Review of “Fluid Mechanics A Very Short Introduction” by Eric Lauga

By GPE

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As someone doing research in fluid dynamics this book served as a great introduction to the field and a great source of fundament physical understanding and spring of ideas for my work.

Chapter 1 introduces various fundamentals such as continuity, pressure, hydrostatics and surface tension. Mention is also made of wetting which is otherwise little discussed in the book. These fundamentals are returned to frequently throughout the rest of the text. Indeed the book has a great flow to it (self similarity intended) with each chapter building an ever more exciting edifice.

The second chapter discusses viscosity, giving the equation for a Newtonian fluid under shear flow. The writing gives clear physical insight into viscous fluids, and the chapter ends with a presentation of the Navier-Stokes equations but these are not really used in the book as the author considers vector calculus and tensors too advanced for this book.

Chapter 3 considers flow in pipes (e.g. water, oil and blood vessels). And I found the description of Hagen-Poiseuille flow very helpful. And turbulence is discussed for the first time.

Chapter 4 was about dimensions and the dimensionless numbers that describe fluids such as the famous Reynolds number. I found this chapter a bit hard to get into as there are so many important numbers. But it was well worth the effort with interesting physics presented.

The next chapter is on boundary layers and explains aircraft flight very well. A simple derivation of Bernoulli’s equation is given which is very satisfying. The next chapter is on vortices and is very appealing given the beautiful visual nature of the subject.

Instabilities are covered next and I found the shear layer section very useful. Finally the book gives a glimpse of modern research in fluid mechanics, but by now it’s all over as far as education goes and I think this chapter is for the beginner.

An excellent introduction to an extremely beautiful and fascinating topic – well worth the read.