APhEx 20, 2019, (ed. Vera Tripodi)
Redattore: Federica Berdini

APhEx
PORTALE ITALIANO DI FILOSOFIA ANALITICA
GIORNALE DI FILOSOFIA
NETWORK
N° 20, 2019

I N T E R V I S T E

Conversation with Elisabeth Pacherie

by Chiara-Camilla Derchi

Elisabeth Pacherie is a philosopher of mind and action. Her methodological proclivities are naturalistic: she believes that progress on philosophical issues depends on sustained interaction with empirical science. In the earlier part of her career, she progressively extended her work from issues concerning intentionality and mental causation to consciousness, perception, action, and their disruptions in mental pathologies. For the last 15 years, action has been her main area of investigation. She has worked extensively on intentions, action understanding, sense of agency and joint action and has a strong record of international interdisciplinary collaborations in these fields. Her current research program extends her work in three directions. Her first project aims to contribute to a more fine-grained account of the architecture of action control by investigating the representational

structures and control processes that support the flexibility and efficiency of highly skilled action. The objective of her second project is to investigate both theoretically and empirically how our sense of agency for joint action relates to, and differs from, our sense of agency for individual actions. Her third project, in collaboration with psychologists and roboticists, concerns human-robot interactions and aims investigating whether and under what conditions commitments, that play a crucial role in human cooperative interactions, could play a similar role in human-robot interactions.

1. How did you get interested in philosophy, and in philosophy of mind and action and philosophy of cognitive science in particular?

EP: After classical studies in philosophy in France with a strong emphasis in the history of philosophy, I had the luck to be a visiting student at the Philosophy Department in Princeton, with Gilbert Harman as my supervisor. The philosophy department together with the psychology department and the department of computer science had just launched an interdisciplinary program in cognitive science. Thanks to Gilbert Harman, I was introduced to both philosophy of mind and cognitive science at the same time. Following this year at Princeton, I spent another year at the Center for the Study of Language and information at Stanford University, where I took classes in linguistics and artificial intelligence. I was introduced to cognitive science at a time where artificial intelligence held center stage and neuroscience was not really on the picture. These two years abroad taught me that it was possible to tackle philosophical issues directly rather than necessarily from a historical perspective and that philosophical research could be fruitfully confronted with ongoing scientific research. I found that really exciting and when I returned to France decided to work in the philosophy of mind. I joined a group of philosophers interested in the philosophy of mind and language and in cognitive science (at the time based at the Center of Research in Applied Epistemology in Paris and who later founded Institut Jean Nicod) and did my Ph.D. on philosophy of mind – specifically, on naturalizing intentionality – with Joëlle Proust. When I was working on my Ph.D. my impression was that people tackling the issue of naturalizing intentionality by looking at propositional attitudes states such as beliefs were probably not taking the best angle; my thought was that probably it would be better to look at more basic forms of intentionality, perceptual intentionality or motor intentionality. Philosophers were already working with psychologists on

perception and there were a lot of interactions on this topic but on the action side there was very little at the time. Then in the early 90s, shortly after finishing my Ph.D. and thanks to Joëlle Proust, I met Marc Jeannerod, a founder of the cognitive neuroscience of action, and discovered his work. That was a decisive encounter – Marc Jeannerod's work helped me see how it was possible to bridge the gap between intentions on the one hand and the physiology of muscle contraction on the other hand. I moved from philosophy of mind to philosophy of action, or rather to philosophy of action from a philosophy of mind perspective.

2. What is, in your opinion, the peculiarity of philosophy with respect to other disciplines, such as neuroscience and cognitive science?

