New model (if interested to make this ‘bigger’)

Currently, it is argued to be good to be different from others, because this allows a colony to recognize non-nestmates and avoid being stolen from. But being different from others also makes stealing from them harder. This means that the whole thing is a bit of a double-edged sword.

There is also the issue of a “type I error” where a nestmate who comes back from a stealing trip might be rejected by own colony-members. Currently, this rejection is implemented by that member coming back without food later (how much later? not defined). Not clear why one gets rejected with food but not rejected when without food?

* “later” means in the next timestep already. The idea was not that it is rejected with food, but accepted without. Rather, the idea was that rejection leads to the loss of this worker’s “harvest”, but we did not want to kill him because he was not recognised as nestmate once.

All these reasons to me sound like one could usefully consider coevolution between two traits. One is the chemical profile itself. The other is the threshold at which one starts being suspicious of another ant’s profile. This would mean the following:

* if the threshold is low (= small differences are enough to elicit attack), one protects the own colony really well, but run the risk of rejecting own nestmates which is very counterproductive for colony life
* if the threshold is high (= only attack others when they are really different), the colony becomes susceptible to stealing attempts, but at least one does not reject own nestmates
* I also have thought about how the receiver side (i.e. reception of the signal) evolves. Maybe this is beyond a master thesis already, but would be really exciting for a follow-up. Not only the threshold should be able to evolve, but also somehow the ‘precision of perception’, e.g. the number of odorant receptors.

This coevolves with the chemical profiles with the already familiar rules: being very different from other colonies is good for own colony protection but bad for own stealing success.

* exactly. Except if the other colonies are so insensitive (receptor evolution) that they don’t notice that I’m different.

I would probably also recommend making the two types of mortality (colony starvation + other reasons) apply all the time, because ‘why not’; right now they are only implemented occasionally after lots of foraging has happened. Also, the “other” mortality component, which does not relate to foraging success in any way, should not be called strength of selection – it is rather the opposite (deaths that are unrelated to any trait value)

* not sure what you mean here by other reasons. At the moment ‘selection’ takes place every 100 ticks. But this is reproduction according to the amount of food you have collected – so this really is selection (in my opinion), right?

Inheritance of the profile: since this is about social insects, we presumably have a queen? rather than all workers contributing somehow a bit to the next colony’s trait values? This is just a detail but it should be easy to code it so that it matches the biology. (The queen is sexually produced though, so we might want to make them mate with a male produced by another colony?)

* true. Well, we have a colony-specific mean (i.e. a colony-specific cue profile), and from this the workers are generated (being drawn from a normal distribution with the averages being those from the colony-specific profile). We could just call the colony-specific mean the queen profile. At some point earlier, Marti already implemented mating and sexuality, so I guess it won’t be hard to include again.

If the above excites the team, this could become really cool…

indeed 😊