Artificial sociality

Simulating the social mind

Photo: Gert Jan Hofstede

Prof.dr G.J. Hofstede

Inaugural lecture upon taking up the position of Personal Professor of Artificial Sociality at Wageningen University & Research on 17 January 2019

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modelling the social mind

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Mr Rector, colleagues, students, ladies, gentlemen,

Welcome to my inaugural lecture, entitled 'Artificial Sociality: simulating the social mind'. An important issue for the decades to come. Let me give you a bit of context first.

Science today has been described as an 'ivory archipelago' (Wilson, 2007). This is the price we pay for advancement in each of these areas. The side effect is that when we need a big picture, science finds it difficult to help. In policy making, typically, it is a big picture of the policy area under study that is needed. That area could be a school, a city, a region, a supply chain, or a society. It includes social aspects, ecological, technical and economical ones. The aim of my professorship is to improve policy making in all kinds of areas. I do this by means of social simulation, using the technique of agent-based modelling. This allows me to bring the system's big picture to life in models.

The road map of this presentation is as follows.

- First, I will introduce the worldview behind my research.
  This is called 'self-organisation'.
- Then I'll talk about social simulation. Social simulation can answer questions of the type "In system X, if we do Y, what could happen?"
- I'll give two case studies from my PhD students.
- I'll present my plans and ambitions.
- Then I will zoom in to my own contribution, artificial sociality, and what I want to achieve with it.
- Finally, I will talk about people.

Self-organisation

Many systems organise themselves from the bottom up, without anyone being in control. The iconic case of self-organisation is the elephant path: elephants will create a path by following in one another's trail. On the slide we also see an aerial picture of our campus taken about ten years ago. Here there seem to be curvy elephant paths, but in fact they were designed. The picture on the right shows a spot in Wageningen where cyclists had their own idea about the road to take.

Once there is a path, it determines what happens next: path dependency. It means the system has a memory, even if the people in that system have none.

An agent-based model can show self-organisation happening. Figure 1 shows the Paths simulation model (Grider & Wilensky, 2015) created in the language NetLogo (Wilensky, 1999).

N.B. The model is freely downloadable from the URL at the bottom. If you are reading the paper copy of this lecture, and have no access to the slides, my suggestion is that you download NetLogo from https://ccl.northwestern.edu/netlogo/ and open the PATHS model from the model library, set walker-count to 1, press the settings button and set 'wrap world' off, and press go.

The interface is a green field consisting of a grid of patches. It represents a field of tall grass. In it you see a number of yellow triangles, representing 'agents'. In our case, the agents are called 'walkers'. On the right (or under the code tab) you see bit of programming code in NetLogo. Some of you might like to check it. You will see that the programming code for the walkers is simple: if there are buildings, walkers will circulate between them; else, they will walk randomly. The patches are also simple: if a walker has walked on them, they become more popular. Think of it as flattening the grass.

Let's run the simulation. As you can see, this single agent aimlessly walks around. It flattens the grass behind itself, but after a while, the trace gets lost. There is no self-organisation and hardly any memory in this system.

Now let us run this same model with 25 agents. Again, the code is just for those interested. This time, we do see a tiny bit of self-organisation. When by chance, the agents walk on the same patch often enough in a short time, that patch becomes grey and attracts more walkers; it becomes part of a path. Now we add some buildings by clicking on the interface. This has a dramatic effect. The agents create straight roads between the buildings (figure 1). If I remove the buildings, the walkers move randomly again, while the paths linger before fading away.

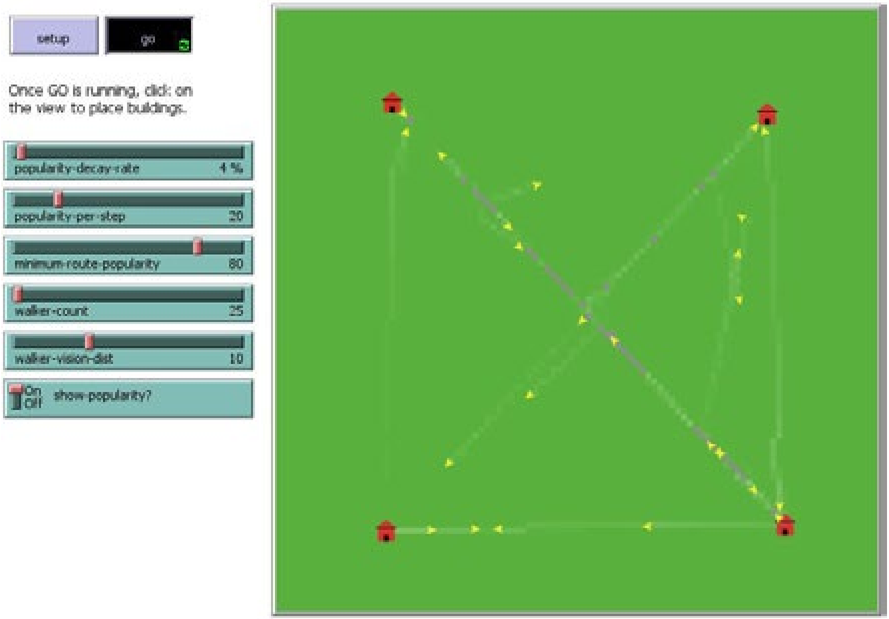

Figure 1: the NetLogo Paths model with 25 agents, showing emerging straight 'Roman roads'.

Actually, this run brings to mind the geography of Europe in places where the Romans have reigned. These conquerors created straight roads from one army camp to the next. Throughout the empire, Roman Roads have left their straight traces. Some of them are still used as roads.

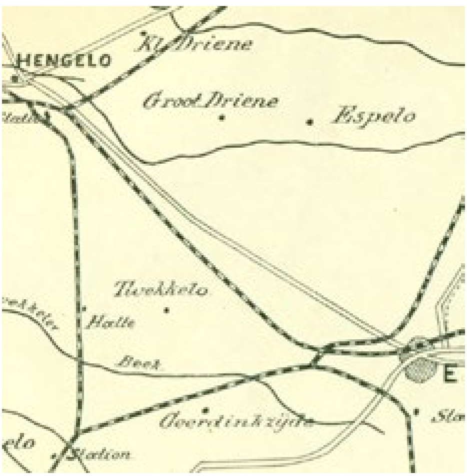

Figure 2: part of Twente in 1912, showing waterways, railroads and the new road Hengelo-Enschede

Figure 3: The same part of Twente as in figure 2 in 2018, showing both changes and continuity

Figure 2 shows a map of my area of birth in Twente in 1912. I was born near Groot Driene. The map shows three kinds of paths: waterways, railways that were the fastest mode of transport at the time, and a straight, brand-new road between Hengelo and Enschede. Figure 3 is a recent Google map of the same area. Most railroads have disappeared and the cities have grown. The old roads are still there, some railroads are now car roads, the cities have not merged, and also the abandoned railroad has stopped the Twentekanaal. In the course of a century, millions of little and big decisions by thousands of people have led to a landscape with great historical continuity.

