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Evolution of Free Will

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Synonyms

Freedom; Liberty; Morality; Rationality

Definition

An ability to choose among alternatives

Introduction

It has always been accepted that free will, an ability to choose among alternative actions or beliefs, is characteristically human. It seems to result from rational thought or perhaps is simply one aspect of rational thought. Because no non-human animal, we might presume, has the capacity for rational thought, none has free will either. As a result, possibilities for biological evolution of free will have never previously come up. Instead the focus has always been on how free will works in humans exclusively.

Descartes and subsequently Newton, in their mathematical descriptions of the universe, precipitated a crisis for any easy acceptance of human free will. Their approach suggested that the universe has a unique diachronic pattern. Philosophers often discuss this pattern as sequences of cause and effect. The mathematics however represents each event (for instance, the rate of change in the movement or location of any object) as an analytical function of its instantaneous context. In the twentieth century, the relativistic disposition of mass and energy and the probabilities of quantal transitions were refinements of these functions. At the scale of human behavior, however, the history of the world is uniquely determined with exceedingly high probability. The past included no alternatives and the future is predictable. Everything that has happened and everything that will happen can in principle be calculated from the present. Choices among alternatives do not occur.

As an apparent confirmation of this strict determinism, neurobiologists have argued in recent years that their results also exclude free will. The pertinent results are (1) failure to locate an area in the brain (a “module”) where neural activity is associated with “choice” or “consciousness” and (2) evidence that initiating an action precedes reporting awareness of the action by a few seconds or fractions of a second. Harris, for instance, concludes that freedom from determinism is therefore an illusion. Nevertheless, recognizing this illusion can make us more sympathetic toward less fortunate people. This recognition of course would also have to be deterministic (Harris 2012).

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These neurobiological results, however, do not justify any strong conclusion about whether or not brains make decisions. It is true that many activities of brains are more or less narrowly localized. Examples include primary sensory analysis, final motor control, memory, emotions, producing and understanding language (or species-specific songs in the case of some birds), and others. Yet there is no reason to think that some activities of the brain might, in contrast, be distributed widely. A capacity to make decisions might, for instance, depend on interactions of relatively few widely dispersed neurons, and, in addition, similar interactions might recur throughout large portions of the brain. Furthermore, the observation that reporting a movement follows initiating it indicates only that the act of reporting takes longer than the act of moving. When and where the pertinent decisions occur still elude us.

The invalidation of free will, which strict determinism entails, has deep ramifications for moral and legal judgments and for our sense of ourselves as individuals. Reluctant to accept these consequences of strict determinism, some philosophers such as Hume have thrown up their hands and accepted that, whatever else might be true, it is intuitively obvious that people routinely make practical choices. A similar position supposes that there are alternative worlds that a mind can choose. Others have proposed various cracks in determinism that could allow choices to seep into our behavior. In other words, someway that choice can originate actions, de novo, despite causes or analytical continuity. The usual procedure is to suppose that each person includes a supernatural component, beyond rational explanation, a soul, a "ghost in the machine," a "categorical imperative," a "Dasein," a self-consciousness, and a "self-forming act," something that makes decisions. Kane has proposed that some inherently random component of rationality underlies freedom of action. Dennett and Gazzaniga propose that the source of freedom is the human "social arena" in which interactions with other humans provide and expect reasons for actions (Kane 1996; Dennett 2002; Baer et al. 2008; Gazzaniga 2011).

These recent approaches do not differ much from earlier ones, back to Descartes and Hume. Adventitious internal randomness (quantum or otherwise) might explain erratic behavior but not rational choice. On the other hand, an intrinsic imperative for rational or moral choice simply displaces the origin of rational choice without explanation. Social arenas for human development can in many cases result in rationality and individual morality, but in other cases in rationalization and collective delusion, all strictly determined by context. To argue that humans can prejudicially accept the desirable alternatives, over the undesirable ones, assumes once again an unexplained moral imperative. Despite these shortcomings, attempts to understand freedom of choice have had the merit of emphasizing the two questions that must be addressed: (1) what is the source of *unpredictability* that provides an opportunity for choice and (2) what is the nature of *decision*.

