F. 2001

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FACULTAD DE CIENCIAS EXACTAS Y NATURALES

U.B.A

1 .- DEPARTAMENTO

2 .- CARRERA de: a) Licenciatura en..... ORIENTACION.....

b) Doctorado y/o Post-Grado en...Doctorado.....

c) Profesorado en.....

d) Cursos Técnicos en Meteorología.....

e) Cursos de Idiomas.....

3 .- 1er. CUATRIMESTRE/2do. CUATRIMESTRE Año:..23-7-01 al 28-7-01.....

4 .- N° DE CODIGO DE CARRERA:

5 .- MATERIA..Tercera Escuela de Invierno "J.J.Giambiagi"..... N° DE CODIGO
Física y Biología

6 .- PUNTAJE PROPUESTO : 2(dos) puntos

7 .- PLAN DE ESTUDIO ; 1987

8 .- CARACTER DE LA MATERIA: Optativo

9 .- DURACION: 23-7-01 al 28-7-01

10 .- HORAS DE CLASES SEMANAL: 50 hs. (una semana)

a) Teóricas.....24..... hs. d) Seminarios..... hs.

b) Problemas..... hs. e) Teórico-problemas.....13..... hs.

c) Laboratorio..... hs. f) Teórico-prácticas.....13..... hs.

g) Totales Horas:.....50..... hs.

11.- CARGA HORARIA TOTAL:.....hs.

12.- ASIGNATURAS CORRELATIVAS:

13.- FORMA DE EVALUACION: Examen final(Escrito)

14.- PROGRAMA ANALITICO: Se adjunta

15.- BIBLIOGRAFIA:

FECHA: 16 NOV 2001

FIRMA PROFESOR:

ACLARACION FIRMA: Dra. Silvina Ponce Dawson

FIRMA DIRECTOR:

Dr. JUAN PABLO PAZ
DIRECTOR
DEPARTAMENTO DE FISICA

TERCERA ESCUELA "J.J.GIAMBIAGI"

FISICA Y BIOLOGIA. UNA APROXIMACION INTERDISCIPLINARIA A LOS PROBLEMAS BIOLOGICOS.

Departamento de Fisica J.J. Giambiagi
Universidad de Buenos Aires
Ciudad Universitaria,

Buenos Aires, 23-28 de julio, 2001

Profesores Invitados

Rita Zorzenon dos Santos	Univ. Fluminense, Brazil
Art Winfree	University of Arizona, USA
Henry Abarbanel	UCSD, USA
William Kristan	UCSD, USA

La escuela de invierno Giambiagi esta dirigida a estudiantes de doctorado y de licenciatura avanzados de la Argentina y otros paises de Latinoamerica. Esta edicion de la escuela esta dedicada a problemas de motivacion biologica que puedan enriquecerse con un abordaje interdisciplinario. El objetivo es brindar una revision de algunos de los temas actuales en los que los fisicos y matematicos aplicados estan haciendo aportes

CURSOS

Modeling inmune responses, por Rita Zorzenon dos Santos
Pattern organizing principles in 3D excitable systems, por Art Winfree
Neurodynamics, por Henry Abarbanel
Organization and functioning of nervous systems, por Bill Kristan

Para mas informacion visite la pagina http://www.df.uba.ar/~silvina/escuela_jjg.html.
Si piensa asistir, por favor informelo a: escuela@birkhoff.df.uba.ar

LDD

COMITE ORGANIZADOR

Silvina Ponce Dawson, Gabriel Mindlin, Manuel Eguía, Damián Strier

Third Winter School "J.J. Giambiagi"

Departamento de Física , FCEyN-UBA, Ciudad Universitaria - Pab. 1 1428 Buenos Aires

Fax: (54-11)4576-3357 ; Tel: (54-11)4576-3353

AUSPICIAN

Universidad de Buenos Aires, FOMEC, Fundación Antorchas, CLAF

''Modeling inmune responses''

Rita Zorzenon dos Santos

The course will cover the following points: *i)* Introduction on the basic concepts of inmunology. *ii)* Brief description of the mathematical modeling of inmunologic responses using differential equations. *iii)* Introduction on cellular automata, including a revision of the first automata used to model the inmune system. *iv)* Modeling inmune responses with cellular automata and comparison with experimental data: HIV infection, inmunization processes and aging. *v)*The modeling of herpes and malaria infections. Other discrete models.