Let us run the PATHS simulation once more, this time with 250 agents. This time, a pattern of curved elephant paths forms. If we place buildings, the paths do not become straight, because the agents keep using existing paths (figure 4). It looks pretty realistic. So, across these three runs of the same model, we saw that the more of these simple, memory-less agents we added, the more memory the system acquired. This is the essence of self-organisation. We also saw tipping points in self-organised pattern between a state of 'no paths' to a state of 'straight paths' to a state of 'curved paths', just because we changed the number of walkers.

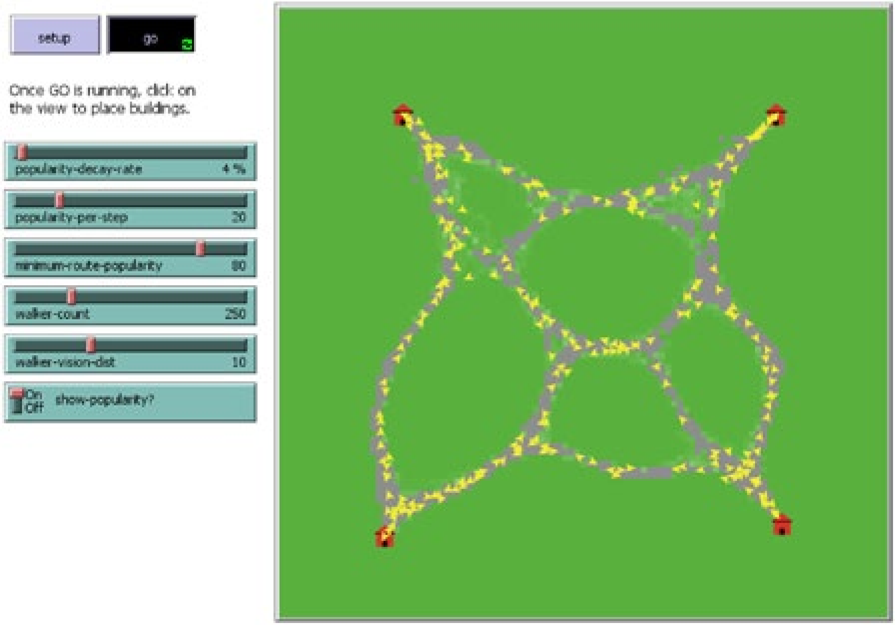

Figure 4: the NetLogo Paths model with 250 agents, showing emerging 'elephant paths'.

We can conclude that fairly simple social tendencies like 'walk where someone has walked' can explain a lot of the patterns we see around us, in a stylized way. I gave you a spatial example so that you can see it, but – and here it comes - the same applies to language, to habits, to norms, to science, to culture. We have many invisible elephant paths in our organisations and our societies. This implies that we cannot study those self-organised patterns by looking at isolated individuals. We have to look at systems in action. The good news is that even a simple agent-based model, like the Paths model, can still generate plausible patterns, and be useful for understanding their causation.

In reality, we people do try to organise things from the top. We have bosses and governments. We plan ahead. We design and build transport systems and roads. We set incentives, rules, and laws. But self-organisation always kicks in (Wilson, 2007). You can see examples everywhere in the unofficial footpaths and bicycle paths in our public space. And by the way, the process of decision making itself is also self-organised in many ways. It depends on culture, among others (G. J. Hofstede, 2015). For instance, when faced with elephant paths, in some countries the authorities would have placed a fence, in most others they would have done nothing; instead of this, the municipality of Kista has tried to accommodate the corner-cutting walkers by creating an official shortcut path.

Let me now take a giant step back from these examples. Self-organisation is not limited to paths or to policy making or to human societies. It is the basis of all life.

The principle that drives life's self-organisation is homeostasis (Damasio, 2018). If we get hungry, we look for food, if we get lonely, we look for friends. We make up for decay and death by reproducing. All living creatures are subject to this 'homeostatic imperative'. This started on our planet with monocellular organisms. These formed societies, better able to maintain homeostasis than individual cells. Later, multicellular organisms were formed, such as ourselves. We have now organised ourselves into vastly complex systems, the ones that we try to create policy for. They are also subject to the homeostatic imperative. For instance, if we feel that our society is under threat, we look for a strong leader. I call them socio-something, because whatever else they consist of, there is also a human component. Bruno Latour, I his recent book 'Facing Gaia' (Latour, 2017), goes further: he calls 'Gaia' the system consisting of the natural earth, technology, and humans. Gaia is one system, he says, and should be studied and managed as such.

By the way, I read that book as 'Oog in oog met Gaia', in the translation created by my brother Rokus. He did that in the very room from which I took this picture at dawn, in Ronse, Vlaanderen (figure 5).

