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The College at
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FREE WILL AND NEUROSCIENCE

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Do we have free will? If you were to Google the question, you might turn up such claims as the following:

The debate about free will . . . has been given new life by scientists, especially neuroscientists studying how the brain works. And what they're finding supports the idea that free will is a complete illusion. (Jerry Coyne, "Why You Don't Really Have Free Will," *USATODAY.com*, Jan. 1, 2012)

"Free will" is not the defining feature of humanness, modern neuroscience implies, but is rather an illusion that endures only because biochemical complexity conceals the mechanisms of decision making. (Tom Siegfried, "The Decider," *Science News* magazine, Dec. 6, 2008)

Researchers have found patterns of brain activity that predict people's decisions up to 10 seconds before they're aware they've made a choice. . . . The result was hard for some to stomach because it suggested that the unconscious brain calls the shots, making free will an illusory afterthought. (Elsa Youngsteadt, "Case Closed for Free Will," *Science NOW* Daily News, April 14, 2008)

The concept of free will is a non-starter, both philosophically and scientifically [because] no description of mental and physical causation . . . allows for this freedom that we habitually claim for ourselves and ascribe to others. (Sam Harris, "Morality without 'Free Will,'" *Huffington Post*, May 30, 2011)

In Mele 2009, I argued that the scientific experiments that are most often claimed to prove that free will is an illusion actually leave the

existence of free will wide open. In the present article I focus on an important dimension of the issue that deserves more attention than it received in Mele 2009.

Overt actions are actions that essentially involve peripheral bodily motion. Examples include signing a petition against the death penalty, proposing marriage, flexing a wrist, and pressing a button. My topic here is a scientific argument for the thesis that no overt actions are free actions (or exercises of free will) that may be sketched as follows:

Skeptical Argument

1. The overt actions studied in experiments of the kind to be described do not have corresponding consciously made decisions or conscious intentions among their causes. (empirical premise)
2. So probably no overt actions have corresponding consciously made decisions or conscious intentions among their causes. (inference from 1)
3. An overt action is a free action only if it has a corresponding consciously made decision or conscious intention among its causes. (theoretical premise)
4. So probably no overt actions are free actions. (conclusion)

In Mele 2009, I argued that the data I discussed there do not justify the first premise. In the present article I focus on the inference made in the second premise. In section 1, I briefly describe the experiments at issue in premise 1. The remainder of the article is a critique of premise 2. I do not discuss premise 3.

1. Some Experiments

In the studies described in this section, participants are asked to report on when they had certain conscious experiences – variously described as experiences of an urge, intention, or decision to do what they did. After they act, they make their reports.

In some of Benjamin Libet's studies (1985, 2004), participants are asked to flex their right wrists whenever they wish. When participants are regularly reminded not to plan their wrist flexes and when they do not afterward say that they did some such planning, an average ramping up of EEG activity (550 ms before muscle motion begins) precedes the average reported time of the

conscious experience (200 ms before muscle motion begins) by about a third of a second (1985). Libet claims that decisions about when to flex were made at the earlier of these two times (1985, p. 536). I have disputed that claim elsewhere (Mele 2009, ch. 3); but, for the sake of argument, I am supposing here that it is true.

Chun Siong Soon, Marcel Brass, Hans-Jochen Heinze, and John-Dylan Haynes, commenting on Libet's studies, write: "Because brain activity in the SMA consistently preceded the conscious decision, it has been argued that the brain had already unconsciously made a decision to move even before the subject became aware of it" (2008, p. 543). To get additional evidence about the proposition at issue, they use functional magnetic resonance imaging (fMRI) in a study of participants instructed to do the following "when they felt the urge to do so": "decide between one of two buttons, operated by the left and right index fingers, and press it immediately" (p. 543). Soon and colleagues find that, using readings from two brain regions (one in the frontopolar cortex and the other in the parietal cortex), they are able to predict with about 60% accuracy (see Soon et al. 2008, supplementary figure 6, Haynes 2011, p. 93) which button participants will press several seconds in advance of the button press (p. 544).

