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Looking at Life by the Numbers

An interview with Professor Chris Bauch
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How is math used in health and sustainability research?

The reason why mathematical models are so useful is context, is that it's hard to do experiments with these populations. If we only have one population, we simply can't do experiments so we have to create artificial worlds in the computer using mathematics and computer simulations to try to figure out what would happen under different scenarios. So for example, how do humans create land use changes that affect endangered species and endangered ecosystems? Or another example is vaccines: how do human vaccine choices influence disease levels of the population? We might want to use a mathematical model to figure out what is the critical community size that's required to sustain a population or you might want to figure out how high the vaccine coverage needs to be to eliminate the disease entirely. The human environment is very important because if humans influence environment, and the environment influences human, then it really makes sense to speak of one single coupled human-environment system, rather than two separate systems. And so I'm really interested in creating mathematical models that can capture this coupling – this single system – and how we interact with our environment and how it affects us.

How does your research work?

One of the things I'm particularly interested in is new data sources. We have a lot of online social media nowadays – we have Twitter, Facebook, we have webpages – and this is really a massive treasure trove of potential data. So this has been compared to the invention of the microscope several centuries ago, which completely opened up a new world of microbiology. And in the same way, we now have enormous amounts of data that we can hopefully analyze and learn something about human behavioural patterns; and particularly, how they respond to their environment. We need mathematics to help us interpret what's happening, create a framework that explains it and helps to understand it better.