



# OLD DOMINION UNIVERSITY

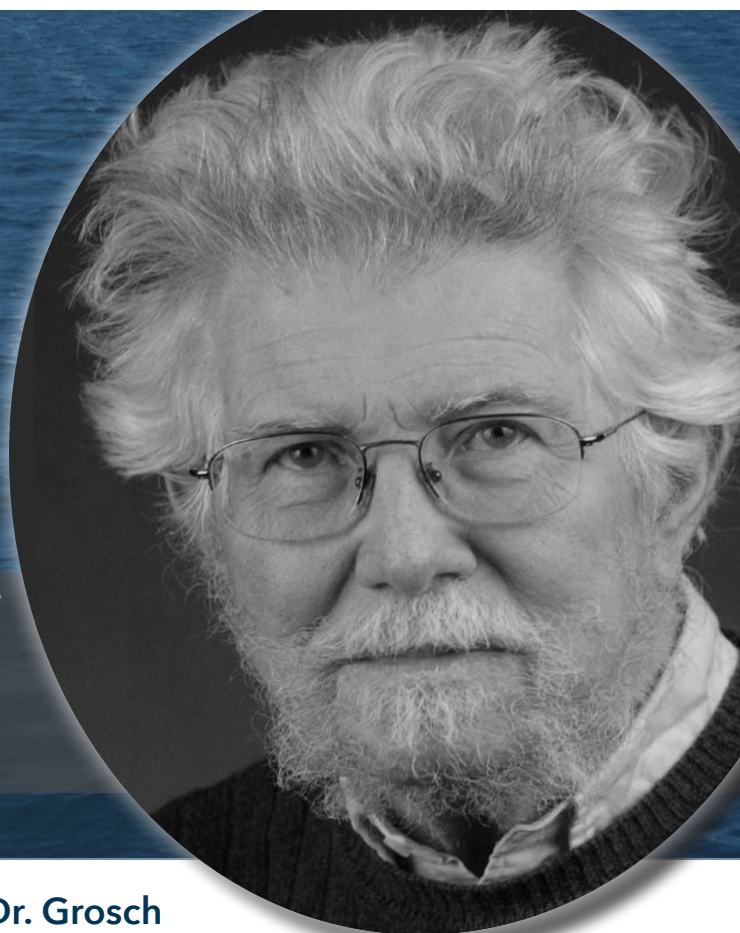
Center for Coastal Physical Oceanography

IDEA FUSION

## CCPO CIRCULATION

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### Reflections from Dr. Grosch

Dr. Chet Grosch

Emeritus Professor & Founding Member of CCPO

There were a number of reasons why I decided to change positions in early 1973. I was a tenured Associate Professor at Pratt and had been told that I would be promoted to the rank of Professor beginning with the 1973-1974 academic year. However among other things, I was looking for a position at a larger and more diverse academic institution that had, in contrast to Pratt, a major emphasis on research.

In April of 1973 I answered an advertisement in *Science* for a position at the Institute of Oceanography of Old Dominion University. I had no formal education in Oceanography (my degrees are in Engineering, Mathematics and Physics) but had, so to speak, “drifted” into doing oceanography. An aside will, I hope, explain what I mean by “drifted”.

After receiving a degree of ME (Mechanical Engineer) from Stevens Institute of Technology in 1956, I accepted a position at the Davidson Laboratory of Ste-

vens. Beginning in late ‘56 or early ‘57, Steve Lukasik and I were supported by contracts from the US Navy; first by the Minesweeping Branch of the Bureau of Ships and later by ONR. Both organizations were funding us to investigate the generation, propagation and dissipation of long waves. I carried out a number of theoretical studies and laboratory experiments in a wave channel. These research results were published in Physics and Engineering journals.