EP: A friend of mine has this saying: *"philosophy deals with the sphere of possibilities whereas the science is concerned with what is actual."* I like this way of putting things. Philosophers often act as intellectual explorers drawing tentative conceptual maps of new territories and trying to ask the right questions about it. Sometimes this philosophical spadework allows scientific explorers to follow in their steps, operationalize these questions and claim the domain as their own. This happened first with mathematics in Antiquity, then physics in the early modern age, followed by biology and at the end of the 19th century psychology. Sometimes, though, the territory explored is one of values and norms, and when philosophers map it in incompatible ways, it is unclear whether science can help adjudicate between them. The mind is probably a hybrid domain where both factual and normative issues arise and where philosophers and scientists can offer complementary insights. Another thing – that is more intuitive – is that in empirical science you really must be very careful about methodology, and this tends to lead scientists to be highly specialized and focus on one specific field of inquiry and all the methodological issues its empirical investigation raises. Philosophers are a bit less constrained, they work at a more abstract level and can try and identify possible connections between work done in these different fields. In that respect, they can be bridge builders and play an important role in interdisciplinary projects. I would like also to say, paraphrasing Shakespeare, that there are more things in heaven and earth than are dreamt of in philosophy. Sometimes the world is more surprising than philosophers imagine, and sometimes science can reveal the existence of phenomena philosophers had not dreamt of, or had thought impossible. For example, neuropsychology and psychiatry provide many interesting data for

philosophical analysis, as the famous cases of dissociations reported by Oliver Sacks in his books, or the delusions of thought insertion reported by schizophrenic patients who feel as if their thoughts are not their own but rather belong to someone else and have been inserted in their minds.

3. What is your interpretation of this phenomenon?

EP: I wrote a paper with Jean-Remy Martin, in which we argue that thought insertion primarily involves a disruption of the sense of ownership for thoughts and that the lack of a sense of agency is but a consequence of this disruption. We defend the hypothesis that this disruption of the sense of ownership stems from a failure in the online integration of the contextual information related to a thought, contextual information concerning the different causal factors that may be implicated in their production. Loss of unity of consciousness, manifested by incoherent subjective experiences, is a general phenomenal characteristic of schizophrenia. This loss of coherence has been hypothesized to reflect a generalized deficit of contextual information integration not conveyed by, but related to, a target event. This deficit is manifested across many cognitive domains. We argue that it is also manifested in the process of thinking itself, resulting in causally decontextualized thoughts that are experienced as inserted thoughts. If you lose the capacity to associate an event with its context it seems to come from nowhere.

4. I see. Do you think this would be the same for actions and delusion of control?

EP: There are important similarities, but I think a deficit in our capacities to make predictions about the consequences of our actions may play a more important role in delusions of control where a person's sense of agency for their actions is disturbed. According to Bayesian approaches to the sense of agency, there's an important predictive component to our sense of agency. We use our prior knowledge of the world to make predictions about the probable consequences of our actions and the sense of agency depends to a large extent on how accurate these predictions are. If this predictive machinery is not functioning properly, you experience the consequences of your actions as unexpected and may infer that it is some external cause rather than you that is responsible for them.

5. Let's now talk about other empirical data. I'd like to discuss with you the philosophical understanding of one of the most important findings about intentionality, that is, the "readiness potential". This neurophysiological finding, described for the first time by Benjamin Libet, was recently challenged by Aron Schurger, who claimed that the Readiness Potential (RP) is not the neural sign, nor the neural mechanism of volition, but it should be interpreted as a general (not specific) fluctuation of the EEG activity. The RP appears in fact only if we average out different trials, as it is very unlikely to detect the RP at a single trial.

EP: I was pretty convinced by Schurger's deconstruction, so to speak, of the original interpretation of the readiness potential and of Libet's speculations on its significance.

6. So, going one step back, do you think that Libet's experiment is an example of operationalizing proximal intention or motor intention?

EP: Basically, in this case you know already what you are supposed to do, and you can already prepare the movement – it is up to you when to move. So probably this is a basic form of proximal intentions. Motor intentions can be prepared in advance.

7. So, do you think it is feasible to see Schurger's interpretation of readiness potential as the product of stochastic fluctuations of the brain?