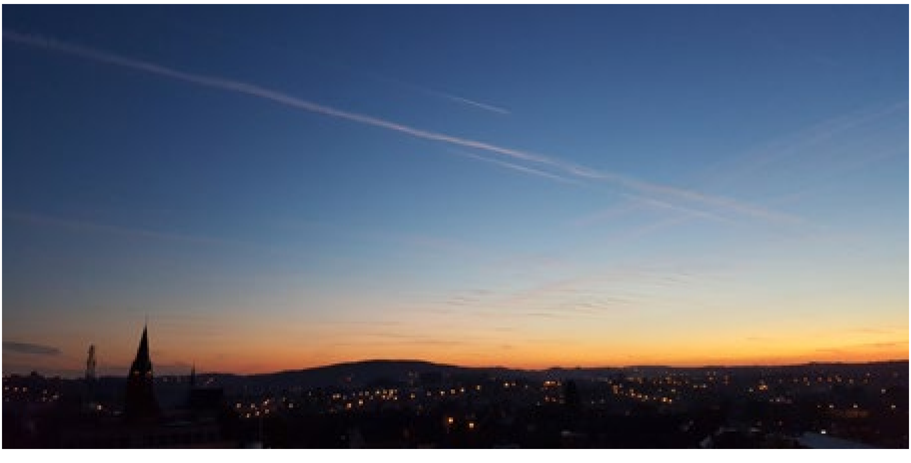

Figure 5: Ronse at dawn: oog in oog met Gaia

So, to summarise: my reason for working with agent-based models is that every policy-relevant system is at least partly the result of self-organisation. If we want to study it, we need to understand three things: the parts, the system, and how the parts work together to create the system patterns. In the Paths model, the parts were the simple walkers with their goal of going to the next building, the system was the grassland with its paths and walkers, and the mechanisms were 1) grass flattens when walked on, 2) walkers prefer flattened grass to new grass if it brings them closer to their destination, even if it is not the shortest way. We have seen that even such a simple agent-based model can be useful, not for predicting the future, but for understanding the present and its history. We ran the model three times. But we could have run it three million times, different versions of it, with all kinds of different parameters, to investigate the dynamics of elephant paths.

Social simulation

We now turn to social simulation using these self-organising agent-based models (figure 6). The slide summarises social simulation. Seen from a hot air balloon, the world is simplified, but you see the dynamics and patterns clearly. Cows and cars move around, cities sit in the distance.

Figure 6: Social simulation as the view from a hot air balloon

Policy makers have tended, and still do, to create rules and laws for achieving their policy aims. For instance: maximum speed, parking permission. The problem with rules is that any new rule will have unintended consequences. This is because people adapt their behaviours to work around it. For instance, car drivers tell one another where the speed cameras are, and slow down only at those places; cars park in the first street outside the city centre where parking is still free. As a result, the system patterns might change in ways that nobody had anticipated. Let me give a few non-traffic examples.

- Since globalization, the largest companies in the world end up paying the least taxes, because they move their money to the cheapest places.

- Animal species go extinct due to loss of habitat. At the same time, new subspecies of animals, from blackbirds to mosquitoes, form in cities because some animals rapidly co-evolve with their city habitats (Schilthuizen, 2018).
- When school canteens are forced to only sell healthy foods, children go buy their fast food elsewhere.
- Social media favour excitement over reason, leading to new dynamics in politics.
- Brexit (De Gruyter, 2018).
- Climate change.

Almost nobody intended these things, but they still happen. I am sure that you could think of a thousand other examples. As a consequence, rules are not enough. If you are a policy maker, you need to know the system, before you can make a policy. A model that 'grows' the system can help consider alternative policy options and their indirect effects in the longer term. This idea first became popular in the nineteen-nineties (Rosaria Conte & Castelfranchi, 1995; Epstein & Axtell, 1996), but then the World Wide Web came along, and most people forgot about it. The issue did not go away though, and there is now a second wave of social simulation underway (Squazzoni, Jager, & Edmonds, 2013). This brings to mind the 'theory of small steps' of policy professor Katrien Termeer (Termeer, 2018), which consists of trying out new things 'that often clash with existing rules and business models' and seeing whether 'a change takes hold and spreads'. Katrien is effectively finding out whether a new elephant path forms.

It is now time to talk about methodology. Figure 7 is an abstract picture of the kind that we information system people often use. This one shows my summary of the method of social simulation.

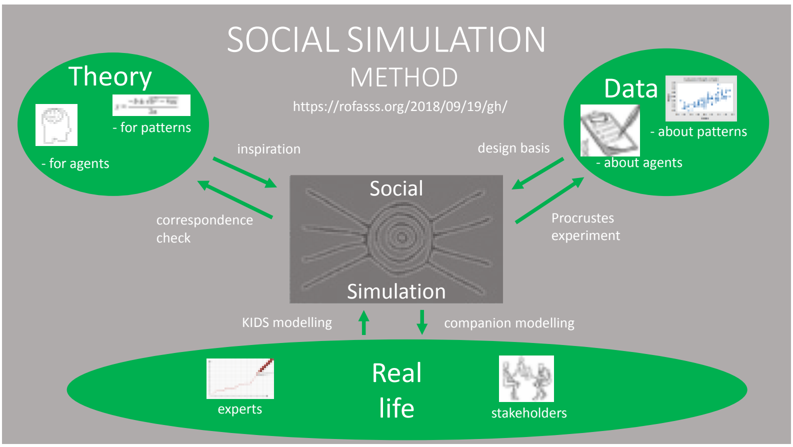

Figure 7: Social Simulation as a meeting place (Gert JanHofstede, 2018).

In the middle are the agent-based models that we are busy creating. They are a meeting place between three sources of inspiration: theory, data, and real life. Some models mainly use one of the three, others use two or all three. It would be boring for most of you if I explained the figure in detail at this point, but you can go to the 'Review of Artificial Societies and social Simulation' online and read it, if you like. The point I want to make here is that just like any other scientist, we researchers that use social simulation need to work carefully and justify our method. Since we go for the big picture across disciplines, our methodology is complicated. I intend to make contributions to it in the coming years...

…but not now. Instead, I'll take you to the case studies that my PhD students are working on (figure 8). I have PhD students in all five knowledge areas of the university. Without them I would be nothing but a paper tiger. In most of these, I am only one of the supervisors. I know about agent-based models, and I collaborate with someone who knows more about that particular case or its theory base.

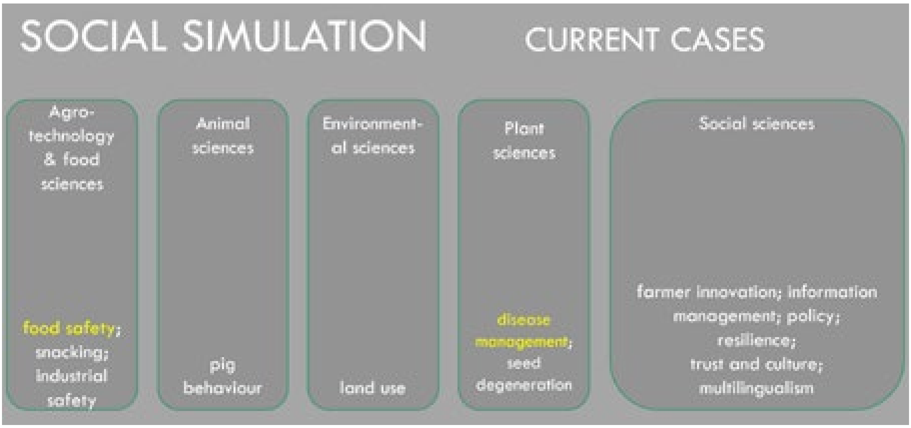

Figure 8: Wageningen University's five knowledge areas, showing my current PhD projects. The ones in yellow to be discussed below.

