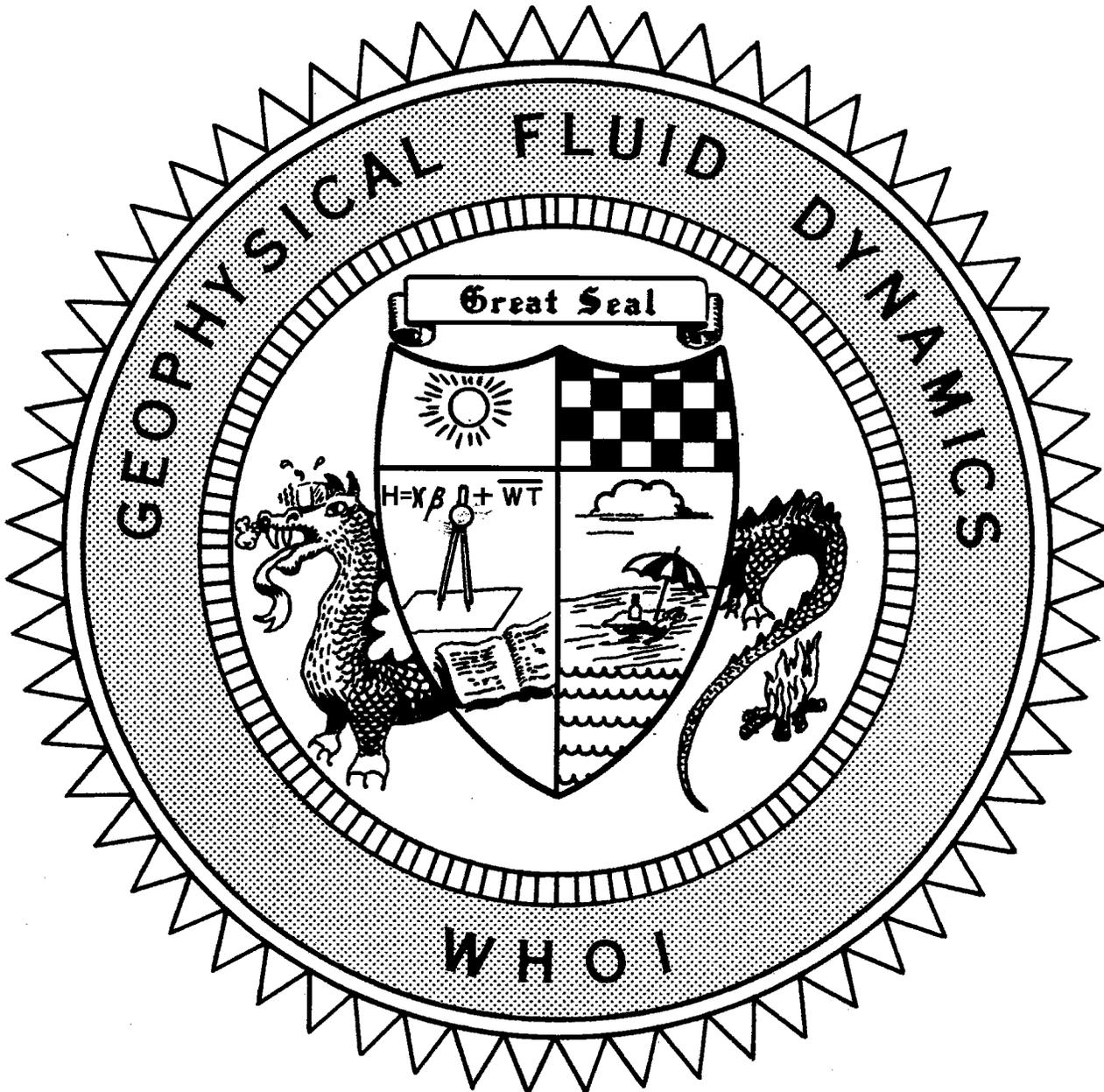


# Bio-Physical Models of Oceanic Population Dynamics

## 1994 Summer Study Program



Course Lectures  
Abstracts of Participants  
Fellows Project Reports

**WHOI-97-18**

**Bio-Physical Models of Oceanic Population Dynamics  
1994 Summer Study Program in Geophysical Fluid Dynamics**

by

Glenn Flierl and Donald Olson, co-Directors

Woods Hole Oceanographic Institution  
Woods Hole, Massachusetts 02543

November 1997

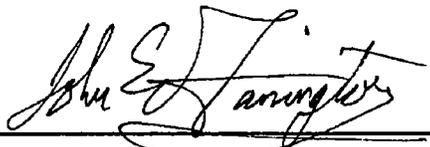
**Technical Report**

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**John W. Farrington**  