EP: I like it precisely because it is very difficult to follow the original instructions to "flex your wrist when you feel the urge". The instruction has an air of paradox: you are told to spontaneously flex your wrist, but if you let someone alone in a room without giving him a specific instruction, very few, I guess, would start flexing their wrist! So, to comply with the experimenter's instruction, subjects had to try to somehow create some false spontaneity. So, you have to harness for that purpose random brain activity. Schurger and his colleagues assume that the decisions of the participants in Libet's experiment can be modelled –as neural decision tasks typically are– in terms of an accumulator-plus-threshold mechanism: when relevant evidence accumulated over time reaches a threshold a decision is reached. What is unique to Libet's task is that subjects are explicitly instructed not to base their decision on any specific evidence. Schurger and colleagues propose that the motor system constantly undergoes random fluctuations of RPs

and that this random premotor activity can be used as a substitute for actual evidence. According to their stochastic decision model, the decision process, given Libet's instructions, amounts to simply shifting premotor activation up closer to the decision threshold for initiation of the movement and waiting for a random threshold-crossing fluctuation in RP. Do intentions lurk in the back of that? Well, perhaps. One possibility is that in trying to comply with the instruction, the participant forms the intention to attend to possible urges and in so orienting her attention increases activation in the premotor cortex. Schurger himself does not say much about how premotor activation is shifted up closer to the decision threshold.

8. My other question is: What you think about the timing of readiness potential? The readiness potential, in fact, received attention since the seminal work of Libet, who demonstrated that the specific time course of this potential is not compatible with the concept of "free will". Basically, the RP as "neural signature of volition" appeared well before the subject became conscious of the intention to move.

EP: You can interpret this activity as the brain causing the intention and then the intention causing the action, or (and I think this may have been Libet's interpretation) you can interpret the brain activity as causing the conscious experience of intending and also causing the action, making the conscious intention itself a mere epiphenomenon. I think there are too many gaps and questionable assumptions in Libet's arguments, for it to warrant any conclusions against free will. For all my life I tried staying away from issues relating to free will [laughing], but anyway if I were to defend free will, I would not side with libertarian views that take it to be incompatible with any kind of determinism –I would be some kind of compatibilist.

9. Adina Roskies and her group recently demonstrated that intentional movement can occur without an accompanying feeling of will. She additionally showed that the neural processes indexed by the RP are insufficient to cause the experience of conscious willing. Specifically, the RP still occurs when subjects make self-timed, endogenously-initiated movements due to a post-hypnotic suggestion, without a conscious feeling of having intended those movements. In a way this would suggest that conscious will is not related with the appearance of the readiness potential. So again, what is the actual nature of this potential?

EP: If I remember correctly, empirical studies have found that the readiness potential was shorter when you have an external stimulus triggering the action (stimulus-induced action) while it is longer, it appears well before, around 2 second before the action itself, if the action is planned. This can indicate that conscious will has an impact on neural preparation. Moreover, several neuroimaging studies comparing the neural activity for self-paced actions and stimulus-driven actions found that the activation of the pre-SMA (supplementary motor area) is stronger for self-paced actions than for stimulus-driven ones. As described by Patrick Haggard, the starting point of the Readiness Potential is seen as the initiation "of a cascade of neural activity" that flows from the pre-SMA back to the SMA proper and M1. However, the pre-SMA itself has to be activated in order to produce the neural activity cascade. It has been suggested that the basal ganglia can convey inputs to the pre-SMA. This is different for stimulus-driven actions that seem to involve a faster path from early sensory cortices (S1) to parietal cortex (level of representation of the movement) to orientate stimulus-driven actions.

10. Let's now focus on the clarification of the relationship between "motor intention" and consciousness.

EP: I've often been criticized for talking of "motor intentions" rather than simply motor representations because many philosophers want to reserve the term "intention" for states that are conscious or at least accessible to consciousness. When talking of "motor intentions" I was not really focusing on this reported characteristic of intentions – I was more interested in the goal-directness of intentions and the fact that intentions contribute to the production of the action. The notion of "motor representations" is broader; not all motor representations are implicated in action production. Motor representations are also activated when we observe others acting, when we simply imagine actions or when we process action verbs. "Motor intentions", as I use the term, refers to those motor representations that represent goals and contribute to the production of actions. Thus, they satisfy at least some of the criteria traditionally associated with intentions, although they may not always satisfy the consciousness criterion. More recently I have been working on expert skills in sports or the arts. Very often, when one performs an ordinary, routine action, like when you tie your shoelaces, you are not aware of your motor intentions – all this has been automatized. I think that what differentiates an expert (imagine for example Rafael Nadal) from someone that is not an expert, is the fact that although he can in prin-

