

## Abstractions



### FIRST AUTHOR

Benjamin Kerr, a biologist at the University of Washington, Seattle, sees migration as a double-edged sword. Relocation can help organisms survive. But if the migrants

are careless with their consumption of resources, they could ruin their new home. Kerr examined the dynamics that sustain or destroy a community by using a robot to migrate *Escherichia coli* bacteria (the hosts) and its viral pathogen (T4 coliphage) to different neighbourhoods with varying characteristics. He saw two kinds of phage behaviour, 'rapacious' and 'prudent'. Kerr explained to *Nature* what this might mean.

### Why did you come up with the terms rapacious and prudent?

They were a bit more colourful than unrestrained and restrained. What comes to mind when people think of rapaciousness is eating, which is appropriate here, because the phage, in a sense, eat *E. coli*. As an analogy, think of two different ways of eating a bag of crisps. You could prudently pick out crisps one at a time and consume every last carbohydrate. Alternatively, you can shake the inverted bag over your mouth, capturing a few crisps, but wasting a bunch on the floor. In our experiment, the crisps are the *E. coli* hosts, the snacker is the phage, and we find both prudent and rapacious eating styles.

### Why did you use the phrase 'tragedy of the commons' in the paper's title?

The term relates to an analogy about shared pasture for grazing livestock (the commons). Although there are incentives for each herdsman to continue grazing cows, lack of restraint by everyone leads to overgrazing — the 'tragedy of the commons'. In our system, as rapacious phage displace prudent users of bacteria, the phage population becomes less productive.

### Did you get along well with your robot?

Unlike for most of my home electronics, I did read the manual (a learn-by-doing strategy being a bit more risky when the machine costs several hundred thousand dollars). Although that got our relationship off on the right foot, the robot did require my constant attention. Actually, I became quite fond of it — especially when it was behaving itself.

### What does this study say about migration?

The big picture is that while the tragedy of the commons may be inevitable on a local scale, migration can determine whether local tragedies become global tragedies. Different migratory patterns can either liberate or isolate rapacious types. If isolated, unrestrained subpopulations will be short-lived, with relatively prudent resource users left in the long run. ■