INTRODUCTION

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When it started, it was so small nobody noticed. At first. But then reports began to surface in different places, few of them believed at the time. Quickly, far more quickly than anyone thought possible, the news began to spread. First locally, then globally. In a matter of days, the story was everywhere: a professor at the University of Ottawa had created a mathematical model of zombies. Soon there was a second wave to the epidemic: the professor had a question mark in his name. That too spread around the globe.

For several weeks in the summer of 2009, mathematical modelling of zombies was one of the biggest news stories in the world. It spawned print and radio interviews, podcasts, TV features and documentaries. Coincidentally, it happened at the same time as the publication of *Pride and Prejudice and Zombies*, so it seemed as though zombies were everywhere.

The best thing about the media attention was that it raised awareness of my academic field—mathematical modelling of infectious diseases—among people who had no idea that such a thing is possible. Mathematics is essentially a language

that's extremely rigorous and systematic. If you can translate a real-world problem into the language of mathematics, then you have access to a system of logic that's completely robust. You then do your mathematical analysis and any conclusion you find is 100 percent true, based on the premise. The premise might not be true—in fact, almost certainly it won't be, any more than a map is a true representation of streets—but your conclusion is solid. You can then go back and improve your premise by comparing the outcome with what you know from the real world. This requires being an expert in math, but also in biology. If you have the know-how, then it's incredibly powerful and very rewarding.

The zombie model was the perfect illustration of this process. You take the "biology" (in this case a zombie outbreak) and try to understand the underlying mechanisms involved (zombies can infect susceptible humans or raise the dead, but they can also be killed by humans). You translate that into mathematics (using differential equations, which are mathematical engines of change, telling you how things move in time) and come up with a conclusion: zombies will take over the world. You compare your conclusion with data (in this case by watching movies and playing video games) and maybe refine your model (to include, for example, a latent period of infection). Once you have the model, you can alter it to include other factors: quarantine, potential cure, more aggressive attacks.

Usually, I study infectious diseases, such as HIV and malaria. The process allows us to consider big questions for which there might not even be data yet. If there is an HIV vaccine, can it make things worse? (Answer: Yes, unless it lowers the viral load sufficiently.) Can spraying inside houses in malaria-endemic areas control the disease? (Answer: Yes, but global warming will make this progressively harder.) Can we spend our way out of the AIDS epidemic if we spend all the available money at once? (Answer: Yes, but we need to act quickly.)

I mention all this because this is as close to mathematics as this book will get. So, mathphobes, you can breathe more easily.

It all started because I was teaching a course in mathematical modelling of infectious diseases. The students had to do

a project and I told them they could model any disease they liked. When a group came to my office and suggested zombies, they thought I'd shoot the idea right down. But I loved it! Zombies are the perfect way to illustrate disease modelling. At the end of the course, I so enjoyed their project that I rewrote it for publication in an academic book. This amused me and I thought no more of it.

Six months later the book came out, just as I decided to present the chapter at an academic conference (the Society for Mathematical Biology annual meeting in Vancouver, Canada). I was scheduled to do the last talk in the last session on the last day of the conference, so I thought it would be nice to finish with an amusing topic.

The response was incredible: I've never attended a talk (let alone given one) where the question period went on longer than the talk itself. Everyone laughed in the right places (except for one poor soul who'd never heard of zombies and thought this was a real disease). Distinguished professors in their seventies asked insightful questions about drug resistance to the cure. And, crucially, a blogger from the *Globe and Mail* (Canada's national newspaper) found out about it and wrote a story for the online version of the paper.

National Geographic had interviewed me the week before after seeing the book's table of contents. Among mathematical models of HIV, malaria and tuberculosis, the chapter on zombies stood out like a decaying, undead thumb.

From those two stories, the chapter began to get attention. First it was twittered about. Then blogged. The *Globe and Mail* decided to run a print version. A few other Canadian newspapers also picked it up. Then it hit Wired.com and that was the point at which the tsunami was unleashed.

"Science Ponders 'Zombie Attack,'" BBC News, United Kingdom, 18 August 2009 (the number one story for forty-eight hours).