In another study, Soon et al. instruct participants to "decide between left and right responses at an externally determined point in time" (2008, p. 544). The subjects are to make their decision about which of two buttons to press when shown a cue and then execute their decision later, when presented with a "respond" cue (see their supplementary material on "Control fMRI experiment"). They report that one interpretation of their findings in this study is that "frontopolar cortex was the first cortical stage at which the actual decision was made, whereas precuneus was involved in storage of the decision until it reached awareness" (p. 545).

In Mele n.d.a, I argue that Soon and colleagues are more likely to have detected a slight unconscious bias toward pressing a particular button on the next go than an actual decision (or intention) to press that button. But I suppose here, for the sake of argument, that, as they claim, they detect decisions several seconds in advance of button presses.

Itzhak Fried, Roy Mukamel, and Gabriel Kreiman record directly from the brain, using depth electrodes (2011). They report that "A population of SMA [supplementary motor area] neurons is sufficient to predict in single trials the impending decision to move

with accuracy greater than 80% already 700 ms prior to subjects' awareness" (p. 548) of their "urge" (p. 558) to press the key. By "700 ms prior to subjects's awareness" here, Fried and coauthors mean 700 ms prior to the awareness time that participants later *report*: the authors recognize that the reports might not be accurate (pp. 552-53, 560). And, unlike Libet, they seem sometimes to treat decisions to press keys as items that are, by definition, conscious (p. 548). Possibly, in their thinking about their findings, they identify the participants' decisions with conscious urges. If that is how they use "decision," their claim here is that on the basis of activity in the SMA they can predict with greater than 80% accuracy what time a participant will report to be the time at which he was first aware of an urge to press 700 ms prior to the reported time. But someone who uses the word "decision" differently may describe the same result as a greater than 80% accuracy rate in detecting decisions 700 ms before the person becomes aware of a decision he already made. These two different ways of describing the result obviously are very different. The former description does not include an assertion about when the decision was made.

2. Are All Decisions on a Par?

For reasons I have presented elsewhere (see Mele 2009 on Libet's work and Mele n.d.a on Soon et al. 2008), I am not persuaded that participants in the studies described above actually decide on the actions described there before they become conscious of their decisions or intentions. But, for the sake of argument, I suppose that they do unconsciously decide to perform simple actions they perform. I suppose as well that premise 1 of the skeptical argument sketched above is true, and I focus on the inference made in premise 2.

Assume that participants in the studies at issue actually made the decisions the experimenters attributed to them, decisions that were detected with scientific apparatus. What did they decide to do? They decided when to flex a wrist, when to press a key,¹ or which of two buttons to press. In none of these studies was there any reason to prefer the decided upon options to similar alternative options – and vice versa. There was no reason to prefer a particular

1. Fried et al. mention another study of theirs in which participants select which hand to use for the key press (2011, p. 553).

moment for beginning to flex a wrist or press a key over nearby moments and (in the study by Soon et al.) no reason to prefer one button over the other. Accordingly, conscious reasoning about what to do – for example, about whether to press the left button or the right button next or about exactly when to flex – is out of place.

The philosophical literature on free will tends to link free will closely to moral responsibility. “Moral responsibility” means different things to different philosophers. But, according to one reasonable way of thinking about the matter, a necessary condition of an agent’s being morally responsible for an action is that the action has some moral import or significance. The actions studied in the experiments described in section 1 have no such import: they are morally neutral actions. Of course, one might flex a wrist to signal an accomplice to shoot someone or press a button to launch a nuclear missile. But that is not what is happening in the experiments under consideration, and it is the participants’ wrist flexes and button presses – along with the decisions that supposedly issue in them – that are at issue now.

