Classical fluid mechanics confronts modern research questions: Problem choices and serendipity

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Fluid mechanics is part of the domain of classical physics, yet remains applicable to important problems and still yields surprising, and even elegant, answers. I will provide an overview of some of the thought processes behind fluid dynamical analyses, e.g. dimensional analysis, using examples from my own research, and various other problems that are beautiful (in my view) and instructive. Also, I will describe two recent projects in my group where we identify new analytical and physical features of flows common to modern research questions: 1) Experimental and numerical studies of fluid dynamics themes related to virus transmission by speech, which has largely been neglected, but may be relevant when thinking about asymptomatic transmission of a pathogen, e.g., what kinds of air flows and air exchanges occur when you are talking, masked or unmasked, with a colleague? 2) Drainage of a liquid film on a vertical substrate of finite width, where we identify a novel similarity solution, which is in excellent agreement with the experimental measurements.