"Pattern Organizing Principles in 3D Excitable Media".

Art Winfree

The course will cover phase singularities, wave propagation, vortices, spiral waves, scroll waves, stable organizing centers, etc, in biological and chemical media such as Belousov-Zhabotinsky reagent, heart muscle, brain tissue. The course will start from first principles, and will slowly build up to current hot questions awaiting inquiry and answer. It will not use very sophisticated mathematics, but it will contain some information about ordinary and partial differential equations, with particular emphasis on the topological aspects of their solutions, trying to convey mostly the general idea in a verbal presentation. The lectures will consist mostly of dramatic pictures logically linked from simplest ideas to sophisticated research questions.
The contents of this course can be encountered at
http://eeb8.biosci.arizona.edu/art/2000_lectures/
More specifically, you can look at them in html format at;
http://eeb8.biosci.arizona.edu/art/2000_lectures/UBA.1_files/v3_document.htm
http://eeb8.biosci.arizona.edu/art/2000_lectures/UBA.2_files/v3_document.htm
http://eeb8.biosci.arizona.edu/art/2000_lectures/UBA.3_files/v3_document.htm

"Neurodynamics"

Henry Abarbanel

We will cover material associated with the nonlinear dynamics of biological neurons, including numerical and electrical modeling of these nonlinear oscillators.

In the lectures we will cover these topics: neurons as nonlinear oscillators, the biophysics of neural oscillators--Hodgkin-Huxley models, functions of neural circuits, connections among neurons in circuits--ohmic connections, excitatory and inhibitory chemical synapses. Central pattern generators and rhythmic activity of small networks. Other networks--sensory networks.

Characterizing the oscillations of neurons, analysis of neural oscillations using methods of nonlinear dynamics. Modeling the reduced dynamics observed in neural activity. Asking "non biological" questions of the neurons--synchronization of neurons, bifurcation sequences of neural oscillations. Information transmission by active networks or channels--how does information flow through a network of oscillating neurons.

Network models--winnerless competition for olfaction.

The power point presentations of these lectures (as *ppt files) can be downloaded here. These are rather big files, two of them are gzipped.

winter1.ppt

winter2.ppt

winter3.ppt.gz

winter4.ppt.gz

winter5.ppt

"Organization and functioning of nervous systems"

William Kristan

I plan to discuss widely different concepts about how nervous systems function, centered around behaviors we have studied in the medicinal leech. I will build from simple to complex behaviors, attempting to make theorganizational concepts emerge from behavioral necessities and evolutionary constraints. The three topics I will cover are:

1. Population coding for directional behaviors.

Leeches bend away from the site of a light touch to their body surface. This local bending response uses a very simple three-layered, feed-forward, excitatory network with lateral inhibition at the motor output layer. This network produces a population vector that produces a localized bend in an appropriate direction. We are now testing whether the direction is calculated as a vector sum or a vector average. I will relate these finding in the leech to behavioral control in other animals.

2. Initiation, production, and coordination of rhythmic behaviors.

Leeches move from place to place either by swimming or by crawling. Both behaviors are produced by central pattern generators (CPGs) in each of the 21 body segments. The individual segmental CPGs are coordinated to produce effective locomotion. This coordination is achieved both by intersegmental connections and by sensory feedback produced by the movements. In addition, these behaviors need to be turned on, modified, and turned off in appropriate situations. I will present both data and modeling studies to show how we are approaching these issues.

3. Making behavioral choices.

The simplest way to produce a number of different behaviors would be to have a variety of pattern generators that are each activated by decision-making neurons (which are sometimes called "command neurons"), with each one inhibiting all the others. It has become clear, however, that pattern-generating circuits for different behaviors overlap, with the same neuron being used in two mutually exclusive behaviors (such as shortening and swimming). Surprisingly, the decision-making neurons also appear to multiplex, so that the selection of a given behavior depends upon combinations of decision-making elements, probably in a very dynamical way. I will show how we are using voltage-sensitive dyes to monitor the simultaneous activity of many identifiable neurons