Dedicated to Professor William Layton
on the occasion of his 60th birthday

"My personal preference is to work on problems where mathematics can make a difference in extending the boundary of what is predictable rather than perfecting a theory where the main outlines are already known. (There is nothing wrong in the latter. Math is hard enough that progress will only be possible when we all work on whatever is closest to our own hearts)."

--William Layton

FOREWORD

This peer-reviewed special issue is dedicated to Professor William Layton in celebration of his 60th birthday and eminent career achievements. Professor Layton is a distinguished applied mathematician whose pioneering research works and creative ideas have accelerated progress on many fronts in computational mathematics. His research involves mathematical modeling based on partial differential equations, the design of inventive, efficient, and effective computational schemes, and rigorous numerical analysis and error studies. Using his words, *"In all these areas, one common theme is: Mathematical analysis as a guide to practical computing."* His research includes new models and algorithms for complex fluid flow, ensemble simulation models and algorithms for turbulence, partitioned time stepping methods for coupled, multi domain & physics, large eddy simulation, uncertainty quantification, the big data in turbulent combustion project, algorithms for flow in complex pebble bed geometries, long time behavior of numerical methods, energy transfer theories of turbulence and shell models, among many other areas.

Professor Layton has authored over 150 journal papers, and 4 widely used books:

- L. C. Berselli, T. Iliescu, W. Layton , Mathematics of Large Eddy Simulation of Turbulent Flows, Springer Verlag, Scientific Computation, 2005.

- W. Layton , Introduction to Finite Element Methods for Incompressible, Viscous Flows, SIAM, 2008.

- W. Layton and L. Rebholz , Approximate Deconvolution Models of Turbulence: Analysis, Phenomenology and Numerical Analysis, Springer Lecture Notes in Math, V. 2042, 2012.

- W. Layton and M. Sussman, Numerical Linear Algebra, Lulu press, 2014.

Professor Layton is an amazing advisor. It is truly impressive how he has managed over the years to steer a plethora of students on the arduous path toward earning a Ph.D. What is actually even more impressive is that many of his students (and his students' students, too!) still retain the joy of doing mathematical research, whether in academia or in industry. Professor Layton has the unique talent of taking some of the hardest mathematical concepts and making them memorable experiences for his students. (Indeed, who else would say "ET phone home" when talking about the energy inequality for the Navier-Stokes equations) His office door has always been open to his students, to find a solution to the hardest mathematical problems, but also talk about personal issues. He has always been thinking about a myriad of beautiful mathematical and computational open problems. He did not, however, keep them for himself. His greatest joy was to share them with his students and patiently help them overcome the many hurdles to reach the light at the end of the tunnel. We are all grateful for his advising over the years, including after graduating, and we could not have wished for a better advisor. Professor Layton is an enthusiastic, passionate, and whole-hearted advocate of mathematical sciences, an amazing mentor of students of different nationalities from all around the world, and an astounding collaborator with researchers of diverse cultural and educational backgrounds. The contributing authors of this special issue consist mostly of Professor Layton's former Ph.D students, postdoctoral fellows, and colleagues who at one time or another had the opportunity to collaborate with Professor Layton. This special issue represents the embodiment and essence of his outstanding leadership in research areas on the national and international level. His diligent service and unselfish contributions have impacted these research areas worldwide. There is no doubt that great ideas and brainwaves will continue to cascade out of his beautiful mind for years to come.

Traian Iliescu, Virginia Tech

Alexander Labovsky, Michigan Tech

Monika Neda, University of Nevada Las Vegas

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