"LOST IN TRANSLATION: BEES DREAM, OR DO THEY?"
GIOVANNI GALIZIA

Giovanni Galizia is a neuroscientist working with honeybee brains at the University of Konstanz in southern Germany and the Director of the Zukunftskolleg, an Institute of Advanced Studies for early career researchers. Born in Rome, Italy, he studied Biology at the Freie Universität in Berlin. After his Ph.D. in Zoology at the University of Cambridge, UK, he worked at the Max Planck Institute for Developmental Biology in Tübingen and at the Freie Universität in Berlin and was Associate Professor for Entomology and Entomologist at the Department of Entomology, University of California, Riverside (USA, 2003–2005). He moved to Constance in 2005. Research interests: neurobiology, olfactory system in insects, learning and memory. – Address: Zukunftskolleg, Universität Konstanz, Postfach 623, 78457 Konstanz. E-mail: giovanni.galizia@uni-konstanz.de.

Almost a full year, with about 40 strangers of all nations, strangers in the sense that I did not know them, strangers in the sense that I do not understand their research, their questions – and strangers in a temporary sense, because after a year, they are now all friends, their research close to me, their questions fascinating. After a year, I can relate to August of Saxony, to gods in Mesopotamia, and to multicultural entrapment. I understand the sorrow of physics and the role of mitochondria in female fertility. It felt, it still feels like a dream.

Bees dream, too, or do they? As a neuroscientist, I used the year to study brain activity in bees while they sleep. How can we interpret the brain waves of an insect, in particular during sleep? Do they dream about flying about in the landscape? What do we know about spatial maps in bee brains? And how can a discussion over lunch or at dinner get me closer to a solution? I'll report about these activities here.

Then, just past halfway through the year, came the first wave of Corona. Yes, this year was special – hopefully not as a first, but as an only one. The lockdown! What did it do? Did it kill the spirit of the Wissenschaftskolleg? Well, it did not. How the wonderful people at the Wissenschaftskolleg managed to organize an efficient lockdown of the institute, without locking down the spirit, the exchange, and the intellectual thriving, was amazing to witness. Do not desist, join the impossible, create the unthinkable, a big "*thank you!*" for this! The Fellows, in the meantime, did their own part: the intellectual exchange grew to a new level, since suddenly we all had a common worry to think about: how to cope? What does this mean? And what are the consequences? Each one of us moved in different directions, and still it was a common topic: how to balance freedom against safety? Should we develop an "avalanche" strategy of voluntary infection, or rather a "safe", but costly rundown of society? Do we face the danger of an oppressive regime, hidden behind Corona-protection policies? What do we learn from previous epidemics? And what is the sociological effect of a common threat with a disease that we cannot (yet) control? (Last, but certainly not least, how do we organize a Catholic baptism in a group of many religions and none, and in a Corona-safe manner?). An interesting effect: we all got distracted, and at the same time more focused – both because we shared more questions than we did before and because Berlin in lockdown mode had – alas – no theater, no opera, no music to share with us.

So, I digressed from studying the dreams of the bees, thought of the long-term implication of the Corona pandemic, and came up with my own political proposal, which I presented to the group, the discussion of which I will present here:

A quick calculation revealed that, even if a person might be immune after the disease, herd immunity would take many years to achieve. That means that, once the first wave was under control, contact tracing and rapid action would be of paramount importance to keep the virus at bay. It was remarkable to see how, in the choice between freedom and security, both people and politicians have shifted rapidly in favor of security. And it was comforting to observe a strong discussion of the restriction of freedom, which gives reason for optimism about democratic societies. The value we attach to freedom in our society is once more increasing by dint of this crisis situation and the restrictions that we must endure. Such situations make us realize that freedom is not a natural asset and that we must repeatedly commit ourselves to the defense, preservation, and expansion of civil liberties. How, then, should personal freedom be organized in our society? Which freedoms can be relinquished in order to fight a pandemic? And will democracy survive a

shift from freedom to control? We can be optimistic about our country and a number of other states, but in some countries, there is the danger that totalitarian policies will expand under the pretext of the Corona crisis.

