

*Fifth Course on Mathematical Ecology
including an introduction to Ecological Economics*

28 February - 24 March 2000

Preliminary Programme

All lectures will be held in the Main Building Main Lecture Hall

Week 1 Feb. 28 - March 3, 2000

Directors: G. Canziani, T. Hallam
Lecturers: G. Canziani, A. De Leo, T. Hallam,
S. Kooijman, M. Neubert, M. Panzieri, T. Purucker,
R. Stewart

Monday, 28 February

08.30 - 09.30	REGISTRATION
09.30 - 10.15	Registration Formalities
10.15 - 10.30	OPENING, Professor. M. VIRASORO
10.30 - 11.00	Welcome ICTP, Course Directors
11.00 - 12.00	T. HALLAM Models for risk assessment I
12.00 - 14.00	Lunch
14.00 - 15.00	S. KOOIJMAN An introduction to dynamic energy budget theory
15.00 - 15.30	Break
15.30 - 16.30	M. NEUBERT Integrodifference equations: models for population growth and dispersal
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Tuesday, 29 February

- 09.00 - 10.00 **G. CANZIANI**
Aggregated community models
- 10.00 - 10.30 Break
- 10.30 - 12.00 **T. HALLAM**
Continuous structured population models
- 12.00 - 13.30 Lunch
- 13.30 - 14.30 **G. DE LEO**
Population dynamics model I
- 14.30 - 15.30 **S. KOIJMAN**
The dynamics of physiologically structured populations
- 15.30 - 16.00 Break
- 16.00 - 17.00 **G. DE LEO**
Computer-based workshop on population models

Wednesday, 1 March

- 09:00 - 10.00 **S. KOIJMAN**
Applications of dynamic energy budget theory
- 10:00 - 10.15 Break
- 10:15 - 11.15 **G. DE LEO**
Conservation biology models I
- 11:15 - 12.00 Core group organization on:
- (i) Conservation biology
 - (a) Species-level conservation biology
 - (b) Landscape management and biodiversity
 - (ii) Environmental Assessment Issues
 - (a) Ecotoxicology
 - (b) Ecological economics
 - (iii) Epidemiology
 - (a) Microparasitic
 - (b) Macroparasitic
- 12:00 - 13.30 Lunch
- 13.30 - 14.30 **M. NEUBERT**
Integrodifference equations: critical habitat size and spatial pattern formation
- 14.30 - 15.30 Participant Talks (2, each 20 min)
- (1) A. Borodich - Predator-Prey interaction with soliton-like functional response
 - (2) A. Klyashtorin - Biogeochemical migration of radionuclides in natural and seminatural environments: Old problems and new approaches

- 15.30 - 16.00 Break
- 16.00 - 17.00 **S. KOOLJMAN**
Workshop on dynamic energy budget models

Thursday, 2 March

- 09:00 - 10.00 **G. DE LEO**
Conservation biology models II
- 10:00 - 10.15 Break
- 10:15 - 11.15 **T. HALLAM**
Models for risk assessment II
- 11.15 - 12.15 **M. PANZIERI**
Environmental Impact Assessment: Emergy Analysis
- 12.15 - 13.30 Lunch
- 13.30 - 14.30 **T. PURUCKER**
Tools for risk assessment
- 14.30 - 16.30 **M. NEUBERT**
Workshop: Integrodifference equations: numerical simulations using Matlab
- 16.30 Participant Talks (2, each 20 min)
- (1) Lang'o Odondi - Matrix optimal management models
(2) Budi Nurani - The space-time autoregressive order 1, STAR (1):
Case study on tea production

Friday, 3 March

- 09:00 - 10.00 **M. NEUBERT**
Integrodifference equations: models for biological invasions
- 10:00 - 11.00 Participant Talks (2, each 20 min)
- (1) A. Shyshkanova - Mathematical modeling of dewatering of soil mass in the case of radioactive contamination
(2) K. Boushaba - A mathematical model of phytoplankton
- 12:00 - 13.30 Lunch
- 13.30 - 15.30 **T. PURUCKER, A. STEWART**
Workshop on risk assessment
- 15.30 - 16.00 Break
- 16.00 Core groups working period
Identification and delineation of problems for the next week

Posters displayed for Week 1:

- E. Bojilova-- Introduction to disaggregation models
Application of disaggregation models to hydrological time series

Week 2

March 6 - 10, 2000

Directors: G. Canziani, L. Gross
Lecturers: G. Canziani, L. Gross, A. Dobson,
V. Hull, J. Rodriguez, C. Rossi, M. Rustici