We needed a longer channel, ours was only 300 feet long, and so we decided to make a set of observations of swell in the ocean. We decided to test existing theory by measuring the correlation between bottom pressure and velocity near and in the bottom boundary layer. These observations required purchasing a pressure gauge and designing, building and calibrating a velocity measuring device using a thermistor as well as structures to hold both instruments. We also needed a vessel so we hired one

from the NYU Dept. of Meteorology and Oceanography. (I first met Denny Kirwan there; he was an assistant professor at the time.) I also met Willard Pierson who was very helpful. Bill gave me a list of papers on spectra to read as well as a copy of their Fortran spectral code, COQUAD. We also needed divers. This wasn’t a problem because the director of research at Stevens at that time was a retired admiral who arranged for us to hire two diving instructors on leave from the Submarine School at New London. After two summers, our observation program succeeded and we published in JGR.

By 1973, I had also done and published research on boundary layers, hypervelocity impact, shock structure and hydrodynamic stability. However, despite not being an oceanographer, it appears that the wave dynamics research was enough for Jack Ludwick, the Director of the Institute of Oceanography at the time.

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## Letter from the Director

John Klinck  
Professor & CCPO Director

This issue of CCPO Circulation is unusual in that it focuses on one member of the group, Chet Grosch, and the festivities surrounding his retirement. Chet has been a continuing presence at CCPO and has contributed in many ways: some are obvious, some are subtle. These contributions were the focus of a symposium, organized by Eileen and Ann, which reminded all of us why Chet is an important member of CCPO. Celebrating Chet's accomplishments reminds me that a career can be a "long and winding road", to quote the Beatles, where our interests and skills change over time, as do our colleagues, some of whom become good friends. Maybe that is the real message from this celebration for Chet--to be open to new ideas, new directions and new friends.

*Crittenton Hall basement renovation and silly neck tie celebration, mid 1990s. (Left to Right:) Eddie Haskell, Larry Atkinson, Denny Kirwan, and Chet Grosch*



## Reflections from Dr. Grosch, cont'd.

In late April Jack phoned and asked me to interview for the position. I visited ODU in early May and I decided that the university had a real commitment to increasing research. I was also impressed with Jack; he was a serious scientist and was committed to improving the Institute of Oceanography. I also judged that he was a serious, formal and reserved person. In early June I was offered a contract as Samuel L. & Fay M. Slover Professor of Oceanography. The appointment was without tenure but I was told that the tenure process would start at the beginning of the '73 academic year. I was also told that I would not be assigned any teaching in the Fall Semester and, perhaps, in the Spring as well so that I could devote my time to starting a research program. These terms were acceptable and I agreed, signing a contract.

By happenstance I gained a great deal of insight into Jack Ludwick's character during the Summer of '73. I had been invited by the Jasons (Wikipedia has

an entry for the Jason group) to visit them during that summer. I was part of a small sub-group of the Jasons studying the potential of computational fluid dynamics. Accordingly, in early July I went to La Jolla where the Jasons met and stayed there for six weeks. At some point during that time, I was having lunch with Walter Munk and several others. Walter told me that he had read my paper on pressure-velocity correlations and asked was I still at Stevens. I told him "no" and that I was joining an oceanography institute/department at ODU in the fall. He then asked who was the director and I said "Jack Ludwick". Walter replied, "Oh, the Mayor of Tijuana". The remainder of lunchtime was filled by Walter Munk telling me everything he remembered about Ludwick's career at Scripps. Thereafter, I never considered Jack to be "stiff".

Although I had been told that I wasn't be asked to teach in the fall, I received a call from Jack Ludwick in late August

asking if I could teach a course on wave dynamics at NASA Langley in the upcoming semester. I agreed; I had so much material on waves that teaching was easy. That semester I taught a three-hour course at NASA one day a week. The first week Ron Johnson drove me to Langley and after that I was on my own. One week I got lost and ended up driving down a runway toward a jet fighter. I got off and never made that mistake again. At the end of the course, the six or so students at NASA told me that they were satisfied with the course even though they had had a difficult time understanding the first two or three classes because of my "Jersey accent". I was the MS advisor to one of them later on so, in the end, the accent couldn't have been so bad.

Another interesting event occurred in December of 1974. As mentioned above, I was told that the tenure process would begin in 1973 but it actually began early in 1974.

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**Reflections from Dr. Grosch, cont'd.**

On 4 December 1974, I received a letter from the Provost stating that he would recommend me for tenure when the Board of Visitors (Visitor sounds so much more elegant than Trustee) met. The next week, the student paper appeared with a list of those awarded tenure by the Board. My name wasn't on it.