It may be claimed that the participants in these studies did not freely make the decisions being studied and therefore would not have been morally responsible for those decisions – nor for the actions that execute them – even if those decisions and overt actions had been morally significant. This claim merits attention. I have already observed that in these studies, there is never a reason to prefer the decided upon option to other relevant options and vice versa. This normally is not the case when people are making *moral* decisions. In typical cases of moral decision making, pros and cons are weighed. It is difficult to generalize from (alleged) findings about morally neutral decisions made under conditions of indifference to the conclusion that all morally significant decisions made in situations in which agents apparently are consciously weighing competing reasons are made unconsciously. Perhaps when agents consciously weigh reasons and apparently decide (partly) on the basis of their conscious assessment of reasons, the decisions they make are much less likely to be unconsciously made. Perhaps the conscious processing increases the likelihood of conscious deciding.²

2. For a model of conscious deciding, see Mele 2009, pp. 40-44.

A related point about generalizing from (alleged) findings in the experiments at issue to propositions about all decisions should also be made (see Mele 2009, pp. 79-87). Philosophers who believe that we sometimes act freely (exercise free will) disagree about whether we can do this in situations that feature indifference between or among our leading options. As some philosophers conceive of free will (Campbell 1957, pp. 167-74, Kane 1989, p. 252, van Inwagen 1989), exercises of it can occur only in situations in which people make significant moral or practical decisions in the face of temptation or competing motivation; and some other philosophers are much less restrictive about free will (Fischer and Ravizza 1992, O'Connor 2000, pp. 101-7). If the former group of philosophers is right, alleged findings of the sort I have mentioned do not tell us much about free will: the decisions and overt actions being investigated are outside the sphere of free will. But even if a proper conception of free will leaves room for free decisions in cases of indifference, the disagreement between the two groups just mentioned may point to an interesting difference among kinds of allegedly free decisions. Perhaps people who consciously struggle with temptation or competing motivation during a process that leads to a decision are more likely to decide consciously than are people who unreflectively select among options with respect to which they are indifferent. If so, drawing the conclusion that all decisions are unconsciously made from the alleged findings about decisions in the experiments at issue is a huge stretch.

One cannot reason persuasively from the alleged findings about decisions in cases in which, as the agents realize, they have no reason to favor any acceptable option over any other to the conclusion that the same sort of thing would be found in cases in which the agents are far from indifferent about their options. Elsewhere, I have suggested that automatic tie-breaking mechanisms are at work in many ordinary cases in which we are indifferent between or among the available options (Mele 2009, p. 83); and it is rash to assume that what happens in situations featuring indifference is also what happens in situations in which unsettledness about what to do leads to careful, extensive, conscious reasoning about what to do. Even if some action-ties are broken for us well before we are aware of what we “decided” to do, it certainly does not follow from this that we never consciously make decisions.

For the reasons I have noted, one is not warranted in generalizing from alleged findings about the decisions allegedly

made in the experiments I have been discussing to the claim that all decisions are unconsciously made. And the normal route from the claim that the decisions at issue are made unconsciously to the conclusion that no one has free will includes the presumption that just as these decisions are unconsciously made, so are all decisions.

3. Short-term and Long-range Decisions and Intentions

The decisions and intentions at issue in the studies discussed in section 1 concern actions to be performed right away or very soon. But some of our decisions and intentions concern actions to be performed days, weeks, or months later. For example, I might decide on Monday to devote the workday on Friday to writing a referee report, and I might decide today, in March, to visit some friends abroad in July. I have identified some problems involved in making the inference reported in premise 2. Might another problem lie in differences between the short-term decisions and intentions that are supposedly being investigated in the studies described in section 1 and longer-term decisions and intentions? I take up this question after commenting on some terminological matters and a theoretical issue.