I would like to tell you about all of them. There is no time for that, so I picked two. The first is about food safety. It is about a socio-technical system studied by Shingai Nyarugwe, who is based in the Food Quality and Design group of our University. On the slide, you see her on the far left, together with other PhD students, when we were visiting the premises. It is a dairy factory in rural Zimbabwe. Delicious milk is processed in the factory and sold at local retail shops as first-quality yoghurt, ice cream, cheese and other products. Only, Staphylococcus aureus bacteria can infect the milk, and that can be dangerous to health. Many of us have Staphylococcus on our hands, but we do not want them in milk products.

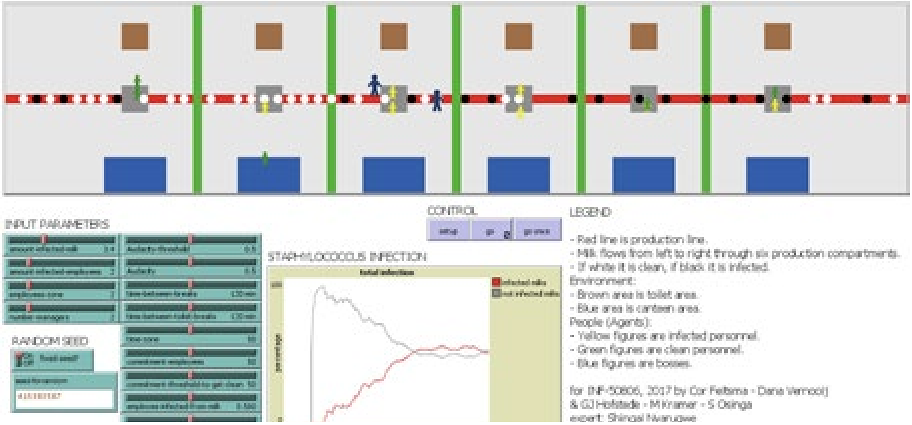

Figure 9: Schematic view of Victoria milk factory showing the production line and emerging degree of Staphylococcus infection of 50%

We created an agent-based model of the production process (figure 9). Two students of our agent-based modelling course (INF-50806) wrote it in a period of three weeks based on Shingai's expertise. At the top of the screen you see the factory floor. The red line is the transport line. You see green workers there, blue supervisors, and grey workstations. Bottom left is an intimidating collection of sliders that allow us to manipulate the parameters of the model. There are both technical and social parameters. Bottom centre we see the output of the model: the percentage of products infected with Staphylococcus bacteria. Let's run the model for one working day. At first, white milk enters; this is free from Staphylococcus. Then we see infected milk arriving, shown in black. If workers touch it, their hands become infected, and they are shown in yellow. If they go to the brown toilet or to the blue café area, they can wash their hands and turn green again, or fail to wash them and remain yellow. Infected workers can also infect clean milk. At the end of the working day, this leads to a certain percentage of Staphylococcus infection. Here it's about 50%, which was the actual average in Shingai's data. The model becomes useful when you run it many times, varying all these sliders. This allows you to study the sensitivity of the model's output to its parameters. Such a study could help the company establish a policy for reducing infection rates. In this case, Shingai had other research priorities. She is now back in Zimbabwe, and hopes to finish this year.

The second case is about disease management in potatoes. It is about another 'bad guy': late blight, Phytophtora infestans, the disease that caused the Irish famine in 1845. Francine Pacilly defended her PhD dissertation in September 2018 (Pacilly, 2018).

Francine simulated both the disease and the farmers. The point of this is that policy makers cannot just say ‘spray!’. Half of all the pesticides used in our country are against Phytophtora alone, which is both costly and ecologically undesirable. On top of that, farmers depend upon one another for containing the spread of the disease. Phytophtora is an oomycete, a kind of fungus that can create a new generation every three days, and spreads its spores on moist and windy days. This means that fields of neighbouring famers can infect one another.

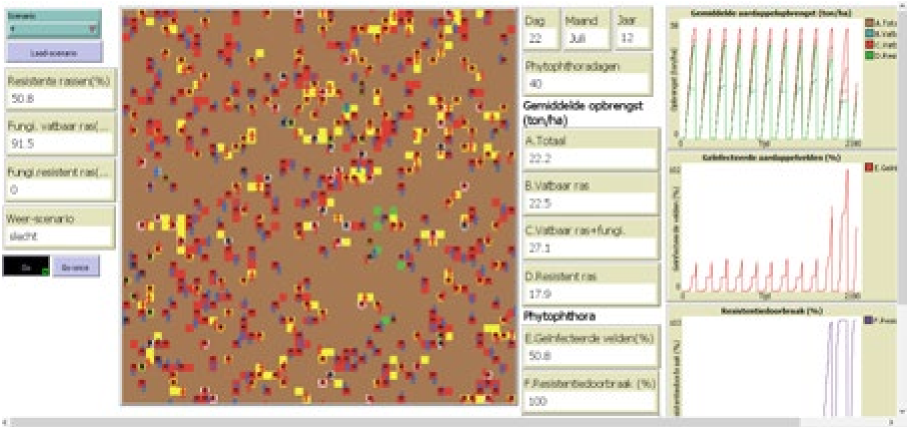

Figure 10: Potato late blight resistance management model (Pacilly 2018).

Figure 10 shows a version of Francine’s model. In the picture, the model has run for 12 years. We see fields of various colours. Brown means no potatoes. Yellow means conventional potatoes, susceptible to infection by Phytophtora. Green means varieties that have a resistant gene. Red means fields that have been infected. We are looking at the end of the twelfth year. From the tenth year, infection rate has soared. This is because the disease has mutated to a strain that broke the resistance, and this rapidly killed off almost all the resistant fields, because they had not been sprayed. Francine used this model interactively with groups of farmers, and the farmers said they learned a lot about how they depend on one another for containing the disease.