I decided to wait before erupting. On 17 December 1974 the Provost sent me a letter of apology saying that my name had been left off the list of candidates for tenure sent to the Board because of a "typographical error". The Provost assured me that my name would be presented to the Board at their next meeting. On 17 February 1975 I was notified that I had been awarded tenure. All in all, an interesting and revealing first years at the Institute of Oceanography of Old Dominion University.

In the 70s Oceanography didn't have an undergraduate degree program but offered a two-course undergraduate elective, OC106 & OC107, that was taught by Ron Johnson with an enrollment of order 300 students per semester. The graduate students were all MS students with about half of the 30-50 students being full time and the others being part time. Because of the part time students the graduate courses were given in late afternoon or in the evening, starting at 7:00PM. I enjoyed teaching a variety of graduate courses at ODU including waves and tides, estuary dynamics, geophysical fluid dynamics, turbulence and mixing in the ocean and time series applications in oceanography.

When I arrived at ODU the University had just been given permission to award PhD degrees in Oceanography.

I had the privilege of advising the first, I believe, two PhD Oceanography students; Vic Delnore defended in 1975 and Paul Moersdorf in 1978.

Altogether I have been advisor or co-advisor for twelve PhD students.

During my entire career, both before coming to ODU and at ODU, I have derived great satisfaction from collaborating with other scientists. My first collaboration at ODU was, perhaps oddly, with a computer scientist. This arose from my interest in computer architecture. Much of my early research as well as later research was and is in the areas of computational fluid dynamics and analysis of large time series data sets. All of my early research was limited by the available computing power. (For example the IBM computer that I used for my dissertation had only 32K, 36 bit words of memory.)

In the middle 60s I began to study the literature on computer architecture so as to understand computer limitations. This was a time of rapid change in computer architecture with IBM introducing the System 360, Cray producing the ancestor of the first super computer and several projects aimed at producing parallel computers. Before coming to ODU I had a joint appointment in Physics and CS at Pratt where I taught computer architecture and computational algorithms for CS. By the time I came to ODU I was thinking about the feasibility of a parallel architecture designed to solve the Navier-Stokes equations. I don't remember how we met but a year or so after coming to ODU I began to collaborate with Carl Weiman who was a computer scientist in the Math Department. (At that time CS was housed in Math.) We presented a paper on that idea at

an International Conference on Parallel Processing in 1977. In the next year I gave a paper on solving Poisson equations on large array architectures at a conference at Los Alamos. Around 1980 CS was split off from Math. I continued to interact with the CS faculty and in 1982 was asked to accept a joint appointment in the CS Department. I agreed and had such an appointment until 2000 by which time I had lost interest in High Performance Computing because the overall structure of these machines had become frozen. During the time that I had the joint appointment I taught the undergraduate and graduate CS courses in Computer Architecture and enjoyed doing so. Also I collaborated with Mohamed Zubair in CS. We had several joint papers published in CS journals and Zubair and I were co-advisors to two CS graduate students.

In either late 79 or early 80 I received a phone call from Milton Rose, the director of the Institute for Computer Applications in Science and Engineering (ICASE) at NASA Langley Research Center. He asked if I would visit the Institute. We arranged a date when ICASE was having a seminar. I attended the Seminar had lunch with Milt and had a long conversation about my research. (I asked how he knew of me and he said that he had read several of my papers.) I had several other visits; the Seminars were very interesting. I was very impressed with Milt's accomplishments in numerical analysis and further impressed when I learned that he had been a student of Kurt Friedrichs. (If you don't recognize the name, the CFL condition is the Courant-Friedrichs-Lewy condition published in 1928.)

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## Reflections from Dr. Grosch, cont'd.

After a few months, Milt asked me to become an ICASE consultant and I readily agreed. From then until 2000 I was a consultant spending a day a week there during the academic year and often several days a week during the Summer. I was able to meet and speak with some of the world's best numerical analysts who visited ICASE. Milt became a very good friend until his untimely death some years ago.