I have been using the word “decide,” but I have not discussed its meaning. In my view, to decide to do something, *A*, is to perform a very brief action of a certain kind – an action of forming an intention to *A* (Mele 2003, ch. 9). Deliberating about what to do often is not very brief, but it must be distinguished from an act of deciding that is based on deliberation. Incidentally, my way of understanding deciding does not entail that all intentions are formed in acts of deciding. In fact, many intentions seem to be acquired without being so formed (see Mele 2003, ch. 9). If, as I believe, all decisions about what to do are prompted partly by uncertainty about what to do (Mele 2003, ch. 9), in situations in which there is no such uncertainty, no decisions will be made. Even so, intentions may be acquired in these situations.

The expression “consciously made decision” appears in the skeptical argument sketched in my introduction. A consciously made decision is just what it sounds like – a decision one is conscious of making when one makes it. Elsewhere, I have argued that even if our consciousness of decision making were always to lag a bit behind decision making, that fact would not constitute a serious obstacle to free will (Mele n.d.b). When we engage in protracted deliberation about weighty matters with a view to

deciding what to do, how unsettled do we typically feel very shortly before we have the conscious experience of settling the issue – that is, of deciding to *A*? (Bear in mind that an experience in this sense of the word might not be veridical: you might have an experience of settling the issue now even if you unconsciously settled it 200 ms ago.) Perhaps, at this late point in a process culminating in a decision to *A*, we often feel strongly inclined to *A*, feel that we are on the verge of deciding to *A*, or something of the sort. At these times, we may believe or feel that we are nearly settled on *A*-ing. If we are already settled on *A*-ing because, a few hundred milliseconds earlier, we settled the issue by unconsciously deciding to *A*, this belief or feeling is a bit off the mark. But its being inaccurate is entirely compatible with our conscious reasoning's having played an important role in producing our decision to *A*. And the role it played may be conducive to our having decided freely and to our freely performing the action we decided to perform (see Mele n.d.b).

That, as I say, is a thesis I have defended elsewhere. In the present section I focus on another point. Return to premise 2 of the skeptical argument:

2. So probably no overt actions have corresponding consciously made decisions or conscious intentions among their causes.

This premise refers both to consciously made decisions and to conscious intentions. The latter merit attention here. Even if all decisions are made unconsciously, it certainly seems that we sometimes are conscious of our intentions. Perhaps, it sometimes happens that we become conscious of an intention to *A* formed in an unconsciously made decision to *A* some time after that decision is made. How strongly do data of the sort reviewed in section 1 support the inference about conscious intentions reported in premise 2, even if it is assumed that premise 1 is true?

The question I just raised is an approximation the question that will become the main topic of this section. Some clarification is required before I begin to develop an answer. The existence of effective conscious intentions seemingly does not depend on the truth of substance dualism – a doctrine that includes a commitment to the idea that “associated with each human person, there is a thinking thing . . . not composed of the same kinds of stuff as . . . nonmental things” (Zimmerman 2006, p. 115; Zimmerman describes the “thinking thing” as a soul, but some substance

dualists prefer to use the word “mind”). Conscious intentions might, for example, be physical items or supervene on physical items. Scientists normally are not metaphysicians; and they should not be expected to take a stand on metaphysical connections between mental items and physical items – for example, on whether conscious intentions supervene on physical states.³ From a physicalist neuroscientific point of view, evidence that the physical correlates of conscious intentions are among the causes of some corresponding actions may be counted as evidence that conscious intentions are among the causes of some corresponding actions, and evidence that the physical correlates of conscious intentions are never among the causes of corresponding actions may be counted as evidence that conscious intentions are never among the causes of corresponding actions. In this connection, try to imagine a *scientific* discovery that the physical correlates of conscious intentions actually *are* (or actually are not) conscious intentions or that conscious intentions do (or do not) supervene on their physical correlates. How would the discovery be made? What would the experimental design be? As I observed in Mele 2009 (p. 146), it is primarily philosophers who would worry about the metaphysical intricacies of the mind-body problem despite accepting the imagined proof about physical correlates, and the argumentation would be distinctly philosophical.⁴

Consider an intention to *A* together with one’s consciousness of that intention. Call that combination an *intention+* to *A*. Might it – and not just some part or aspect of it – be among the causes of an *A*-ing? How strongly do data of the sort reviewed in section 1 support the inference that intentions+ to *A* are (as wholes) never among the causes of *A*-ing, even if it is assumed that premise 1 is true? This is my topic now. I pay particular attention to intentions that are neither for the present nor for the near future. I call them *significantly distal* intentions.