ciple perform the actions in his tennis repertoire automatically, for example a backhand shot, he can also have much more precise intentional control over the details of how to perform the action, and so, I guess, has more awareness of the parameters of his motor actions and thus better control over them. For the ordinary actions we perform in our daily life, it is actually a good thing if the motor intentions are not conscious. If they were and you had to exert conscious control over the details of how you perform these actions, you might go in cognitive overdrive. On the other hand, when a motor process is completely automatized, it may be very difficult to get access to it and reconfigure it. It is not easy to break an automatism and replace it with another movement. I think that the great experts are probably those who have achieved sufficient mastery to flexibly switch between automatic control and conscious cognitive control and can, when the need arises, exert conscious control over even very fine-grained aspects of their motor skills.

11. Are motor intentions structured?

EP: When I was discussing motor intentions, my claim was typically that motor intentions might be themselves hierarchically structured in a way. Let's say for example that I have the future-directed intention to spend a vacation in Italy. I can also have more detailed future-directed intentions, so I can make plans about where to go in Italy, about means of transportations, hotel bookings, etc. For instance, if I decide to fly, then I will make plans about buying plane tickets and form more specific intentions to buy tickets. Even within this level you have a hierarchy of more general, or more abstract, intentions and more specific intentions. I think that you can have the same thing with motor intentions. If your motor intention is an intention to grasp a craft beer bottle, there will be a more specific reach, then grasp. And then there would be more specific grasp with this or that type of grip. This might go various steps further in terms of finger placements, muscle contractions and so on. I think motor intentions may also be fully consciously accessible if you consider the very specific parameters at the most fine-grained level of motor specification. Marc Jeannerod was very keen on the idea that motor representations are not just involved in action production, but are also the substrate for conscious motor imagery. Conscious motor imagery can be more or less detailed of course, and tennis experts are probably able to form more detailed images of, say, a forehand volley than a novice player. We probably can't form motor images that are as detailed as

are most fine-grained motor representations, but clearly motor imagery shares some of the features to motor intention. For instance, if you ask a person to imagine moving their hand back and forth, some of the temporal properties of the action will be retained when they do. There is a limit to how fast you can actually move your hand back and forth and there is a similar limit to how fast you can imagine moving your hand. The way you imagine performing an action depends on how you can implement it at the motor level. There are a number of biomechanical constraints in motor organization that are reflected in the content of motor intention and are also reflected in the content of motor imagery. If the properties of the representations involved in motor imagery were not closely related to the properties of the representations involved in motor intentions, we would have a hard time explaining why mental training involving motor imagery can be beneficial and help improve the performance of athletes for instance.

12. This is of particular interest for disorders of consciousness. Several studies in fact provided empirical evidence that the employment of "mental imagery" offers additional and crucial information ancillary to standard clinical assessment of severe brain-injured patients. A specific set of protocol called "active paradigms" employs "active tasks" such as mental imagery as an alternative to behavioral response to commands. In particular, in a seminal work Adrian Owen showed how mental imagery can modulate patients' brain activity in a manner similar to healthy subjects.

EP: This a very interesting finding that could also offer new prospects for remediation. But this may also depend on the extent and seriousness of the brain injury. For instance, Angela Sirigu in Lyons found that some patients with lesions in the motor cortex presented similar impairments for real and for imagined movements. Presumably, "mental imagery" rehabilitation techniques would not be well adapted for such patients.