Monday, 6 March

- 09:00 - 10.00 **L. GROSS**
Overview of stochastic models in ecology
- 10:00 - 10.30 Break
- 10:30 - 11.30 **A. DOBSON**
The worm gets the bird! Red grouse and population cycles:
Kin-selection or parasitism?
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch
- 13.30 - 14.30 **J. RODRIGUEZ**
Biodiversity status and trends. Why conserve biodiversity?
- 14.30 - 15.00 Break
- 15.00 - 16.00 **M. RUSTICI**
Introduction to non-linear science
- 16.00 Participant Lectures
- (1) B. Dubey - A predator-prey interaction model with self and cross-diffusion
 - (2) P. Federico - Metapopulation dynamics under density dependent disturbances. I : An analytic approach
 - (3) D. Ruiz Moreno - Metapopulation dynamics under density dependent disturbances. II : A cellular automata approach
 - (4) A.K.M. Nazrul-Islam - Environmental condition of sundarban mangrove forest and mathematical analysis of vegetation
 - (5) G.I.B. Obioh - Conservation of woody species in Omo biosphere reserve, Nigeria: The role of modelling

Tuesday, 7 March

- 09:00 - 10.00 **G. CANZIANI**
Age and stage structured matrix models I
- 10:00 - 10.30 Break
- 10:30 - 11.30 **L. GROSS**
Behavioral ecology and individual-based modeling
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch

- 13.30 - 14.30 **A. DOBSON**
The role of pathogens in ecology
- 14.30 - 15.30 **J. RODRIGUEZ**
Principles of conservation biology
- 15.30 - 16.00 Break
- 16.00 **M. RUSTICI**
Workshop

Wednesday, 8 March

- 09:00 - 10.00 **A. DOBSON**
Parasites and biodiversity: Parasites as biodiversity
- 10:00 - 10.30 Break
- 10:30 - 11.30 **J. RODRIGUEZ**
In situ and *ex situ* approaches to the conservation of biodiversity
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch
- 13.30 - 14.30 **M. RUSTICI**
Continuous models for interacting populations
- 14.30 - 15.30 **V. HULL**
The experimental fish pond and phyto depuration system at the University of Rome: Ecological studies, mathematical implications, and future prospects
- 15.30 - 16.00 Break
- 16.00 **L. GROSS**
Workshop on individual-based models

Thursday, 9 March

- 09:00 - 10.00 **G. CANZIANI**
Age and stage structured matrix models II
- 10:00 - 10.30 Break
- 10:30 - 11.30 **L. GROSS**
Models for regional ecological assessment
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch
- 13.30 - 14.30 **C. ROSSI**
Thermodynamic goal functions in ecosystem analysis
- 14.30 - 15.00 Break
- 15.00 **A. DOBSON**
Workshop

Friday, 10 March

- 09:00 - 10.00 **C. ROSSI and G. CANZIANI**
Understanding large ecosystems: the Esteros del Ibera case study
- 10:00 - 10.30 Break
- 10:30 Participant Talks (3, each 20 min)
- (1) P. O. Ubachukwu - Studies on the diurnal biting patterns of the blackfly (*simulium damnosum*) in Uzo-uwani Local government area of Enugu State, Nigeria
(2) J. Munyandorero - Basis for implementing local fisheries models incorporating the migration rate
(3) Ermias Azeria - The distribution and community pattern of land birds in the Dahlak Archipelago, Red Sea, Eritrea
- 12:00 - 13.30 Lunch
- 13.30 - 15.30 **J. RODRIGUEZ**
Workshop - Introduction to available software for population viability analysis
- 15.30 - 16.00 Break
- 16.00 Core groups reporting period - group reports on progress

Posters displayed for Week 2:

- M. de Castro - Simulating a caiman *crocodilus yacare* population in Northern Argentina
- L. De Molnary - Ecosense project applied to Brazil and Latin America - study description and first results
- M. Batista - Coral reef ecosystem. Importance and threats

Week 3**March 13 - 17, 2000****Directors: G. Canziani, S. Levin**
Lecturers: G. Canziani, S. Levin, A. Dobson,
I. Olivieri, J. Velasco Hernandez, P. Rohani**Monday, 13 March**

- 09:00 - 10.00 **S. LEVIN**
Modeling infectious diseases
- 10:00 - 10.30 Break
- 10:30 - 11.30 **P. ROHANI**
Understanding measles dynamics
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch
- 13.30 - 14.30 **J. VELASCO HERNANDEZ**
Population dynamics of vector-transmitted diseases (Denge and Chagas disease)
- 14.30 - 15.00 Break
- 15.00 **G. CANZIANI**
Workshop

Tuesday, 14 March

- 09:00 - 10.00 **S. LEVIN**
Valuing biodiversity
- 10:00 - 10.30 Break
- 10:30 - 11.30 **J. VELASCO HERNANDEZ**
Density dependence regulation and super infection in epidemic models
- 11:30 - 12.00 Core groups working period
- 12:00 - 13.30 Lunch
- 13:30 - 14.30 Participant Talks (2, each 20 min)
- (1) A. K. Ghosh - Dynamics of Japanese encephalitis - A study in mathematical epidemiology
 (2) M. Santana - Useful plants in central Panama
- 14.30 - 15.00 Break
- 15.00 - 16.00 **P. ROHANI**
Spatio-temporal epidemiology of two sympatric disease metapopulations
- 16.00 **I. OLIVIERI**
Genetical, ecological and evolutionary approaches to plant conservation biology