There is a large and growing body of work on “implementation intentions” (for reviews, see Gollwitzer 1999 and Gollwitzer and Sheeran 2006). Implementation intentions, as Peter Gollwitzer conceives of them, “are subordinate to goal intentions and specify

3. Kim 2003 is an excellent introduction to supervenience.

4. Jackson 2000 is an excellent brief critical review of various relevant philosophical positions that highlights the metaphysical nature of the debate.

the when, where, and how of responses leading to goal attainment” (1999, p. 494). They “serve the purpose of promoting the attainment of the goal specified in the goal intention.” In forming an implementation intention, “the person commits himself or herself to respond to a certain situation in a certain manner.”

In one study of participants “who had reported strong goal intentions to perform a BSE [breast self-examination] during the next month, 100% did so if they had been induced to form additional implementation intentions” (Gollwitzer 1999, p. 496, reporting on Orbell et al. 1997). In a control group of people who also reported strong goal intentions to do this but were not induced to form implementation intentions, only 53% performed a BSE. Participants in the former group were asked to state in writing “where and when” they would perform a BSE during the next month. These statements expressed implementation intentions.

Another study featured the task of “vigorous exercise for 20 minutes during the next week” (Gollwitzer 1999, p. 496). “A motivational intervention that focused on increasing self-efficacy to exercise, the perceived severity of and vulnerability to coronary heart disease, and the expectation that exercise will reduce the risk of coronary heart disease raised compliance from 29% to only 39%.” When this intervention was paired with the instruction to form relevant implementation intentions, “the compliance rate rose to 91%.”

In a third study reviewed in Gollwitzer 1999, drug addicts who showed symptoms of withdrawal were divided into two groups. “One group was asked in the morning to form the goal intention to write a short curriculum vitae before 5:00 p.m. and to add implementation intentions that specified when and where they would write it” (p. 496). The other participants were asked “to form the same goal intention but with irrelevant implementation intentions (i.e., they were asked to specify when they would eat lunch and where they would sit).” Once again, the results are striking: although none of the people in the second group completed the task, 80% of the people in the first group completed it.

Numerous studies of this kind are reviewed in Gollwitzer 1999, and Gollwitzer and Paschal Sheeran report that “findings from 94 independent tests showed that implementation intentions had a positive effect of medium-to-large magnitude . . . on goal attainment” (2006, p. 69). Collectively, the results provide evidence that the presence of relevant significantly distal implementation

intentions markedly increases the probability that agents will execute associated distal “goal intentions” in a broad range of circumstances. In the experimental studies that Gollwitzer reviews, participants are explicitly asked to form relevant implementation intentions, and the intentions at issue are consciously expressed (1999, p. 501).⁵

In Mele 2009, I argued that findings of the kind just described provide evidence that what I am here calling intentions+ sometimes are (as wholes) among the causes of corresponding actions (pp. 136-44). I will not repeat the arguments here. The main point I want to make is that one who is considering making the inference expressed in premise 2 of the skeptical argument should attend to differences between intentions of the kind that are supposedly being studied in the experiments described in section 1 – that is, proximal or nearly proximal intentions – and significantly distal intentions.