Associate Director for Education  
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# 1994 GFD Fellows, Staff and Visitors

## The Fellows

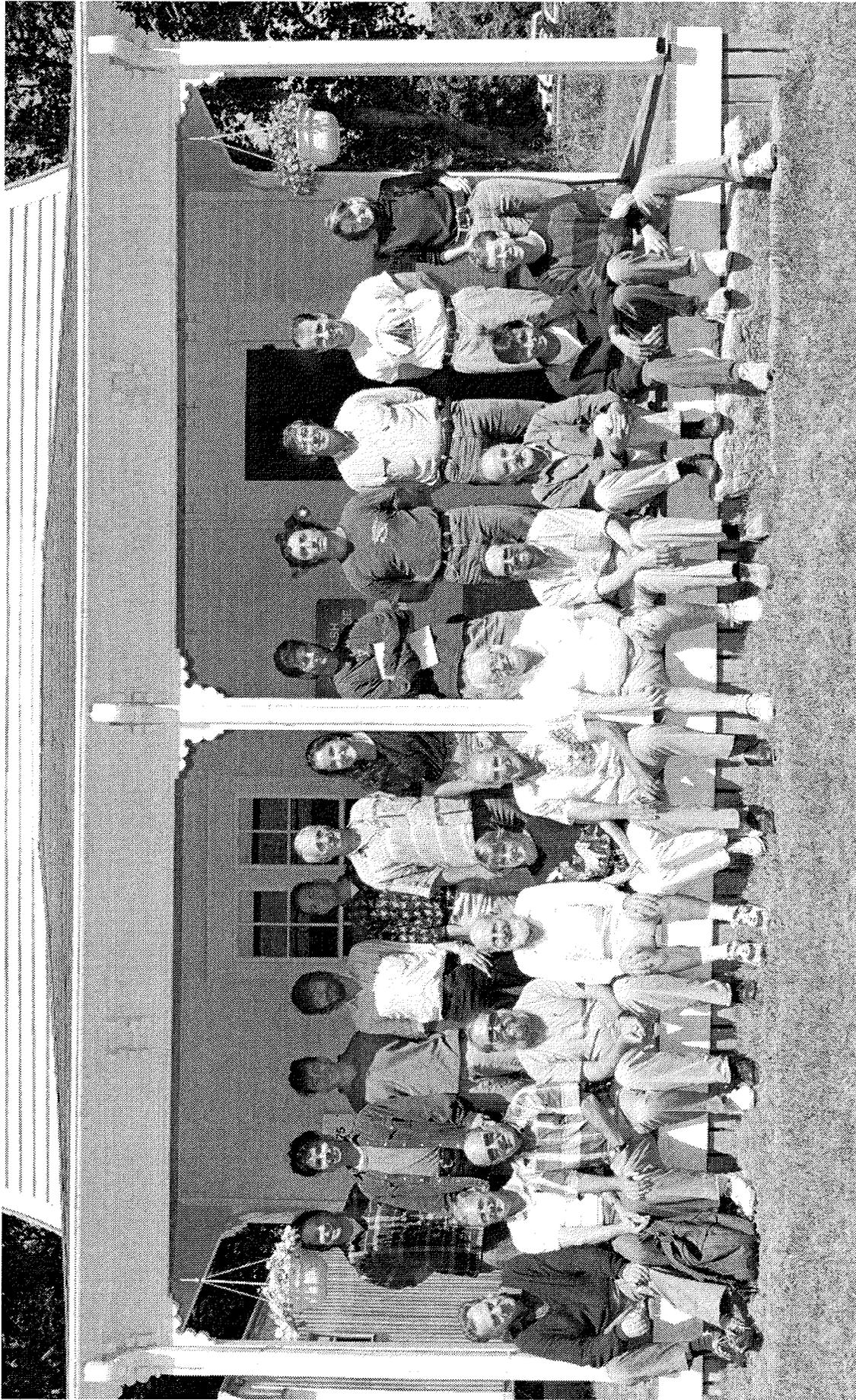
Martin Bees	Leeds University, UK
Emmanuel Boss	University of Washington
Tonya Clayton	University of South Florida
Amanda Cohen	University of Washington
Amar Gandhi	Princeton University
Maryam Golnaraghi	Harvard University
Deborah Le Bel	University of Washington
Douglas Morgan	Thayer School of Engineering, Dartmouth College
Michael Neubert	University of Washington
Scott Stewart	University of Colorado