The key is: information, and how to control it. To keep the virus at bay, we need to know: who had contact with whom, when, how long, and what kind? This kind of information means: entering into everybody's private sphere, and having – centrally, or distributed, in the public hand or privately – masses of data that can be used, yes, but that can also be misused. The infrastructure that would serve as the basis for any such approach would require that governments create a massive stockpile of data about their citizens. Even if all the data were to be deleted over the longer term, in the short term such large-scale collections must be retained in order to trace prior contacts over the space of two weeks (the time of putative infective danger). That, of course, will be impossible without a massive encroachment on each person's information sovereignty. This scenario is a data-protection nightmare, even if data-protection officers stand ready to certify the "commensurability" of the encroachment, meaning that we must relinquish certain freedoms to make gains in security. The majority of politicians will demand the collection of data (because they do not want to be held responsible for the dead), and so will most of the population (because our beloved family members or we ourselves are the ones threatened by the virus).

Where will the data come from? As a matter of fact, much of it is already available, distributed among many institutions that not only collect such data, but also avail themselves of it. Many of these institutions are in private hands (Google, Facebook, telephone companies), whereas many others are state organizations (the German Federal Criminal Police Office, public utility companies, health insurance companies). Most COVID-tracking apps have distributed data schemes. New sources of data emerge on a daily basis. Data become dangerous for a free society when they are linked with other data – for instance from the national intelligence service or foreign intelligence agencies – to be exploited. The buildup of massive collections of data will open the door to misuse of this data, and the data-protection officers will be powerless in the face of it.

Corona boosts this development, but the digitalization of our lives had already moved us in that direction. As a consequence of this thinking, I proposed a new way how democratic societies should deal with the increased importance, quantity, and quality of personal data that is being generated, stored, and processed. Thinking back to Baron de Montesquieu, who in 1748 proposed to separate legislature, judiciary, and executive power

within the state, I proposed to also separate "information". Make "information" a fourth pillar of state power!

Data is neither good nor evil – only the use to which it is put can be described in such terms – so its misuse must be duly punished. The purpose here is to create structures that make such misuse difficult. Montesquieu bestowed a wonderful gift upon future generations. If the police (the executive power) seek to wiretap a phone, then they will require a legal decision (the legislative power); if such is not at hand, then the evidence cannot be used in a court of law and the accused person must be acquitted of the charge even if they are in fact guilty. This separation of powers is a great good. The idea is that various people, i.e., various institutions, are separated from each other and have complementary powers. This arrangement can reduce the potential for misuse, for in a system with the separation of powers each entity is jealous of its own prerogatives and thus jealously protects them. The members of a certain entity are perforce loyal to it, and this psychological effect strengthens the separation and thus widens the potential for democratic control (in fact, this observation about the possessive nature of civil servants for their own branch was an important contribution from Co-Fellow Alon Harel).

What does all this mean for our information society? Data is power! If the separation of powers into three entities has hitherto been able to direct state power in an orderly manner, what we see today is that data crosscuts these entities and thus undermines their separation. It would therefore be better to apply the concept of the separation of powers also to information itself. In concrete terms, this means that the collection of data and its utilization must be separated on the institutional level. If the health authorities, as in a pandemic situation, possess a great deal of executive power, then they should not also be collecting the necessary data – this should instead be the purview of another agency. If the police require certain data, then they themselves should not be collecting it, but should be compelled to request that information from a data agency. Alongside the legislative, executive, and judicial branches, we need a new state entity that collects data without utilizing that data itself. If other agencies need data, then they must request it – this makes for transparency. It also creates a staff of officials who will vouch for the state's honorable handling of the data and will monitor that data's lawful use (by other agencies and officials) so as to justify and protect their own right to exist as officials with oversight.

The legislature will have to govern which data is to be collected and how long it can be retained; it will have to govern the confidentiality of data and how requests for new data should be processed – in other words, under what conditions and what data can be issued

to what authorities. This is not fundamentally different from what we have today, for example there are regulations as to who and under what conditions someone is permitted to access another person's police background check. The legislature will also have to govern how the data can be divided and distributed so that the records are not gathered in a single place and thereby made all too vulnerable a target for data theft and hacker attacks. Data-protection officers will continue to play an important role in monitoring what is actually being collected, as well as overseeing what specific data is being requested and by whom and for what reason and how it is then in fact being used.