Participants in the neuroscience experiments described in my first section were asked to make reports about consciousness – reports about when they were first conscious of an urge, intention, or decision. Imagine a study that resembles the experiment by Libet that I described but without any instruction to report on conscious urges or the like. At the beginning of the imagined experiment, participants are told to flex their right wrists spontaneously a few times each minute while watching a fast clock. Afterwards they are asked whether they were often conscious of intentions, urges, or decisions to flex. A *no* answer would not be terribly surprising. If you doubt that, try the following experiment on a friend who knows nothing about the studies at issue. Ask your friend to flex his or her right wrist several times while having a conversation with you. After a few minutes, ask your friend how often, when he or she flexed, he or she was aware of an intention to do that right then – a proximal intention. In Libet’s studies, if participants are conscious of something like proximal intentions to flex, that consciousness may be largely an artefact of the instruction

5. It should not be assumed, incidentally, that all members of all of the control groups lack conscious implementation intentions. Perhaps some members of the control groups who executed their goal intentions consciously made relevant distal implementation decisions.

to report on such things – and unconscious intentions might have been just as effective in generating flexes.

Is something similar likely to be true of conscious implementation intentions to do something days later? I doubt it. As I observed elsewhere, consciousness of one's significantly distal implementation intentions around the time they are formed or acquired promotes conscious memory, at appropriate times, of agents' intentions to perform the pertinent actions at specific places and times, which increases the probability of appropriate intentional actions (Mele 2009, p. 143). Two of the hypotheses tested in the BSE study I mentioned by Sheina Orbell and colleagues specifically concern memory: "Women who form implementation intentions will be less likely to report forgetting to perform the behavior"; and "Memory for timing and location of behavioral performance will mediate the effects of implementation intentions on behavior" (Orbell et al. 1997, p. 948). Both hypotheses were confirmed by their data. Indeed, a remarkable finding was that of the women who were highly motivated to perform a BSE, *all* of those in the implementation-intention group "reported performing the behavior at the time and place originally specified" (p. 952; see p. 950 for a single possible exception). Imagine that these fourteen women had had only *unconscious* implementation intentions – that they had never been conscious of their implementation intentions to conduct a BSE at a specific time and place. That all fourteen women would succeed nonetheless in executing these significantly distal and relatively precise intentions – intentions specifying a place and time for a BSE – would be beyond amazing. The consciousness aspect of intentions+ seems to be doing important work here – even if in some other situations that aspect of an intention+ may be useful for little more than enabling an experimental subject to comply with instructions to report on a conscious experience of a certain kind.

4. Parting Remarks

Consider decision making by one person after consultation with a group. Imagine a person in his mid-seventies who has been diagnosed with terminal cancer. He is contemplating suicide, and he has frank discussions with his wife and adult children about this. He outlines what he takes to be the advantages of suicide in his case, and he asks for his family's reaction. He is trying to gauge whether his loved ones would be more troubled by his suicide or

by the painful deterioration that is likely if he allows his disease take its course. He sees what is best for him as intimately bound up with what is best for them. After much discussion and reflection, he decides to take his life. His intention is to wait – perhaps for a month or several months – until the quality of his life is such that, in his estimation, death would be preferable and then to execute his plan for suicide. There are obvious differences between decision-making scenarios of this kind and the laboratory scenarios described in section 1. Some of these differences should set off an internal warning signal in anyone contemplating the inference in premise 2 of the skeptical argument.

I have argued that even if it is supposed that premise 1 of the skeptical argument is true, the inference expressed in premise 2 is unwarranted. As I observed, in the experiments to which premise 1 refers, there is no reason to prefer the decided upon options to similar alternative options (and vice versa), and no place for conscious reasoning about which option to select. Furthermore, all the intentions and decisions that are supposedly investigated in these experiments are proximal or nearly proximal ones. But in many ordinary cases of decision making, we are not indifferent about our options. In some of those cases, we decide after engaging in careful conscious reasoning about pros and cons. And in many cases of this kind, the decisions we make are significantly distal ones. (The example in the preceding paragraph is a case in point.) There are notable differences, then, between the relatively trivial decisions (allegedly) made in the laboratory settings that I have described and some other decisions we seem to make. As I have explained, these differences constitute a significant obstacle to any attempt to generalize from the alleged finding that in the laboratory studies at issue consciously made decisions and conscious intentions are not among the causes of the wrist flexes and key or button presses to the conclusion (see premise 2 of the skeptical argument) that no overt actions have corresponding consciously made decisions or conscious intentions among their causes. What is more, there is, as I have explained, evidence that significantly distal conscious intentions sometimes are among the causes of corresponding actions and that our consciousness of

those intentions plays a significant role in the production of corresponding actions.⁶

