

PRACTICAL APPLICATIONS OF FLUID DYNAMICS

It goes so fast, you think to yourself, watching the brook at the bottom of your father's garden. There has been heavy rain over the last few days, and the gentle stream you played in in your youth is now swollen and threatening to burst its banks. You watch the floodwater pass by, seeing how it negotiates the submerged rocks, which parts go faster than others, and how it changes—or doesn't—over time. You do not cry.

You might be expected to cry, because your father died three days ago, and because the place might remind you of him. Many people would cry in such a situation. You suspect that your close friend, who drove you here, and who is watching you from a distance, is probably expecting you to cry as well.

It is not as though you are already used to tragedy; you have never lost a close family member before. Similarly, it is not that you didn't care about your father. He was a kind and very intelligent man, and the world is surely worse off without him. But somehow it simply doesn't seem like a tragedy to you. Death is the natural consequence of a terminal illness; it wouldn't make sense to get sad or angry at natural phenomena like that.

Your father was a fluid dynamicist. He did try to explain his work to you as a child, but you never really understood well enough to take an interest. Now you are left with thousands of pages of intricate, lovingly penned equations and graphs, the ticks and swirls of which possess some fundamental yet elusive connection to the flow of the stream at the bottom of the garden. You feel an odd sense of powerlessness at your inability to understand. Still, you do not cry, although something does tighten in your throat.

To leave such a gulf between you and your father seems somehow too sad, so you begin to study fluid dynamics yourself. Slowly, laboriously, and painfully, like learning to walk, you work through calculus from first principles, differential equations, vector calculus, inviscid flows, streamfunctions, potentials, and everything else as it comes. You become familiar with the work of men such as Bernoulli, Kelvin, Stokes, Reynold and Blasius, but never hear your father's name come up.

You graduate from university to find that there is nothing else in life you really care about, so you continue on to do a doctorate degree in the same field. It is difficult, certainly, but it is peaceful. You find an odd sense of purity in devoting your every waking hour to study.

You never visit your father's house again. That's not to say you avoid it; you simply have no reason to go back.

As your waking life flows on, slowly, steadily, like a viscous fluid down a shallow incline, your dreams became ever more frequent and vivid. You seem to be forever dreaming of solemn official events—court trials, funerals, interviews and the like—but bizarrely out of balance: the pet dog from your childhood is on trial for murder, or the priest turns up drunk and half naked to the funeral,

or you are trying to interview a man but keep being interrupted by swarms of butterflies. You find these dreams inexplicably exhausting and frustrating.

Rarely, you dream of people you know (that is, acquaintances from the university) and these are worst of all. They do things like offer sincere sympathy over something trifling, or walk just behind you, or try to persuade you to let them touch your hand, and these things seem so minor by daylight that you cannot explain the unspeakable horror and suffering they fill you with at the time. Once, a young professor asks you about your family and something—perhaps the way her voice lifts at the end, or that lopsided smile of hers—is more than you can bear. You bludgeon her to death. There is no blood; her grinning face simply crumples and tears like writing paper. You are still screaming when you wake up.

You achieve your doctorate degree without significant difficulty. You take up a lecturing position at a university of slightly better reputation than your previous one. The work is simple and satisfying, and the students all keep a respectful distance. You publish several papers, and—the greatest achievement of your life so far—write a successful proof to a longstanding problem involving paired vortex interactions. Life is good. After all, this is everything you wanted, isn't it?

Only once do you waver. One Friday, a colleague asks you what your plans for the weekend are and you reply, without thinking, the truth: you will be at home, writing up the final draft of your next paper. Only when you are lying in bed that night trying to fall asleep do you realise the question might have been more than idle courtesy.

You stare up at the ceiling. How many advances like that have you missed until now? Why is it that romance, sex and companionship just don't interest you? What is it that you are missing that everyone else has?

