysis for periodicity, trends and scale invariance. See

<http://www.giacs.org/node/564>.

***Agent based models for spatial systems in the social sciences and economics, with heterogeneous interacting agents.***

At La Londe les Maures, France from 17 to 22 September 2007.

The emphasis of this school was on methods covering automata, multi-agent modeling, discrete event modeling, implementation, UML, sensitivity analysis and model validation, simulation of social systems, spatial segregation, and urban geography. It was jointly funded by the French CNRS. See

<http://www.giacs.org/node/554>.

***Second European PhD Complexity School: stochastic effects in differential nonlinear models.***

At ISI, Torino, Italy from 22 to 27 November 2007.

The topics covered included: power laws in social systems, message passing and percolation in networks, the minority game, gene regulation, immune networks, cell motility, bacteria and neuro-complexity, financial markets, economic growth, population dynamics, epidemics. See

<http://www.giacs.org/node/571> and  
<http://www.isi.it/progetti/giacs-school/>

***Third European PhD Complexity School: evolution in biological systems: from molecules to life and language.***

At ISI, Torino, Italy from 4 to 8 February 2008.

The topics covered ranged from chemical and gene evolution, both natural and experimental, copying fidelity in the gene, metabolic replicators and the origin of the genetic code, the origins of language, the architecture of reasoning. See

<http://www.giacs.org/node/583> and  
[http://www.isi.it/progetti/3\\_phd\\_complex08/index.html](http://www.isi.it/progetti/3_phd_complex08/index.html)

***International workshop on Complexity, policy and agents.***

At Manchester, UK from 23 April 2008.

The aim of this one-day workshop, part of the final project meeting of CAVES, was to disseminate the knowledge gained in the project to CAVES stakeholders: policy makers and analysts involved with the three case studies in Scotland, Poland and South Africa. Each of the three models developed were presented and demonstrated and their results discussed. The participants agreed that genuine companion modeling, i.e. modelers and stakeholders developing a model together, is not feasible. Nonetheless, with evidence-based models such as the ones developed in the CAVES project, stakeholder participation in the process of model validation is indispensable. See

<http://www.giacs.org/node/601> and  
<http://cfpm.org/caves/CAVESWiki/Workshop>.

***International workshop on Sociophysics: status and perspectives***

At ISI, Torino, Italy from 26-29 May 2008.

Sociophysics aims at a statistical physics modeling of large scale social phenomena, like opinion formation, cultural dissemination, the origin and evolution of language, crowd behavior, social contagion. The workshop was an occasion to review the state of the art of the field and to identify open problems and future research directions. The topics covered included: percolation, social networks, scientific networks, the www, voting, economic networks. See

<http://www.isi.it/progetti/sociophysics08/index.html>

***EU-China summer school on Internet, science and society.***

At Warsaw, Poland from 1 to 4 June 2008.

Topics covered include: algorithms for reputation or quality, tagging and semantics, web user-dynamics and new start-up models. See

<http://www.giacs.org/node/599>.

***Fourth European PhD Complexity School***

In Jerusalem from 11 to 14 September, 2008.

While the previous schools took place mainly at ISI Foundation, Turin Italy , the present took place in Jerusalem in conjunction with the 5<sup>th</sup> European Conference on Complex Systems ECCS 2008. The topics covered Eco(logical)-inspired problems, Eco(nomics)-inspired problems, Socio-Economics inspired problems, Global System Dynamics (Policy making, Climate change, HIV), Physical and Mathematical Methods, Biology and Bioinformatics. See

<http://www.giacs.org/ECCSphdschool> and  
<http://www.jeruccs2008.org/phdschool-main.htm>.

***Facing the challenge of infectious diseases***

At ISI, Torino, Italy from 13-17 October 2008.

The aim of the Workshop was to bring together experts in the field of infectious disease modeling to compare, evaluate and assess the recent advances reached with the use of sophisticate modeling, computational approaches, and ICT applications, highlighting the results they can provide and the different questions they can address, and bridging with the actual implications from a public health perspective. Topics covered included: spread of diseases on networks, models of specific cases, preventive measures, immunity. See

<http://www.isi.it/progetti/epiwork08/>