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References

- Campbell, C. 1957. *On Selfhood and Godhood*. London: Allen and Unwin.
- Fischer, J., and M. Ravizza. 1992. "When the Will is Free." *Philosophical Perspectives* 6: 423-51.
- Fried, I., R. Mukamel, and G. Kreiman. 2011. "Internally Generated Preactivation of Single Neurons in Human Medial Frontal Cortex Predicts Volition." *Neuron* 69: 548-562.
- Gollwitzer, P. 1999. "Implementation Intentions." *American Psychologist* 54: 493-503.
- Gollwitzer, P., and P. Sheeran. 2006. "Implementation Intentions and Goal Achievement: A Meta-Analysis of Effects and Processes." *Advances in Experimental Social Psychology* 38: 69-119.
- Haynes, J.D. 2011. "Beyond Libet: Long-term Prediction of Free Choices from Neuroimaging Signals." In W. Sinnott-Armstrong and L. Nadel, eds. *Conscious Will and Responsibility*. Oxford: Oxford University Press, 85-96.
- Jackson, F. 2000. "Psychological Explanation and Implicit Theory." *Philosophical Explorations* 3: 83-95.
- Kane, R. 1989. "Two Kinds of Incompatibilism." *Philosophy and Phenomenological Research* 50: 219-54.
- Kim, J. 2003. "Supervenience, Emergence, Realization, Reduction." In M. Loux and D. Zimmerman, eds. *Oxford Handbook of Metaphysics*. Oxford: Clarendon Press.
- Libet, B. 1985. "Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action." *Behavioral and Brain Sciences* 8: 529-66.
- Libet, B. 2004. *Mind Time*. Cambridge, Mass. Harvard University Press.
- Mele, A. 2003. *Motivation and Agency*. Oxford: Oxford University Press.
- Mele, A. 2009. *Effective Intentions*. Oxford University Press.
- Mele, A. 2012. "Consciousness in Action: Free Will, Moral Responsibility, Data, and Inferences." In J. Larrazabal, ed. *Cognition, Reasoning, Emotion, and Action*. University of the Basque Country Press, 87-98.
- Mele, A. n.d.a. "Free Will and Substance Dualism: The Real Scientific Threat to Free Will?" In W. Sinnott-Armstrong, ed. *Moral Psychology, Volume 4: Free Will and Responsibility*. MIT Press (forthcoming).

- Mele, A. n.d.b. "Unconscious Decisions and Free Will." *Philosophical Psychology* (forthcoming).
- O'Connor, T. 2000. *Persons and Causes*. New York: Oxford University Press.
- Orbell, S., S. Hodgkins, and P. Sheeran. 1997. "Implementation Intentions and the Theory of Planned Behavior." *Personality and Social Psychology Bulletin*. 23: 945–954.
- Soon, C.S., M. Brass, H.J. Heinze, and J.D. Haynes. 2008. "Unconscious Determinants of Free Decisions in the Human Brain." *Nature Neuroscience*. 11: 543-545.
- van Inwagen, P. 1989. "When Is the Will Free?" *Philosophical Perspectives* 3: 399-422.
- Zimmerman, D. 2006. "Dualism in the Philosophy of Mind." In D. Borchert, ed. *Encyclopedia of Philosophy*, 2nd ed. Detroit: Thomson Gale, vol. 3, 113-22.