

# The AOS Program's Fortuitous Beginnings



*Professor Emeritus George Mellor who played an instrumental role in GFDL's move to Princeton*

The long and distinguished history of the AOS Program began with a chance meeting between Professor Emeritus George Mellor, then an Associate Professor at Princeton, and Joe Smagorinsky, then Director of GFDL, at GFDL's Pennsylvania Avenue offices in June of 1966.

Mellor recalls that at the time GFDL was “deeply engaged in various meteorological and oceanographic researches,” and Smagorinsky “had succeeded in drawing together an impressive group of scholars who he thought would derive stimulation from a university environment and could contribute to the educational and scholarly objectives of the University.” Following what he refers to as a “long chat” and a succession of committee deliberations, it was agreed that by forming a collaboration between GFDL and Princeton University, both institutions could together make a major step forward, by building with the breadth and traditions of the University and the resources of GFDL.



*Joseph Smagorinsky, Former Director of GFDL at his desk in the newly designed GFDL building*

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*AOS Senior Scientists Kirk Bryan & Suki Manabe – early collaborators on the development of the coupled ocean-atmosphere model, and former GFDL Director Joseph Smagorinsky*

“We owe a lasting debt to the “gang of three,” George Mellor, Bob Phinney (then an Associate Professor of Geological and Geophysical Sciences), and Lucien Brush (then an Associate Professor of Civil and Geological Engineering), who with Joe Smagorinsky engineered our move to Princeton,” said AOS Senior Scientist Kirk Bryan. Mellor credits five additional committee members who were instrumental in the move, including Martin Schwarzschild, (then a Eugene Higgins Professor of Astronomy), John Tukey, (then a Professor of Statistics), Court Perkins, (then an Associate Dean of the School of Engineering and Applied Science and a Professor of Aeronautical Engineering), Norm Stollenberger, (then a Professor of Civil Engineering), and Harry Hess, (then a Blair Professor of Geology). “Their enthusiasm and rational procedure convinced Princeton’s administration and faculty that a wonderful opportunity was at hand,” he said.

The Program in Geophysical Fluid Dynamics (GFD) was approved in a memorandum of understanding between Princeton University and the Environmental Science Service Administration (now NOAA) of the Department of Commerce in June of 1967. GFDL moved from the Washington area to the Forrester Campus in the autumn of 1968 to a new \$2.1 million three story-building opposite the Gas Dynamics Laboratory and became home to some 50 laboratory personnel, including 15 research scientists, and two state-of-the-art, large Univac 1108 computers. It’s hard to imagine that the computer used to develop and run the first climate model had only half a megabyte of memory - not enough to store a song or a high-resolution picture today. Today’s cell phones and MP3 players now have chips that process faster than the Univac 1108.

In the early years, it took 20 minutes to simulate one day for the atmosphere alone. Thankfully, processing time did not slow down the exchange of ideas between scientists at the new facility.



*GFDL was home to the IBM 990, a successor to the Univac 1108.*

taught graduate students and interacted with other faculty members in geophysics, engineering, and statistics. “Right from the very beginning, the Program had an exceptionally collegial atmosphere, where students felt free to seek out advice from the entire staff and were exposed to a wide range of ideas. This fostered independent thinkers, and contributed to the success of our graduate students after leaving Princeton,” said Bryan.

In late 1976, it was proposed that the Geophysical Fluid Dynamics Program become part of the Department of Geological and Geophysical Sciences. In years prior, the Program was under the direction of an interdepartmental committee in cooperation with the Departments of Aerospace and Mechanical Sciences, Civil Engineering, and the Geological and Geophysical Sciences. The "union" of the Geophysical Fluid Dynamics Program and the Department of Geological and Geophysical Sciences was recognized with a celebration at Prospect House on March 17, 1977. George Mellor, the Program’s first director (1969-1976), then of Aerospace and Mechanical Sciences, was succeeded as director by Phinney (1976-1978) and F. Anthony Dahlen (1978-1980), both of the Department of Geological and Geophysical Sciences.