Wednesday, 15 March

9:00 - 10.00	S. LEVIN Individual based models, and the problem of scaling
10:00 - 10.30	Break
10:30 - 11.30	J. VELASCO HERNANDEZ Some remarks on certain classes of epidemic models that generate a monotone flow
11:30 - 12.00	Core groups working period
12:00- 13.30	Lunch
13.30 - 14.30	Participant Talks (1, each 20 min) (1) C. Xu - Complementation in a simple two-linked-population model
14.30 - 15.00	Break
15.00	S. LEVIN Workshop

Thursday, 16 March

09:00 - 10.00	P. ROHANI Extinction, dispersal and colonisation: lessons from epidemiology
10:00 - 10.30	Break
10:30 - 11.30	Participant Talks (2, each 20 min) (1) J. Mugisha - A vaccination strategy for HIV/AIDS pandemic in a two-age groups population: (a) Vaccinating adult susceptibles (2) D. Castillo Guajardo - The effect of stage structure on the persistence of parasitoid-host interactions
11:30 - 12.00	Core groups working period
12:00 - 13.30	Lunch
13.30 - 14.30	Core groups working period
14.30 - 15.00	Break
15.00	J. VELASCO HERNANDEZ Workshop

Friday, 17 March

09:00 - 10.00	P. ROHANI The population dynamics of disease interference
10:00 - 11.00	Break
10:30 - 12.00	Participant Talks (1, each 20 min) (1) Li Tao HAN - Two Predator-Prey Models for disease
12:00 - 13.30	Lunch
13.30 - 14.30	Core groups working period
15.30 - 16.00	Break
16.00	Core groups reporting period - group reports on progress

Posters displayed for Week 3:

G. Casas Cardoso - The Analysis of Disease Clusters with Risk Factors. Applications in Cuba

Week 4

March 20 - 24, 2000

**Lecturers: G. Chichilnisky, G. Heal, I. Musu, C. Perrings,
D. Siniscalco, A. Xepapadeas**

Monday, 20 March

09:00 - 10.30	Students
10.30 - 11.00	Break
11.00 - 12.30	Students
12.30 - 14.00	Lunch
14:00 - 15.30	Students
16:00 - 17.30	Students

Tuesday, 21 March

09:00 - 10.30	G. HEAL Basic theory of a market economy - consumers, producers, equilibrium and efficiency, including the first and second theorems of welfare economics
10.30 - 11.00	Break
11.00 - 12.30	A. XEPAPADEAS Classical environmental policy instruments
12.30 - 14.00	Lunch
14:00 - 15.30	A. XEPAPADEAS Environmental policy and pollution dynamics
15.30 - 16.00	Break
16:00 - 17.30	G. HEAL Market failure - externalities, public goods and non-convexities

Wednesday, 22 March

- 09:00 - 10.30 **G. HEAL**
Application to marketing ecosystem services - watersheds,
forests and carbon sequestration, ecotourism, wetlands, etc.
- 10.30 - 11.00 Break
- 11.00 - 12.30 **A. XEPAPADEAS**
Environmental policy and strategic behavior
- 12.30 - 14.00 Lunch
- 14:00 - 15.30 **D. SINISCALCO**
Global Commons, Sovereign Nations (non cooperative
environmental agreements among states, ‡ la Kyoto)
- 15.30 - 16.00 Break
- 16:00 - 17.30 **A. XEPAPADEAS**
Environmental policy under asymmetric information

Thursday, 23 March

- 09:00 - 10.30 **C. PERRINGS**
Modelling dynamical economy-environment systems
- 10.30 - 11.00 Break
- 11.00 - 12.30 **D. SINISCALCO**
Information based environmental policies and company
behaviour (how environmental reporting and audit affects
firms'behaviour)
- 12.30 - 14.00 Lunch
- 14:00 - 15.30 **G. CHICHILNISKY**
Title to be confirmed
- 15.30 - 16.00 Break
- 16:00 - 17.30 **C. PERRINGS**
Ecosystem functions and the valuation of environmental
resources

Friday, 24 March

09:00 - 10.30	I. MUSU Environmentally sustainable economic growth
10.30 - 11.00	Break
11.00 - 12.30	C. PERRINGS Resilience, stability and sustainability
12.30 - 14.00	Lunch
14:00 - 15.30	G. CHICHILNISKY Title to be confirmed
15.30 - 16.00	Break
16:00 - 17.30	I. MUSU International trade and the environment

Week 4 Participant talks:

K. Srivastava - An Econometric Model for Reproductive Behaviour
P.D.N. Srinivasu - Bioeconomics of a renewable resource in presence of a predator

Posters displayed for Week 4:

J. Bondarenko - A probability model describing financial indexes evolution
The model for investment process optimization under extreme restrictions