Perhaps for the first time, you look back at your life. You see the strange, meandering mists of childhood condense into the strong, steady flow of young adulthood, before curling into the inexorable spiralling vortex of middle age. With a shock, you realise that you can't quite recall your own father's face, yet you can remember perfectly the way the stream at the bottom of the garden flows around the submerged rocks.

And what lies ahead? Another twenty years of the same, before slowly draining away into the grave? You lie awake thinking for a long time. Drip by drip, determination gathers in your gut. Finally, your eyelids drift closed, and you fall into a peaceful, dreamless sleep.

The raindrops flowing down the window pane can best be described by free film lubrication theory. The equations simplify dramatically when one spatial dimension is negligible compared to another, however the unknown free boundary on the surface of the droplet makes the problem more difficult—and more interesting.

Your formerly close friend—the same one who had driven you to your father's house after his death—is sitting opposite you, talking incessantly about one of her children. Apparently he is aspiring to become a theatrical producer and

actor, which she finds abhorrent. You can't understand what she is upset about, but then again you don't really know anything about theatre.

The café is cramped and humid, and the air is dense with conversation and the clinking of crockery. The rotund man in the seat behind you keeps periodically exploding in laughter. She asks you a question, but you weren't listening, so she has to repeat it.

"What did you want to be when you grew up?" she asks again. You suppose she is trying to prove some point about her son, but you aren't sure what answer she wants, so you just answer honestly.

"I wanted to be a fluid dynamicist," you say. She sips her coffee, then leans forwards. "The hell you did," she says with a patronising half smile. "What did you really want to be?"

You stare at her dumbly. But I really did want to be a fluid dynamicist, you want to say. You know, however, that she won't believe you, so you try to concoct a suitable lie. By the time you've thought of something she's already continued talking, though.

"You see, this is your problem," she declares, thrusting a finger at you. "You have no motivation, no dreams; you just drift through life, like one of those damn liquids you're so obsessed with. You and I are past fifty already! You don't even have a husband—let alone a family. You've barely been outside your own country. You've never really lived!"

"I sometimes go abroad on conferences," you object, though you aren't seriously trying to refute her point. She waves your words aside and continues with redoubled vigour.

"Just imagine if someone wrote a story about your life. You'd be an awful protagonist, because you just don't care enough about anything! You have no passion! A story about you would never go anywhere." Good God, she's serious.

"You have to get out of your comfort zone and do stuff! Try dating, or learning another language, or... I don't know... skydiving! Anything, but you have to move forwards, or you'll be left behind." You can't take much more of this.

"I mean really, I know your fluid mechanics is important to you, but do you really think that's all there is to life? Don't you wonder what else you could be doing instead? Life is short, and if you don't t—"

You burst out laughing. You try to hold it in, but you simply cannot—the more you try to suppress it, the more the pressure builds up and peal after peal spurts from your mouth. She glares at you, a sour look on her face.

"Of all the things to say," you reply at last, once your breath has returned to you. "I appreciate your concern, but if there's one of us not living our lives to the full it's you, darling. Let me ask you: why do you bother to continue living? Why not just end it all now?"

She goes pale and sputters something. "It's okay, you don't have to answer," you reassure her, leaning forwards and smiling conspiratorially. "Do you want to know my answer? It's because I haven't proven the existence and smoothness of the Navier-Stokes equations yet!"

The dam is broken. “There is such beauty in this world, how can you turn a blind eye to it? I want you to see—” and it’s true, you really do, “—the childlike innocence of Couette flow! The terrible cruelty of turbulence! Who cares about husbands or skydiving or learning French?”

“Please don’t shout,” she says weakly, which is patently ridiculous as you haven’t raised your voice at all. Nonetheless, when you look around you find every pair of eyes in the café looking at you with the same vacant stare.

Well, clearly there is no point staying here. Without stopping for your umbrella, you stride straight out the entrance into the pouring rain. The water cascades through your hair, down your face, over your shoulders, down your body, off your shoes and away.

You look up to the sky, spread your arms wide, and cry out with all your heart:

“I love you, fluid dynamics!”