## Staff and Visitors

James Anderson	Stevens Institute of Technology
Robert Armstrong	Princeton University
Neil Balmforth	University of Texas, Austin
Pavel Berloff	Florida State University
Robert Cantrell	University of Miami
Hal Caswell	Woods Hole Oceanographic Institution
Eric Chassignet	University of Miami
George Cosner	University of Miami
Glenn Flierl	Massachusetts Institute of Technology
Mick Follows	Massachusetts Institute of Technology
Robert Frazel	Woods Hole Oceanographic Institution
Daniel Grunbaum	University of British Columbia, CANADA
John Guckenheimer	Cornell University
Louis Howard	Florida State University
George Hurtt	Princeton University
Joseph Keller	Stanford University
Sergey Kraustov	Florida State University
Simon Levin	Princeton University
Willem Malkus	Massachusetts Institute of Technology
Arthur Mariano	University of Miami
Richard Matear	Institute of Ocean Sciences, CANADA
Salvatore Mazzola	Massachusetts Institute of Technology
Dennis McGillicuddy	Woods Hole Oceanographic Institution
Stephen Meacham	Florida State University
Donald Olson	University of Miami
Mercedes Pascual	Woods Hole Oceanographic Institution
Nathan Platt	Naval Warfare Research Center

**Staff and Visitors (continued)**

Thomas Powell	University of California, Berkeley
Michael Renardy	Virginia Polytechnic Institute and State University
Yuriko Y. Renardy	Virginia Polytechnic Institute and State University
Kathy Rhodes	University of California
Claes Rooth	University of Miami
Andrew Solow	Woods Hole Oceanographic Institution
Edward Spiegel	Columbia University
John Steele	Woods Hole Oceanographic Institution
Melvin Stern	Florida State University
Shripad Tuljapurkar	Morrison Institute for Population and Resources
Matthew Umurhan	Columbia University
George Veronis	Yale University
Jack Whitehead	Woods Hole Oceanographic Institution
Andrew Woods	University of Cambridge, UK
Hidekatsu Yamazaki	Tokyo University of Fisheries, JAPAN
Philip Yecko	Columbia University



1994

**Standing (l-r):** M. Umurhan, M. Bees, N. Balmforth, S. Meacham, P. Yecko, W. Malkus, A. Cohen, D. Grunbaum, E. Boss, S. Mazzola, M. Neubert, D. Le Bel  
**Seated (l-r):** E. Spiegel, J. Whitehead, R. Frazel, D. Olson, J. Keller, M. Thurston, G. Veronis, C. Rooth, G. Flierl, M. Stern, A. Gandhi, S. Stewart  
**Missing from photo:** J. Anderson, R. Armstrong, P. Berloff, R. Cantrell, H. Caswell, E. Chassignet, T. Clayton, G. Cosner, M. Follows, M. Golnaraghi, J. Guckenheimer, L. Howard, G. Hurtt, S. Kraustov, S. Levin, A. Mariano, R. Matear, D. McGillicuddy, D. Morgan, M. Pascual, N. Platt, T. Powell, M. Renardy, Y. Renardy, K. Rhodes, A. Solow, J. Steele, S. Tuljapurkar, A. Woods, H. Yamazaki