"What's the Best Way to Fight Zombies? Someone Did the Math," *Wall Street Journal,* United States, 18 August 2009.

"Mathematicians Use Zombies to Learn about Swine Flu, *Toronto Star,* Canada, 18 August 2009.

"Who Will Win in Human, Zombie War?," National Public Radio, United States, 20 August 2009.

"Forget Swine Flu—Could We Cope with a Plague of the Undead?," *Daily Mail,* United Kingdom, 26 August 2009.

"How to Survive a Zombie Invasion," *Hungry Beast,* ABC TV, Australia, 2 December 2009.

"Tiedemiehet pohtivat zombien hyökkäystä," *Iltalehti,* Finland, 18 August 2009.

I think the appeal of zombies lies in the fact that they're so primal. They represent two fundamental fears that we have as humans: being eaten by a predator and dying from an infectious disease. Although they're not technically a disease, they have the hallmarks of one, so we can learn a lot from thinking about them in the same way.

Zombies allow us to explore our fundamental fears in a safe way. When confronted with an actual predator, we're unlikely to have much of a chance. Weapons provide the illusion of comfort, which is why they're so intrinsically associated with zombies, but that's really only because we like to think we could fight off a predator with guns. In reality, shooting something that's moving is incredibly difficult and shooting a moving creature in a specific area such as the head is all but impossible. And the nasty thing about zombies is that it doesn't matter how many you kill; there are a thousand more on their way.

The particularly gruesome twist that zombies offer is that they're a deathly parody of the living. You might shoot a polar bear coming at you without a second thought, but would you shoot your grandma? Maybe, but if you pause to think about it, you'd soon be a zombie snack. That's a deliciously complex spanner in the zombie machine: almost by definition, those of us who think and have compassion will likely be the first to go, leaving behind only the bloodthirsty and those incapable of empathy. So, even if some of us survive, civilization has already lost the war.

Disease is so terrifying because it takes away even that illusion of control. You can be struck down without warning and

there's very little you can do about it. Little wonder we seize onto perceived differences with such fervour: if you can cast someone suffering from a disease into a fundamentally different camp, then you give yourself the illusion of protection.

What's more, the most successful diseases aren't the fast ones, such as Ebola. They're fast, but they're too fast, burning themselves out too quickly. If your entire village will be dead before anyone can reach the next village, then the disease doesn't have a good chance of spreading. Instead, like zombies, the most successful diseases are the slow ones: those whose initial signs we ignore or those that don't show symptoms for a long time. Combine that with moral panic and you have a recipe for the perfect epidemic. Little wonder HIV/AIDS has done so much damage.

In fact, the best defence against zombies is our brains. Zombies might be unstoppable, neither needing sleep nor lacking in numbers, but we have the one thing they don't: intelligence. We can electrify fences, build moats, construct walls. To do this, of course, we need each other, because our society has become so interdependent that few people are generalists anymore. The thing zombies fear more than anything else is braaaiiinnnsss.

Which brings me to this collection. Covering feminism, archaeology, political science, biology, law, musicals, library science, education, biomechanics, history, landscape architecture and criminal intelligence, the essays assembled here show that zombies have infested every aspect of our lives. Unlike most academic collections, this book has been written with the interested non-expert in mind.

The theme of this collection is "academics on zombies." The remit is to do for your field what I did for mine: showcase its power for non-academics using zombies as a hook. Not everyone who wrote for this collection is an academic, for we also wanted to examine some broader takes on zombies. Contributors range from senior professors, postdocs and graduate students, to writers, comedians and zombie historians.

Academics bring a particular thoughtfulness to a topic, one that comes not with the soundbite of a politician or the utter conviction of the secretly insecure, but the willingness to question and consider ideas over and over until every aspect

is understood. It's important to situate your argument in the field, so existing literature allows context to be built. A crucial part of academia, often overlooked, is the ability to communicate those ideas to the next generation of thinkers.

This book is part of our fight against zombies. The best weapons we have are our brains. It's time to unleash them.

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