My question doesn't take us all the way to free will, but it is about a piece of the puzzle. Suppose we define *deciding* to do something, A, as a momentary action of forming an intention to A. And suppose we stipulate that such decisions are always responses to uncertainty or unsettledness about what to do. A *proximal* decision to A is (in the simplest case) a decision made now to A now. My question (below) is about closing in on the time at which proximal decisions are made.

Consider a pair of experiments by Judy Trevena and Jeff Miller (2010).

Both experiments have an "always-move" and a "sometimes-move" condition. In one experiment, participants in both conditions are presented with either an "L" (indicating a left-handed movement) or an "R" (indicating a right-handed movement) and respond to tones emitted at random intervals. In the sometimes-move condition, participants are given the following instructions: "At the start of each trial you will see an L or an R, indicating the hand to be used on that trial. However, you should only make a key press about half the time. Please try not to decide in advance what you will do, but when you hear the tone either tap the key with the required hand as quickly as possible, or make no movement at all" (p. 449). (The tone may be viewed as a *decide signal* calling for a proximal decision about whether to tap or not. Trevena and Miller write: "participants were instructed to make the spontaneous decision only when they heard the temporally unpredictable tone, and then either to tap a key quickly or to make no movement at all" [p. 448].) In the always-move condition, participants are always to tap the assigned key as quickly as possible after the tone.

Trevena and Miller examine EEG activity for the second preceding the tone and find that mean EEG "amplitudes did not differ among conditions" (p. 450). That is, there are no significant differences among pre-tone EEG amplitudes in the following three conditions: always-move; sometimes-move with movement; sometimes-move without movement. They also find that there is no significant LRP before the tone (p. 450). Trevena and Miller regard these findings as evidence that no part of pre-tone EEG represents a decision to move.

In the always-move condition, if participants follow the instructions, there is no place for proximal decisions to tap (as I have characterized such decisions). The participants know what they are supposed to do when they hear the tone. They are not uncertain or unsettled about what to do. In the sometimes-move condition, by contrast, it is up to the participants whether to tap or not when they hear the tone. So decision making would seem to be a possibility.

In a second experiment, Trevena and Miller leave it up to participants which hand to move when they hear the decide signal. As in the first experiment, there is an always-move condition and a sometimes-move condition. In the always-move condition, participants are given the following instructions: "When you hear the tone, please quickly tap with whichever hand you feel like moving. Please try not to decide in advance which hand you will use, just wait for the tone and then decide" (2010, p. 452). In the sometimes-move condition, participants are given the additional option of not tapping and are asked to tap on only about half of the trials. Trevena and Miller again found that pre-tone EEG "did not discriminate between" trials with movement and trials without movement, "LRP was absent before the tone," and LRP "was significantly

positive after the tone for trials in which a movement was made" (p. 453). They conclude that pre-tone EEG "does not necessarily reflect preparation for movement, and that it may instead simply develop as a consequence of some ongoing attention to or involvement with a task requiring occasional spontaneous movements" (p. 454).

Call the time between the sounding of the signal and switch closure *reaction time (RT)*. Here are the average RT figures for the two experiments (pp. 450, 452).

C1. Pre-selected key (no decision). 322 ms
C2. Tapping a particular key or not tapping. 355 ms
C3. Tapping key x or key y. 374 ms
C4. Whether to tap or not and, if so, whether to tap key x or key y. 408 ms

In my description of condition C4, I mean to leave two possibilities open: (1) one compound decision is made; (2) two decisions are made in rapid succession: first, whether to tap or not, and, second, which key to tap.

Question: What do you think of this way of attempting to locate proximal decisions (in time, that is), and are there better ways?