In addition to my ICASE consulting, I first met my longest running collaborator, Tom Gatski, at ICASE. Tom had just joined the staff of NASA after doing a PhD with John Lumley at Penn State and a Post-Doc at Brown. It turned out that we had similar interests in CFD and turbulence dynamics. Milt, Tom and I collaborated a number of times on studies of algorithms for numerical solution of the Navier-Stokes equations. Tom and I have collaborated on and off for over 35 years. Whenever I have a "turbulence question", I go to Tom and always get a clear insightful answer. Tom and I have also been very good friends for all these years.

Another outcome of my ICASE appointment was meeting Tom Jackson in, as I recall, in the mid 1980s. Tom had received an undergraduate mathematics degree from ODU a year or so earlier and was at that time a graduate student in Math at RPI. Because of a serious illness in his family he had taken a leave from RPI. Milt had learned of this and offered Tom a student fellowship at ICASE so that he could continue research at least part time. A few years later Tom completed his PhD at RPI and joined the ODU Math Department. He also became an ICASE consultant.

Tom was working on the problem of the stability of a compressible shear flow. Because I had published extensively on the theory of hydrodynamic stability, Tom and I had several discussions. We eventually realized what was the meaning and significance of the rather odd results he was getting. We then published a very well received paper in 1989. This was the beginning of a period of extensive collaboration. Tom introduced me to Glenn Lesseigne and Feng Hu who were also Math

faculty at ODU. From then until 1997, we all collaborated and produced a set of papers on the subject of the stability of compressible shear flows. During this period I published an experimental paper with Mike Gaster and Tom; a result of a visit to Cambridge, UK.



Chet (right) and symposium participant, Paul Moersdorf (left), one of his earliest PhD students

So far I haven't mentioned the very extensive collaborations I've had with members of the faculty of the Department of Ocean, Earth and Atmospheric Sciences. (Bye the bye, the Institute of Oceanography eventually was renamed the Department of Oceanography and then Department of Ocean, Earth and Atmospheric Sciences.) CCPO was founded in 1991 and since

then my closest collaborators have been the faculty of CCPO.

Over the years I've worked with Larry Atkinson and Tom Royer becoming close friends during our collaboration. These collaborations involved detailed analysis of various time series of oceanographic data resulting in some nice papers. Tom Royer and I were also co-advisors for two PhD students. Denny Kirwan and I collaborated on a number of areas involving theoretical and/or numerical problems in physical oceanography while he was here. We also were co-advisors for two PhD students. Denny was and is a very good friend and I was sorry when he left ODU to join the faculty at University of Delaware.



Symposium participant, Professor Mike Gaster, FRS (City, University of London), Chet's long time colleague and collaborator | Photo by David B. Hollingsworth



## The Dr. Chet Grosch Symposium

Dr. Eileen Hofmann & Dr. Ann Gargett

In early 2016 Chet Grosch announced plans to retire from full-time teaching and academic responsibilities and move to Emeritus Professor. Chet has been an integral member of CCPO since its beginning and the general consensus was that the contributions he made during his 43 years at Old Dominion University should be recognized and honored. After considerable discussion, it was decided to hold a symposium to celebrate Chet's scientific and academic achievements.

A 1.5-day Symposium on "The Art of Fluid Dynamics" was held 13-14 October 2016 at Old Dominion University. The Symposium program was developed around three themes - Understanding Turbulence, Nonlinear Mathematics and Flow Analysis, and Time Series Analysis in Earth Systems - which reflect the impressive range of topics that have been the focus for Chet's scientific interests as described in the main article. The Symposium presentations from colleagues and former students highlighted science results in each theme and Chet's influence on these results, as well as on scientists of all levels - undergraduates, post-doctoral fellows, colleagues both local and distant. It is notable that in addition



Professor Tom Royer presented results from a study with Chet on tub toy trajectories in the North Pacific | Photo by David B. Hollingsworths

to colleagues and students from a range of departments at Old Dominion University, colleagues and former students traveled from international (Canada, England, Ireland) and national (Hawaii, Florida, Delaware, North Carolina, Pennsylvania) locations to participate in the Symposium. The enthusiastic support and willingness by these individuals to take the time from busy schedules to attend the Symposium clearly illustrate Chet's influence and his long-term collegial and collaborative interactions. Chet's collaborations with many of these individuals are described in the main article.