13. In conclusion, what do you think is the relationship between consciousness and motor intentions?

EP: I think of motor intentions as hierarchically organized. I also think, as motor schema theorists have proposed, that motor representations at each level of the hierarchy represent both invariant features that are common to all actions of that type (e.g., a hand grip) or subtype (e.g., a power grip vs. a precision grip) and define its general form and features that vary from con-

text to context, i.e. parameters that may take different values in different contexts. For instance, how a power grip is specified by a motor intention in a particular instance will depend on the exact shape, size and orientation of the object one wants to grasp. One issue regarding the relationship between motor intentions and consciousness concerns the conscious accessibility of the content of motor representations. I think that the content of higher-level motor intentions is typically more accessible than the content of lower-level motor representations and that we can more easily access the invariant features of these representations than their variable features. Indeed, one may think that consciously accessing these invariant features is crucial to the interfacing between conceptual and motor representations of actions. Another, related issue, concerns the conscious control we might have over our motor intentions. Thinking of motor intentions as representing both invariant features and context-dependent features of actions allows us to think of two ways we can exert conscious control over our motor representations. First, to the extent that conceptual representations of actions can hook up motor representations through their invariant features, we can have some intentional control over which motor representations are activated. Second, and more indirectly, we can also exert control over the contents of our motor intentions by directing our attention to features of the context that determine the values of the parameters of a motor representation. For instance, if we take the grasping example again, consciously attending to the relevant features of the object to be grasped may help specify more precisely the parameters of my motor representation of this very action.

14. We discussed about the interplay between empirical evidence and theoretical approaches in understanding the deep roots of the intentions and the sense agency. Do you believe in this interplay between different disciplines such as psychology, neuroscience, cognitive science and philosophy?

EP: Sure, otherwise I wouldn't be doing what I'm doing [laughing]. That is what I have been doing all my life, so I hope I am not completely mistaken thinking that. Let's enjoy it!

15. Absolutely. Recently I have seen that The John Templeton Foundation has announced a grant of $5.34 million to Chapman University in Orange, California, in support of neurobiological research focused on the nature of free will. With the help of an additional grant of $1.7 million from the Fetzer Institute, a team led by computational neuroscientist Uri Maoz

will work to determine whether it can be scientifically proven that actions and behavior are guided by conscious intention reached by rational decision. The funding will support a series of studies over four years by an international team of seventeen neuroscientists and philosophers and includes support for brain imaging techniques and computational modeling.

EP: I was a little bit involved in a previous project funded by the Templeton Foundation on a related topic (self-control) and I attended one of the conferences linked to that project. It was very interesting both for philosophers to better understand the state of the art and also for neuroscientists to disseminate their data and to discuss their hypotheses and their interpretations of their data. I think it is very important, especially for the interaction between different disciplines. Maybe, returning to Libet, if he had had more interactions with philosophers, he would not have drawn the conclusion he drew from his experiments on the readiness potential. So interdisciplinarity is very important.

16. I want to conclude this interview by talking about the role of women in philosophy and neuroscience. What are your impressions about that?

EP: I think that things have improved because in my generation (I'm in my late fifties) there were very few of us. Nowadays, there are more women in both fields. I hope things continue to improve as we are still far from parity. Philosophy, within humanities, remains the discipline with the worst male/female ratio and I am sure there is also room for progress in neuroscience. At least now, there are more role models for young women considering a career in philosophy or neuroscience. Hopefully, this will help redress the balance even more.

References

Pacherie E., 2018, «Motor intentionality», in A. Newen L., de Bruin & S. Gallagher (eds), *The Oxford Handbook of 4e Cognition* (pp. 369-388), Oxford, Oxford University Press.

Mylopoulos M., Pacherie E., 2017, «Intentions and motor representations: the interface challenge», *Review of Philosophy and Psychology,* 8, 2, pp. 317-336.

Pacherie E., 2015, «Time to act: the dynamics of agentive experiences», in Patrick Haggard, Baruch Eitam (eds), *The sense of agency*, Oxford, Oxford University Press, pp. 3-24.

Bayne T., Pacherie E., 2014, «Consciousness and agency», in Jens Clausen & Neil Levy (eds.), *Springer Handbook of Neuroethics*. Dordrecht: Springer, pp. 211-230.