At the time, the Geophysical Fluid Dynamics Program student enrollment was set at sixteen and the Program sought to admit, on average, four students per year. The Program also supported a very successful Visiting Scientist Program which over the years had numbered about 10 persons per year. “The most satisfying memories I have of those early years in Princeton are associated with the wonderful group of visitors to the Program from all over the globe,” remarked Bryan. Since no comparable facilities existed in Europe or Asia at the time, the Program became host to many distinguished visitors. Among them were Adrian Gill, David Anderson and later Brian Hoskins and Tony Hollingsworth from England, Hans Friedrich, Juergen Willebrand, and Peter Lemke from Germany, Ji-Ping Chao, Qing-Cun Zeng, Du-Zheng Ye, and Guo-Xiong Wu from China, and Toshio Yamagata and Taroh Matsuno from Japan, all of whom made valuable

contributions to the Program and are notable in their fields. Faculty included members of GFDL, who had two year appointments as visiting lecturers with appropriate rank, and University faculty members from the Department of Geological and Geophysical Sciences, as well as other departments.



*(L to R): AOS Senior Scientist Suki Manabe, AOS Director Jorge Sarmiento, Former faculty member Abraham (Bram) Oort, & AOS Senior Scientist Kirk Bryan in GFDL's former lobby*

In 1978, a new faculty position in the Geological and Geophysical Sciences resulted in the hiring of current AOS Director Jorge Sarmiento, who served as Director of the GFD Program from 1980 through 1990, followed by George Philander who served as Director until 2006 when Sarmiento resumed his role as Director. According to Miyakoda and Mellor, Sarmiento and Philander played pivotal roles in the Program’s progression during those

years and the Program continued to evolve under their leadership. Almost a decade later in July of 1987, following lengthy discussions and input from alumni, the name of the Program officially changed from the Geophysical Fluid Dynamics Program to “Program in Atmospheric and Oceanic Sciences.” Almost two years later, the Program would move into the newly renovated Sayre Hall on September 28<sup>th</sup>, 1989, the first day of a two day symposium featuring lectures by program graduates to celebrate its 20<sup>th</sup> anniversary. Around the same time, the leadership at GFDL was evolving as well. Jerry Mahlman succeeded Smagorinsky as GFDL Director (1984-2000) followed by Ants Leetma (2001-2007). According to GFDL’s current Director, V. ‘Ram’ Ramaswamy, “the steering done by Jerry and Ants has enabled GFDL and AOS to lead the newer and emerging challenges in the climate and Earth sciences, including the significance of the science for knowledge on the impacts due to climate change.”



*AOS Program graduate and former faculty member Kevin Hamilton at ribbon-cutting ceremony in September of 1989*

Like most programs, the AOS Program has undergone a series of evolutions, since its early years. What makes the AOS Program distinctive, according to current AOS Director Jorge Sarmiento, is that “Princeton as an institution is better positioned than any other institution anywhere to combine the practical nuts and bolts of running models along with broad, deep knowledge and scientific expertise. We work on climate models, but we also have the expertise to analyze them.”



*GFD Program Faculty 1980*  
*Back row: George L. Mellor, Jerry D. Mahlman, Joseph Smagorinsky*  
*Middle row: George Philander, Gareth Williams, Kirk Bryan, Jorge Sarmiento, Abraham (Bram) Oort, Yoshio Kurihara, Isidoro Orlanski*  
*Front row: Sheldon Judson, Stephen Fels, Dawn Eldridge, Esther Olsen (administrative staff), Isaac Held, Kikuro Miyakoda, Suki Manabe*

Today, more than forty years since its inception, the AOS Program is at the forefront of atmospheric and oceanic study and research and is internationally recognized for its development of models of atmospheric and oceanic circulation and climate, particularly studies related to global warming, and *as chance would have it*, remains rooted in the close intellectual ties between members of the University and GFDL.