The Symposium was a celebration of the intellectual guidance and advice that Chet has provided for colleagues and students during his academic career at Old Dominion University. He defines the role of a senior scientist who is willing to share his immense experience and expertise. We look forward to Chet's continued involvement in research and his participation in CCPO activities, especially seminars and cookie time.



## JUST THE FACTS

### Graduations:

Davis, L., M.S., “Climatological Distributions of *Euphausia Superba*, *Euphausia Crystallorophias*, and *Pleuromma Antarcticum* with Correlations to Environmental Variables in the Western Ross Sea, Antarctica,” December 2016, Advisor: E.E. Hofmann.

### Awards:

NSF XSEDE, Predicted Impacts of Changing Climate and Land-use on Chesapeake Bay Water Quality and Biogeochemistry, M.A.M. Friedrichs and P. St-Laurent, \$19,262, October 2016 - September 2017.

### Publications:

Casatagno, P., P. Falco, **M.S. Dinniman**, G. Spezie, and G. Budillon, Temporal Variability of the Circumpolar Deep Water Inflow onto the Ross Sea Continental Shelf, *Journal of Marine Systems*, 166, 37-49, doi:10.1016/j.jmarsys.2016.05.006, 2017.

**Dinniman, M.S.**, X.S. Asay-Davis, B.K. Galton-Fenzi, P.R. Holland, A. Jenkins, and R. Timmermann, Modeling Ice Shelf/Ocean Interaction in Antarctica: A Review. *Oceanography*, 29(4), 144-153, doi:10.5670/oceanog.2016.106, 2016.

Graham, J.A., **M.S. Dinniman**, and **J.M. Klinck**, Impact of Model Resolution for On-Shelf Heat Transport Along the West Antarctic Peninsula, *Journal of Geophysical Research*, 121, 7880-7897, doi:10.1002/2016JC011875, 2016.

Gwyther, D.E., E.A. Cougnon, B.K. Galton-Fenzi, J.L. Roberts, J.R. Hunter, and **M.S. Dinniman**, Modelling the response of ice shelf basal melting to different ocean cavity environmental regimes, *Annals of Glaciology*, 57(73), 131-144, doi:10.1017/aog.2016.31, 2016.

Li, Y., D.J. McGillicuddy, **M.S. Dinniman**, and **J.M. Klinck**, Processes Regarding Formation of Low-Salinity High-Biomass Lenses Near the Edge of the Ross Ice Shelf, *Journal of Marine Systems*, 166, 108-119, doi:10.1016/j.jmarsys.2016.07.002, 2017.

Mack, S.L., **M.S. Dinniman**, D.J. McGillicuddy, Jr., P.N. Sedwick, and **J.M. Klinck**, Dissolved Iron Transport Pathways in the Ross Sea: Influence of Tides and Mesoscale Eddies in a Regional Ocean Model, *Journal of Marine Systems*, 166, 73-86, doi:10.1016/j.jmarsys.2016.10.008, 2017.

Oey, L.-Y., **T. Ezer**, J. Sheng, F. Chai, J. Gan, K. Lamb and Y. Miyazawa, Editorial - The 6th International Workshop on Modeling the Ocean (IWMO 2014), *Ocean Dynamics*, doi:10.1007/s10236-016-1028-x, 2016.

### Presentations:

**Dinniman, M.**, **J. Klinck** and L. Padman, “Transport Pathways and Consequences for Antarctic Ice Shelf Basal Meltwater, 2016 ROMS Asia-Pacific Workshop, Hobart, Tasmania, October 2016.

**Ezer, T.**, “Climate Change, Sea Level Rise and Impacts on the Hampton Roads Region, Hampton University Atmospheric and Planetary Sciences Seminar, Hampton, VA, January 18, 2017.

**Ezer, T.**, “Progress, Challenges and Failures in Ocean Circulation Modeling: The Gulf Stream Case,” Dr. Chet Grosch Symposium, The Art of Fluid Dynamics, Norfolk, VA, October 13, 2016.