I have simplified the story for the sake of time. We can still make a few points. First, this model shows that an agent-based model can merge input from very different theories – in this case, disease dynamics and farmer behaviour. Second, running a model with stakeholders can help them understand their own practice in its context.

Let me now take a step towards ‘Artificial Sociality’. In Francine’s model there are virtual farmers. What makes them decide, in each year, which crop to plant?

The walkers of our Paths model were not based on any grand theory, just on common sense. In fact their design is based on the principle KIDS: ‘Keep It Descriptive, Stupid!’ (Edmonds & Moss, 2005). When agents need to make more complicated decisions, their design could be based on theory. Most of the theory that has been used for agents focuses on economic utility or on cognition (Balke & Gilbert, 2014; R. Conte et al., 2012; Flache et al., 2017). There is far less theory that deals with emotions or relations. Which theory to choose and why? This is the situation facing a beginning modeller. Francine chose the Consumat framework (Wander Jager & Janssen, 2003; W. Jager, Janssen, & Vlek, 1999). It is simpler, less cognitive and more relational, than most.

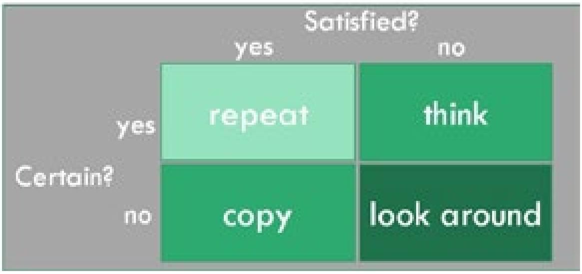

Figure 11: Consumat framework (Jager & Janssen 2003).

Here is the Consumat framework (figure 11). Wander Jager created it during his PhD work. Its essence is a two-by-two matrix. Agents are doing some action and periodically decide whether to change or not. In the top left, as long as they are happy with how things go, and certain about their situation, they keep doing what they did - for instance, grow conventional potato varieties. Bottom left, if they are satisfied but uncertain, they will copy someone else who is also doing well. On the right-hand side, they are unsatisfied. This will make them invest more of their energy in the choice. If they are certain, they will use their own brain. If they are uncertain, they will look around, trying to determine whom to copy.

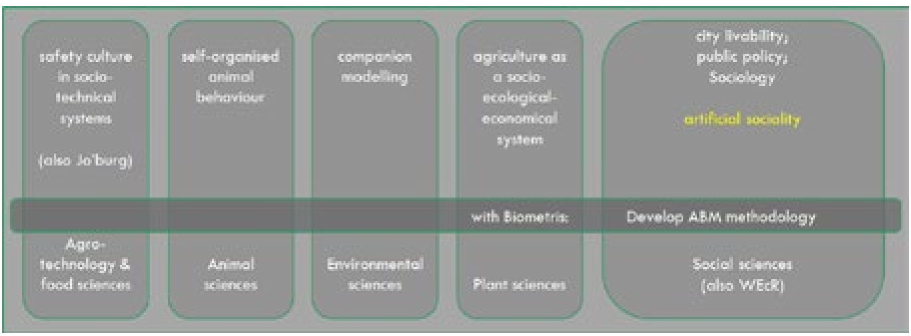

Figure 12: my research plans

This brings us to my plans with social simulation in the coming years (figure 12). I am involved in lots of case studies in various domains, and aim to expand this further, to test design ideas, to achieve critical mass and continuity. You see the five knowledge units with research themes. For all of them, I am busy making friends, writing project proposals, or thinking about them. I expect broad uptake of agent-based modelling at this university, and to be needing more staff before long. Social simulation is not easy though. Cases could come from any and all fields. A stream of methodological research is needed to create coherence. For this I am collaborating with Biometris. I concentrate on the agents' minds, on mechanisms and on patterns, while they concentrate on model analysis. Third, I am involved in education at BSc, MSc and PhD level, to build capacity among young people for doing this kind of research.

Artificial sociality

Let us now zoom in to the heart of my professorship. Artificial Sociality is the social sister of Artificial Intelligence.

The statue on the front cover of the booklet stands in Doesburg, on the river IJssel. Suppose you were one of these three men. Which of them would you be, and why?

When researchers model humans, they tend to concentrate on artificial intelligence. There is a lot of work on logic and on instrumental reasoning. It is my conviction that research has neglected the two other levels (Dignum, Hofstede, & Prada, 2014). First, the relational. Nothing is as important to a human as other humans. Second, the collective. As we have seen in the paths model, patterns in society tend to be the unintended result from self-organisation of collectives (G. J. Hofstede, 2015).

Let us first consider the relational level. Real people do many of the things they do based on feelings, not on reflection (Damasio, 2018). If there is reflection, it is relational: how can I avoid being the little guy, and be the big one instead. Relations and emotions are what a theatre actor really needs to get right, to be credible. My favourite theory for modelling is the 'status-power theory of relations' by Theodore D. Kemper (Kemper, 2011). It is a sparse theory, compatible with self-organisation. Kemper postulates that all of us want to be significant. To do this we trade in social niceties that he summarises in the word 'status'. For instance, you are at this moment giving me status by attending to what I say, and I am giving you status by doing my best to give you a good speech. As long as I am a good speaker and you are a good audience, we'll keep playing this status game. We 'make status', just like people can make love.

On the flip side of Kemper's model is power. If others are disrespectful or unpleasant, we become displeased. In Kemper's language: we are motivated to use power, to obtain from those others the status that they owe us, but fail to give to us. For instance, if I start speaking nonsense, you may get bored and check your mobiles, shake your heads, or even start to 'boo' me.

Kemper sees us as intrinsically group creatures. Status is often claimed, or accorded, for group membership. A black robe means you can claim status among academics. A Dutch passport means you can enter this country.

Now for the collective level. It will not surprise you that my pet theory here is Hofstede's dimensions of culture (G. Hofstede, Hofstede, & Minkov, 2010). This is one of the best and most widely validated studies of last century, still standing strong, with new additions. Many of you know it, so no need to summarise. Its findings are not entirely new. Herodotus, the Greek historian in 5th century BC, wrote about how everyone prefers the customs of their own people over all others. Blaise Pascal, in the 17th century, remarked that the truth changes when one crosses the Pyrenees. My point here is that these different cultures were not ordained by priests or emperors. They self-organised. Culture, essentially, is about the unwritten small print of the status-power game in a group or society. It is a quintessential case of self-organisation.

