APPLIED MATHEMATICS COLLOQUIUM: Applied Mathematics at CCSE/LBL – Software, Algorithms, History and Applications

Andy Nonaka

Staff Scientist and CCSE Group Lead

Lawrence Berkeley National Laboratory

<u>Date:</u>
9/16/2022

<u>Time:</u>
4:00 – 5:00 PM

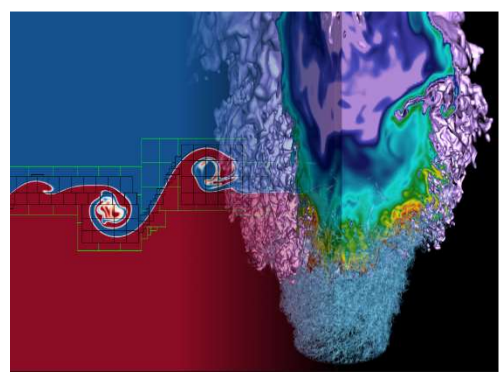
<u>Location:</u>
SSB 170

About The Speaker:

Dr. Andy Nonaka is a Staff Scientist and Group Lead of the Center for Computational Sciences and Engineering (CCSE) in the Applied Mathematics and Computational Research Division at Lawrence Berkeley Lab. Dr. Nonaka's college days were spent entirely in the central valley, having received a Bachelor's Degree in Electrical Engineering from the University of the Pacific (Stockton) and a PhD in Engineering Applied Science from UC Davis. His research focuses on numerical solutions to complex multiphysics applications, and the associated implementation on high-performance computing resources. Sample applications include microscale fluid dynamics, electromagnetic models for physical modeling of microelectronics, and computational astrophysics. The primary code framework he uses is AMReX, an Exascale Computing Project supported software library that supports massively parallel adaptive structured grid calculations. He is an avid competitive swimmer, and enjoys golfing, skiing, and playing the piano in his spare time.

Abstract:

In this talk I will give an overview of the Applied Mathematics efforts at Berkeley Lab within the Center for Computational Sciences and Engineering (CCSE). First will be an overview of the AMReX software library, an Exascale Computing Project funded effort to support massively parallel, GPU-enabled block-structured adaptive mesh calculations. Next I will give a historical perspective on the use of low Mach number models for fluids, which is a long-time mathematical workhorse of CCSE to efficiently model a variety of flow problems that are intractable with traditional compressible approaches. I will then discuss the low Mach number astrophysical code MAESTRO, including its successes, and how the development of the code interplays with other CCSE activities. Finally I will switch gears and talk about efforts in leveraging successful HPC electromagnetic codes to create a springboard for a new next-generation microelectronics modeling effort. We have recently extended the classical finite-difference time-domain approach for Maxwell's equations to include new physics present in emerging devices.



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