**Gatski, T.B.**, Analysis and Prediction of Turbulent Viscoelastic Flows,” Xi’an JiaoTong University, School of Energy and Power Engineering, Xi’an China, September 29, 2016.

**Gatski, T.B.**, “Some Lessons in Teaching Short Courses on Engineering Research,” Northwestern Polytechnical University, Center for Faculty Development, Xi’an China, September 30, 2016.

**Gatski, T.B.**, “Turbulence Modeling and Flow Simulation,” Northwestern Polytechnical University, Department of Fluid Mechanics, Xi’an China, September, 16 - October 5, 2016.

**Gatski, T.B.**, “Turbulence Modeling and Simulation for Compressible Flows,” Nanjing University of Aeronautics and Astronautics, Department of Power Engineering, Nanjing China, October 10 - 14, 2016.



## JUST THE FACTS

### Presentations, cont'd:

Gwyther, D.E., K. Kusahara, B.K. Galton-Fenzi and **M.S. Dinniman**, “Modelling Regional Ice Shelf/Ocean Interaction with ROMS, 2016 ROMS Asia-Pacific Workshop, Hobart, Tasmania, October 2016.

**Hofmann, E.E.**, E.N. Powell, **J.M. Klinck**, G. Bidegain, “Modeling Within-host Pathogen Interactions in Marine Bivalves,” Plenary Presentation, 14th Annual Meeting, Ecology and Evolution of Infectious Disease, Cornell University, Ithaca, NY, June 3-5, 2016.

Kumar, R., K. Hedstrom, **M. Dinniman**, and D. Holland, “Coupling ROMS-CICE for Polar COAWST model,” 2016 ROMS Asia-Pacific Workshop, Hobart/Tasmania, October, 2016.

**St-Laurent, P.**, **M.S. Dinniman**, **E.E. Hofmann**, R.M. Sherrell, S.E. Stammerjohn and P.L. Yager, “Variability of Physical Parameters Influencing the Bloom of the Most Productive Antarctic Coastal Polynya (Amundsen Sea Polynya),” 2016 WAIS workshop, Sterling, VA, October 3-6, 2016.



Teresa Updyke (left), Chet Grosh (center), and John Klinck (right) listening to a symposium presentation | Photo by David B. Hollingsworth



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## SEMINAR SERIES SCHEDULE

JANUARY 23	FEBRUARY 13	MARCH 13
<b>Christine Avenarius</b> East Carolina University	<b>Danny Kaufman</b> Virginia Institute of Marine Science	<b>Fred Bingham</b> University of North Carolina, Wilmington
JANUARY 30	FEBRUARY 20	MARCH 20
<b>Ray Toll</b> Old Dominion University, Coastal Resilience Research	<b>John Cook</b> George Mason University	<b>Gustavo Marques</b> Princeton University, GFDL
FEBRUARY 6	FEBRUARY 27	MARCH 27
<b>Wie Yusuf</b> Old Dominion University Resilience Collaborative	<b>Tom Allen</b> Old Dominion University	<b>William Sweet</b> NOAA National Ocean Service
	<b>APRIL 3</b>	<b>Pierre Dutrieux</b> Lamont-Doherty Earth Observatory

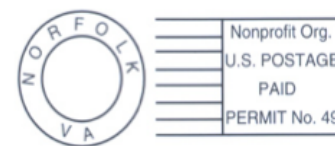




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## The Dr. Chet Symposium: The Art of Fluid Dynamics Symposium Participants



*Front (center): Chet Grosch; Front row (left to right): Lynn Price, Praveen Kumar, Cynthia Jones, Lauren Sommers, Ajoy Kumar, John Holdzkom, Teresa Updyke, Eileen Hofmann, and Nandita Sarkar; Middle row (left to right): Pierre St-Laurent, Tal Ezer, Brett Buzzanga, Michael Echevarria, John Adam, Brian Collister, Brynn Davis, Mike Gaster, Fred Dobbs, and Hannah Aichelman; Back row (left to right): John Klinck, Denny Kirwan, Ben Hamlington, John Kroll, Dick Zimmerman, Matt Weiss, Paul Moersdorf, Tom Royer, Ann Gargett, and Brian Ward*