I gave you these details of Kemper's and Hofstede's theory to show that theories could be used for creating the minds of agents. For instance, let's imagine a socially aware walker in the Paths model. If it sees someone of its own group or social status use a path, it will copy; but if it sees someone of higher status, or of a different group, it may stay away from that path.

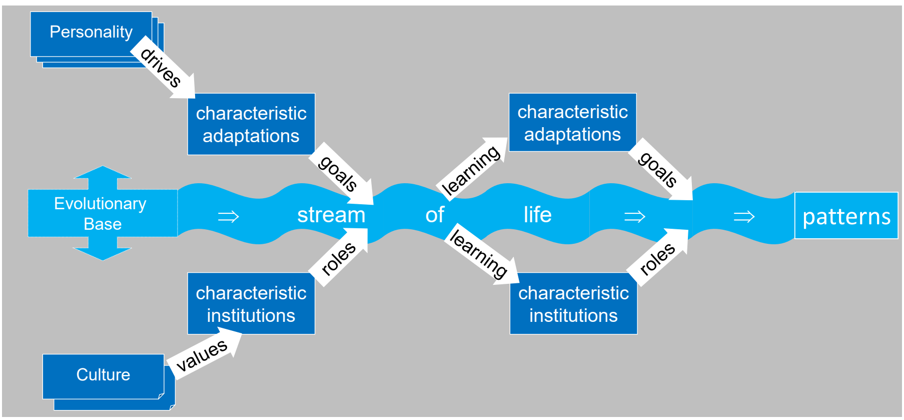

Figure 13: homeostasis at individual and cultural group level (adapted from (G. Hofstede et al., 2010).

Here is another conceptual picture (figure 13). I created it for the 2010 edition of 'Cultures & Organisations: software of the mind'. Now, I shall use it to sketch how a deeply social agent-based model could look. We see time running from left to right. On the left the box 'evolutionary base' depicts the capacities of the agents in the model. When we run the model, these agents will enter the 'stream of life'.

We now consider the individual agents. Each of them may be unique. It enters the stream of life with its drives and goals, learns from experience, adapts, and so on.

The elegance of this picture is that the same applies at group level. A cultural group of agents shares values, institutions, and available roles. These provide opportunities for the agents that enter the stream of life. The institutions can also learn and adapt.

Well, this was all very grand, but our current social agent-based models fall short of this ideal picture. This is where I see a role for my professorship. I want to achieve progress in creating models of artificial sociality. Let me discuss some work in progress with you. As a guideline for creators of models, I developed the meta-model GRASP. It gives five elements of our evolutionary base that should be considered when designing social agents in policy-relevant models.

- Groups: the agents in the system are probably from more than one group. Significance may be attached to group membership. The tensions between groups, or a possible splitting or joining of groups, are often at the heart of socio-something systems.
- Rituals: actions have not only practical, but also ritual meaning. They can signify status worthiness, status claims, or group membership. Grander rituals signify changes in status or in group boundaries; the ritual in which we are now joined is a case in point. Yes, I am giving you a lecture; but the ritual meaning is that I will now be elevated to the status of professor for all to acknowledge, and should show myself worthy of this.
- Affiliation: agents are motivated to interact with one another. There is always significance to give and to receive.
- Status / Significance: 'status' is Kemper's word. I sometimes use 'significance' to make the point that this is not just about pecking order. Agents search significance, or social status, and are motivated to confer it on others that they deem status-worthy. Usual terms for this are respect, politeness, being nice, behaving… If I believe that someone is infinitely status-worthy, that means I admire and love that person.

- Power: if an agent or group feels thwarted, in the sense that it does not receive the accord of status that it thinks it is worth, then that agent or group is motivated to obtain this status by fighting or other forms of force: obstruction, cold shoulder, snubbing, warfare.

Those of you who know about cultural differences will not find it too hard to see how culture can modify the dynamics of a GRASP agent. For instance, I once had a student from Cameroon, Cécile Ngo visit my office. After the meeting she started out to the left, and I indicated that the fast stairway out was to the right. She replied, saying ‘I thought that was not allowed’. I asked her why, and she said ‘I saw a staff member use it’.

At the time that was a big eye opener for me. Now I understand that Cécile, being from a collectivistic, hierarchical culture, would be used to class differences codified in rituals that specify where people are supposed to walk. Think back of the paths model. If a virtual Cécile had been a student agent in the model, she would have avoided paths used by staff agents.

This introduction prepares us for a last series of agent-based model runs (figure 14). Here is GRASP world, a miniature sandbox for GRASP agents (Gert Jan Hofstede, 2017; Gert Jan Hofstede & Liu, 2018).

We see forty agents, randomly placed in an undifferentiated world. In time step 0 they are alone. In this run, they come in two shades called ‘norm memes’, shown as black and white. This has nothing to do with skin colour, by the way. I went to check in Johannesburg recently, and did not find a single black or white person, only fifty shades of brown, from espresso to ‘koffie verkeerd’. In GRASP world, agent shade indicates anything that could lead to misunderstandings across norm memes. A misunderstanding is when an agent tries to be nice – confer appropriate status – but the other takes it as an affront – too little status).

When I run the model, the agents form groups with nearby others, and exchange niceties. If an agent receives less status than it thinks it deserves, it is motivated to fight or leave. Whether it does so, depends on culture. Here, we focus on individualism only. Agents from individualistic cultures leave a group at the slightest incident to find or to found another, whereas agents from collectivistic cultures tend to stay and endure, because leaving is ‘not done’.

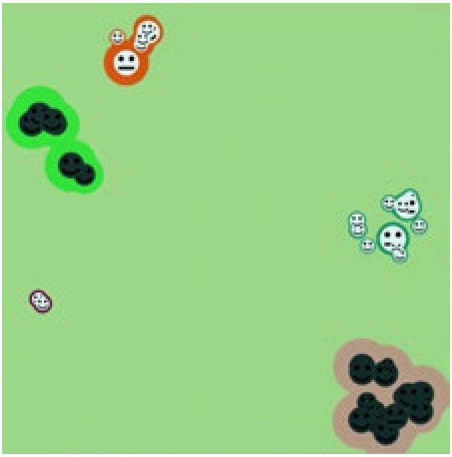

Figure 14: GRASP world with IDV=70, Xenophobia = .15, after 300 ticks

Let's run it. You see that each group develops an aura that grows as the group persists. In this run, groups have trouble staying together. This is caused by misunderstandings between the black and white agents caused by xenophobia. Also, we see that single-shade groups find it easier to stay united. We also see that some agents have become bigger than others. These are the ones that won fights. Winning a fight gives social status, and this makes an agent more likely to win following fights. All in all, this run self-organises into a pattern with stable elite groups that self-segregate, and wandering lower-status agents.