We discussed this proposal in our seminars, and we got lost in translation. It is part of every discussion, in particular if it proposes political content, that some agree and others don't. But here it was different: there was a major division (not complete, but significant) in the understanding of my proposal, between Anglo-American and continental listeners. Part of that was cultural/political (do we trust data in the hands of a private company, say Google, more than data in the hands of the state?). But the more interesting one was cultural/linguistic. In English, the translation of Montesquieu is "branches of power". Creating a new branch for "information" implies adding a new branch, that is: giving the state more power than before. Who should control that? Who would be in charge of that power? And how to avoid misusing it? – all pertinent questions when giving the state more power than before. Not surprisingly, the dominant reading of this proposal was negative. In German, however, the same concept is not "branches of power", but "division of power". Here, adding a new branch implicates taking power away from the existing branches, thus reducing the magnitude of existing powers, and rebalancing the whole lot into four, not three pillars, without adding new competences.

Language, I learn, is so basic for human consciousness, and can so easily lead to misunderstandings, creating fascinating consequences. Working with bees is conceptually easier: their dance language is not a "language" in the human sense. There is communication, and this communication is complex and symbolic, but it is not linguistic. What, then, is the dancing? What is in the bee's mind? Does the bee dream, after all? And if so, how would we know? Even more, isn't this a topic that digs into questions about consciousness and the like – but would we really want to attribute such typically human mental capacities to these furry, flying critters?

Thomas Nagel, in an essay with the captivating title "What is it like to be a bat?", writes: "I assume we all believe that bats have experience. After all, they are mammals,

and there is no more doubt that they have experience than that mice or pigeons or whales have experience. I have chosen bats instead of wasps or flounders because if one travels too far down the phylogenetic tree, people gradually shed their faith that there is experience there at all."

Contrary to Nagel, my hope is that, by moving away from animals that we feel related to, we may also move away from arguments such as "I assume" and into evidence-based "the data shows". This is one of the motivations for working with insects: they have complex behavior, but are sufficiently alien to us as to preclude (to a large extent) the temptation of projecting our own mind onto them.

Therefore, I divided my research topic into three questions:

1) Do bees dream?

Several aspects need to be covered here: Do bees sleep? Does sleep show different phases? What does brain activity look like in the awake bee and in the sleeping bee, and – if the brain is active during sleep – what does that activity mean?

2) Do bees use maps to navigate?

Assume a foraging bee collects nectar. If, in a dream, she would recapitulate her visit to the flower, would that happen in an inner representation of the outer world? And, if so, would we call this a map?

3) Do bees have intentionality or consciousness?

Intentionality, like many concepts in this semantic cloud (consciousness, agency, experiences…), is ambiguous because different scholars use the word with different associations, connotations, and most often with fuzzy definitions. Going back to the original definition by Franz Brentano in 1874, we would attribute intentionality to the bee when a bee dreams (assuming the answer to question 1 is positive) or when she uses a mental map (assuming the answer to question 2 is positive) since she creates an inner (mental) representation of an outside world (to what extent that world needs to correspond to the real world is irrelevant here). The bee would have consciousness, if and only if she herself was part of that world, i.e., if she would dream not "just" a flower meadow, but also dream of herself flying within that meadow.

I am convinced that these questions are objective and scientifically tractable questions, that at the end we will have answers such as "yes, because the data shows that…" (or no, if the data refutes the assumptions), with the open ending that even those findings may be falsifiable by later experiments. I have used my time in Berlin at the Wissenschaftskolleg to develop appropriate experimental approaches to address these issues. For now, the

answers to the three questions are (1) I don't know (but there is convincing data towards yes), (2) I don't know (but there is controversial data toward yes), (3) I don't know (for consciousness, there is no convincing data, for intentionality, the picture is blurry). The experiments are in the pipeline.

A good year came to an end, and I've got plenty of things left to do. Thanks to all the Fellows, and thanks to the staff, the administration, and the leadership of the Wissenschaftskolleg, who created the basis for this productivity boost.