## **GFD 1994 Lecture Schedule**

### **Introduction to Oceanic Biology and Physics**

Monday, June 26, 10 AM

D. Olson

### **Age Structure and Complexity in Biological Models**

Tuesday, June 21, 10 AM

G. Flierl

### **Basic Formulations of Animal Aggregation and Movement**

Wednesday, June 22, 10 AM

D. Grunbaum

### **Dispersal of Populations: Terrestrial vs. Fluid Environments**

Thursday, June 23, 10 AM

D. Grunbaum

### **Models for Predator--Prey Systems at Multiple Scales**

Thursday, June 23, 2 PM

S. Cantrell

### **Individual Behavior and Population Patterns**

Friday, June 24, 10 AM

D. Grunbaum

### **Data for Demographic Plankton Models**

Friday, June 24, 2 PM

J. Steele

### **Evolutionary and Adaptive Trade-offs**

Monday, June 27, 10 AM

D. Grunbaum

### **SEFCAR**

Monday, June 27, 2 PM

C. Rooth

### **TBA**

Tuesday, June 28, 10 AM

D. Grunbaum

### **Tutorial on GFD**

Tuesday, June 28, 1:30 PM

**Matrix Population Models**

Wednesday, June 29, 10 AM

H. Caswell

**Flows and Biology**

Thursday, June 30, 10 AM

G. Flierl

**Tutorial on Oceanic Biology**

Thursday, June 30, 2 PM

**Parameter Optimization and Analysis of Ecosystem Models**

Friday, July 1, 10 AM

R. Matear

**Bioconvection**

Tuesday, July 5, 10 AM

E. Spiegel

**Computing Bifurcations in Dynamical Systems**

Wednesday, July 6, 10 AM

J. Guckenheimer

**TBA**

Thursday, July 7, 10 AM

T. Powell

**Populations in Heterogeneous Environments**

Friday, July 8, 10 AM

S. Levin

**Scale as an Ecological Problem**

Monday, July 11, 10 AM

S. Levin

**Chemical Waves**

Tuesday, July 12, 10 AM

L. Howard

**Tutorial on Mixed Layer Dynamics**

Tuesday, July 12, 1:30 PM

**Modelling Biogeochemical Interactions in the Subtropical Gyre**

Wednesday, July 13, 10 AM

M. Follows

**Mesoscale Ocean Dynamics and Biological Productivity**

Thursday, July 14, 10 AM

D. McGillicuddy

**On-Off Intermittency**

Friday, July 15, 10 AM

N. Platt

**Explosive Decompression and Eruption of Magmas**

Friday, July 15, 2 PM

A. Woods

**Principal Component Analysis of Plankton Patterns**

Monday, July 18, 10 AM

A. Mariano

**Finite Amplitude 3-D Instability of Inviscid Laminar Boundary Layers**

Tuesday, July 19, 10 AM

M. Stern

**Structure of Oceanic Turbulence in Channel EGCMS**

Thursday, July 21, 10 AM

D. Olson

**Biological Structure and Spatial Dynamics; or, the Homogeneous Green Stuff Fights Back**

Friday, July 22, 10 AM

S. Tuljapurkar

**Survival -- What is it and When Does it Occur?**

Tuesday, July 26, 10 AM

G. Cosner

**The Statistical Analysis of Population Time Series Data**

Wednesday, July 27, 10 AM

A. Solow

**Influence of Outcropping Layer on Mid-Latitude Jet Separation**

Thursday, July 28, 10 AM

E. Chassignet

**Flow of Water and Carbon Through Bryozoan Colonies**

Monday, August 1, 10 AM

D. Grunbaum