Now we take the same world with exactly the same forty agents, but with xenophobia set to zero. All agents will now get on equally well, regardless of shade. What do you expect will happen? Let's find out (figure 15). This time, groups are much longer lived and there is no tendency for single-norm-meme groups to form. Note that agents find random new friends after leaving a group. They do not select their friends. In fact, between the first run and this one, the system has crossed a tipping point.

Figure 15: GRASP world with IDV=70, Xenophobia = 0, after 300 ticks

Chutao has run this model hundreds of thousands of times. Here are a few sample runs, at the end of 300 time steps (figure 16). Top left we see a run at maximum individualism and with xenophobia. The result is that no group last for long. Norm meme segregation develops. Norm meme-based class differences also develop. If this brings to mind certain contemporary societies, then that indicates that there may be a point to our simple GRASP world.

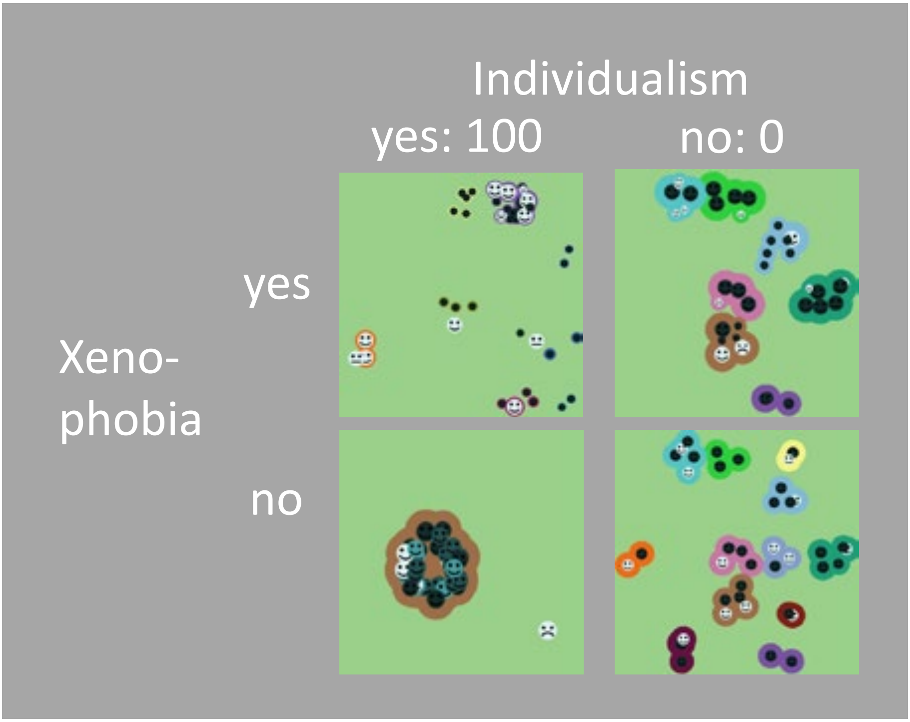

Figure 16: GRASP world varying IDV and Xenophobia after 300 ticks

Bottom left shows a run with no xenophobia. This leads to one happy group – well, not quite. This situation just about summarises Wageningen.

On the right-hand side we see what happens when individualism is zero. Here, the random groups that form in tick 1 have a tendency to remain unchanged. If there is xenophobia, some groups dissolve and there is some self-organised segregation. There are more unhappy faces. But overall it shows that a collectivistic society tends to have stable groups, regardless of xenophobia.

These results are interesting. But so far, these agents are like apes in a zoo. They have nothing else to do than interact. What if we gave them something to do? In this version, developed for Stockholm Resilience Centre, we gave them a common-pool resource, water, to share. They are still the exact same agents of our first run, but in each time step, each agent extracts some water for its crops. This produces better crops that lead to more social status. Only, if an agent extracts above the norm, it is ostracized by the others, and that leads to loss of social status. Let's see what happens (figure 17).

Figure 17: GRASP world as in figure 14 but with common pool added, after 300 ticks

Without the water, this run led to the 'stable elite, wandering others' pattern. As we see, the shared resource leads to a simpler pattern. It is almost like a guild system. The ostracism leads to an equalizing of social status. Through self-organisation, a different situation, with exactly the same forty agents, leads to a very different social pattern (about persons versus situation, see Ross & Nisbett, 2011).

So, what's next? It is my ambition to come up with generic modules of social behaviour that can be re-used in many models of socio-something systems. I will need young people to join the fun. The scientific aim of all of this is to support policy making, and perhaps even social science, by developing models that include increasingly sophisticated GRASP of the how the social world self-organises. This can feed back into all these cases of social simulation that I am involved in.

People

It is now my pleasure to introduce you to a few of the people with whom I have been on academic adventures. The presentation with pictures is available from the author.

The first picture is from Sintra in Portugal, and these are my colleagues from the SEMIRA project: Simulating Emergent Impact of Regulations Across Cultures. It was my first Artificial Sociality project.

Going forward in time, we get to my NIAS/Lorentz fellowship in 2013-2014. Here you see the attendants to the final Lorentz workshop in Leiden, including my fellow fellows Rui Prada and Frank Dignum, my partners in ABM crime of Wageningen university Mark Kramer and Sjoukje Osinga, as well as the two professors whose work I use in GRASP world: Theodore Kemper and Geert Hofstede.

The next year, 2015, marks the end of the strategic programme 'Complex Adaptive Systems' of this University. These are my research friends from Wageningen. Many of them are now affiliated with the virtual Silico Centre, 'Simulating Life Science's complexity'.

Silico organises summer schools on agent-based models; here is the 2015 edition, with some very young students, and friends from Biometris and from GIS.

…and the last picture is the 'tableau de la troupe' of the 2017 edition. You find some of the brightest minds from the European Social Simulation Association on that picture, even though Bruce Edmonds almost succeeds in hiding himself behind George. We plan on another such summer school in 2020.

