Hive calculations yield better homes for migrating bees

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Credit: Lilla Frerichs/public domain

Have you ever danced for joy when you found a great place to live? How about performing that dance to persuade the rest of the family you should move there?

On Wednesday Professor Mary Myerscough will speak at a Sydney Science Forum, at the University of Sydney, on how bees use the power

of dance to manage moving house.

"Social insects - ants, termites, wasps and bees - live in colonies of thousands, sometimes millions, of simple individual insects that interact in basic ways but together the colony is capable of finely tuned, sophisticated behaviour," said Associate Professor Mary Myerscough who is from the School of Mathematics and Statistics.

"In the case of bees having to find a new nest site the decision is critical as a bad choice could spell the end of the swarm," said Associate Professor Myerscough.

"With 'computer bees' I model the approach bees use to find the perfect spot - sending out scouts who perform 'waggle' dances to inform the rest of the swarm of what the options are for a new home.

"The better the site the more vigorously the bees will dance, with a constant interchange of bees dancing for a particular site. Gradually the bees narrow their choice because the dances for the bee equivalent of a waterside mansion last longer and recruit more followers than dances for inner-city studios! So eventually most bees are dancing for really good nest sites.

"It helps that, unlike humans, bees all apply the same criteria and reach a consensus on that basis. Occasionally in experiments you will see that one bee has a very strong 'opinion' and will do a good pitch for a mediocre site, which sways the whole process. So there is an element of randomness but we know that bees make the right decision, most of the time," said Associate Professor Myerscough.

The talk will outline how Associate Professor Myerscough works with her colleagues in the School of Biological Sciences to refine their mutual understanding of bees' behaviour.

"I've been working on and off with bees and other social insects for about 25 years and they still fascinate me. Not only are they charismatic creatures but they present so many interesting problems that maths excels at solving, working from the individual level and putting it together to understand what goes on at the level of the whole colony."

Associate Professor Myerscough has undertaken groundbreaking analysis of how bees' dance patterns produce a decision from the swarm. She also (in collaboration with Macquarie University) recently helped explain how the death of bees that are foraging for food outside the hive can cause the rapid collapse of bee colonies.

The interaction of biologists with mathematicians and computer scientists on collective behavior first started in the 1980s in Europe from work physicists were doing describing how particles interact. By substituting bees or ants for particles those models could describe bee hives or ant colonies.

"Some people are still surprised that a mathematician is working with bees but maths is constantly making contributions in areas people don't realise - such as vaccination policy, analysing the spread of Ebola or modelling wildlife conservation strategies," said Associate Professor Myerscough.

"I also apply maths to understanding heart disease, particularly how plaques start to form inside arteries and to explore cell to cell communication in cancer."

Provided by University of Sydney