Ladies and gentlemen. All that stands between you and your drinks now, is for me to say words of gratitude. If I took the time to thank all those from whom I have learned, with whom I have fought and laughed, walked and talked, played and danced, written and drunk, then this would become a very long speech. I have not forgotten. I hope to speak to some of you in person today, and look forward to more fun with my old and new friends in the years to come.

There are a few among you who I really should mention. First, my parents Geert and Maaike, who put up with me since 1956, and made me a world citizen. Thank you. Then, my colleagues of the INF group, some of whom I have known since 1985. Thank you. Then, my students, and PhD candidates. It has been a continuous source of wonder and joy to work with so many bright, lively young people. Let's keep up the good work! Allow me to also mention the singers of WSKOV that treat our ears to some beautiful and appropriate songs today. I have been a member of the club in the eighties. This year, they celebrate their 100th year of existence.

Then, my wonderful daughters, Liesbeth, Bregje, Katy and Tove, of whom I am so proud. Finally, my fiercest critic and warmest companion since 1977, with whom I hope to spend the rest of my life, Josephie. I dedicate my professorship to my grandchildren, to whom it is my duty to try and leave Gaia in good state.

This brings me to today's moral. Cristiano Castelfranchi, philosopher of artificial sociality, summarised the results of self-organisation as follows: "we do not intend the consequences of our actions". I say we must urgently learn to. We must simulate the possible collective consequences of our actions, so that we can find viable elephant paths for Gaia. This is an essential element of our university's mission. Artificial sociality, used in policy-relevant agent-based models, can crucially contribute.

Ladies and gentlemen, thank you for your attention.

Ik heb gezegd.

References

Balke, T., & Gilbert, N. (2014). How Do Agents Make Decisions? A Survey. *Journal of Artificial Societies and Social Simulation*, **17**(4:13). doi:10.18564/jasss.2687

Conte, R., & Castelfranchi, C. (1995). *Cognitive and Social Action.* London: UCL Press.

Conte, R., Gilbert, N., Bonelli, G., Cioffi-Revilla, C., Deffuant, G., Kertesz, J., . . . Helbing, D. (2012). Manifesto of computational social science. *The European Physical Journal Special Topics*, **214**(1), 325-346. doi:10.1140/epjst/e2012-01697-8

Damasio, A. R. (2018). *The Strange Order of things: Life, Feeeling, and the Making of Cultures*: Pantheon.

Dignum, F., Hofstede, G. J., & Prada, R. (2014). *From autistic to social agents*. Paper presented at the AAMAS 2014, Paris.

Edmonds, B., & Moss, S. (2005). *From KISS to KIDS – An 'Anti-simplistic' Modelling Approach*, Berlin, Heidelberg.

Epstein, J. M., & Axtell, R. (1996). *Growing artificial societies: social science from the bottom up*. Washington D.C.: The Brookings Institution.

Flache, A., Michael Mäs, Feliciani, T., Chattoe-Brown, E., Deffuant, G., Huet, S., & Lorenz, J. (2017). Models of Social Influence: Towards the Next Frontiers. *Journal of Artificial Societies and Social Simulation*, **20**(4:2).

Grider, R., & Wilensky, U. (2015). NetLogo Paths model: Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL. Retrieved from http://ccl.northwestern.edu/netlogo/models/Paths

Gruyter, Caroline de (2018) Waarom Brexit tot meer cohesie leidt. NRC-Handelsblad 27-12-2018 In het nieuws, pp 10-11

Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and Organizations, software of the mind*: McGraw-Hill.

Hofstede, G. J. (2015). Culture's causes: the next challenge. *Cross Cultural Management-an International Journal*, **22**(4), 545-569. doi:10.1108/ccm-03-2015-0040

Hofstede, G. J. (2017). GRASP agents: social first, intelligent later. *Ai & Society*, 1-9. doi:https://doi.org/10.1007/s00146-017-0783-7

Hofstede, G. J. (2018). Social Simulation as a meeting place: report of SSC 2018 Stockholm. *Review of Artificial Societies and social Simulation, 2018*(thread 8).

Hofstede, G. J., & Liu, C. (2018). *Trust, culture and groups in GRASP world: a foundational agent-based model*. Paper presented at the Social Simulation Conference, Stockholm.

Jager, W., & Janssen, M. (2003). *The Need for and Development of Behaviourally Realistic Agents*. Paper presented at the Multi-Agent Based Simulation (MABS).

JAGER, W., Janssen, M. A., & Vlek, C. A. J. (1999). Consumats in a commons dilemma: Testing the behavioural rules of simulated consumers [Press release]. Retrieved from http://www.ppsw.rug.nl/cov/staff/jager/simpaper.pdf

Kemper, T. D. (2011). *Status, Power and Ritual Interaction: a Relational Reading of Durkheim, Goffman and Collins*: Ashgate.

Latour, B. (2017). *Facing Gaia: Eight Lectures on the New Climatic Regime*. Cambridge, UK: Polity Press.

Pacilly, F. C. A. (2018). *Social-ecological modelling of potato late blight: managing crop resistance in disease control*. Wageningen: Wageningen university.

Ross, L., & Nisbett, R. E. (2011). *The Person and the Situation*: Pinter and Martin.
Schilthuizen, M. (2018). *Darwin comes to town*: Picador.

Squazzoni, F., Jager, W., & Edmonds, B. (2013). Social Simulation in the Social Sciences: A Brief Overview. *Social Science Computer Review,* **31**, 1-16.

Termeer, K. (2018, 8 november 2018) *'There are no simple solutions'/Interviewer: T. Louwerens*. Resource (Vol 13:6), Wageningen University, Wageningen.

Wilensky, U. (1999). NetLogo: Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL. Retrieved from http://ccl. northwestern.edu/netlogo/.

Wilson, D. S. (2007). *Evolution for Everyone*. New York: Bantam Dell.

Prof.dr G.J. Hofstede

'We have been obsessed with artificial intelligence, while forgetting artificial sociality.
Nobody wants epidemics, climate change, obesity or war. Yet they happen. In fact, most systems in society self-organise. Human sociality includes both universal drives and cultural variations. It drives self-organisation in ways that are still ill-understood.
Social simulation with agent-based models allows us to explore viable 'elephant paths' for systems. Artificial sociality, used in agent-based models, can crucially contribute to effective policy making.'

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