Unpredictability and Decisions in Noise

A recent mathematical analysis of the evolution of communication by natural selection in the presence of noise reveals unexpected explanations for the unpredictability confronting an organism and for the organism's decisions. It provides an evolutionary context for investigating choice by supposing that all living animals (even plants) face these unpredictabilities and must make these decisions, each in its own way and within its own capabilities. Furthermore, it explains why the universe is deterministic but, for all organisms, the future nevertheless remains unpredictable. The crucial novelty of this approach is the inclusion of noise in an analysis of optimal performance in communication and perception. Noise here is anything that contributes to errors in reception of signals or in perceptions of sensations; errors in turn are responses disadvantageous to the receiver or perceiver in question; and a response can be overt or, in the case of a memory, covert (Wiley 2015, 2017, also see "▶ Evolution of Communication").

The first result of this analysis derives from signal detection theory. In the presence of noise, every receiver of any signal or perceiver of any sensation is in a double bind. Noise produces the possibility of errors, responses to signals or sensations that have net disadvantages. There are two possible kinds of errors in noise, false alarm and missed detection (errors of commission and omission). Regardless of the criteria for recognizing relevant signals or veridical sensations, it is not possible to decrease the probability of one kind of error without increasing the probability of the other.

The second result of this analysis derives from decision theory. The utility (net advantage or disadvantage) of a receiver's criterion for response depends on the intensity of the signaler's signal, and the utility of a signaler's signal depends on the stringency of the receiver's criterion for a response. Consequently, signalers and receivers evolve jointly to a mutual optimum, a Nash equilibrium at which each party does the best it can provided the other party does likewise.

The result scales to the level of noise. One prevalent determinant of the level of noise, for instance, is the distance between signalers and receivers. At close range optimal communication consists of quiet signals and lenient criteria for response. At long range the optimum consists of intense signals and stringent criteria. In all cases residual noise persists. The evolution of communication cannot escape noise. It is inevitable.

This analysis makes it clear that decisions are ubiquitous for receivers and perceivers. Every time a receiver checks its sensors, it must decide whether or not a response (or which response) is justified. Nervous systems of all types must analyze sensations and coordinate movements, but between sensation and movement, nervous systems are primarily decision-making organs.

Noise in reception or perception is not completely predictable simply because nervous systems are not complex enough to compute the dynamics of the universe. The number of neurons in a human brain is vast, but not so incomprehensibly vast as the number of interacting particles in its environment. For a brain, indeed for any practical machine, the universe is under-specified. The universe is determined but, for any brain, it remains partly unpredictable. As a result, humans remain notoriously incompetent in predicting all the consequences even of their own actions.

Unpredictability of signals and sensations thus requires decisions. These decisions, like all else in the universe, are evidently determined. Each individual's brain, like all components of every living organism, is influenced by the genes it carries and by the environment in which it lives and develops throughout its life. If a brain is complex enough to think (to use language in an internal dialogue), presumably it can weigh evidence for adopting more lenient or more stringent criteria for responses to any kind of signal or sensation. Whatever a brain thinks, as influenced by its genes and environment, is presumably determined, as are all other parts of the universe.

Nevertheless, a human brain cannot completely *predict* another comparable brain's activity. Explaining all interactions at any level of complexity would require a superordinate level of complexity. The collaboration among the brains of multiple people and workings of multiple other machines is making progress in understanding the general principles of how brains work. Who knows what superordinate complexity of thought might develop in the future. It remains unlikely, however, that a brain will ever completely understand and predict its own activity. Until that time, humans will continue to make decisions when faced with under-specified situations in the course of communication and perception in a noisy world.

An example of the interaction of predictability and decision in a deterministic universe is provided by chess. In this case the rules of the game are deterministic. They specify the possible moves and interactions of the pieces, in effect their "cause and effect" relationships. The number of possible sequences of moves in a game is unimaginably huge, but the number is finite (at least in versions excluding endless repetition of moves). Although the game has not been solved numerically, it is possible that there exists only one sequence of optimal moves. Humans nevertheless cannot predict this game from the outset – otherwise it would hardly be the challenge it is. Humans play the game by making decisions based on incomplete foresight. On the other hand, appropriately programmed computers can learn, indeed can teach themselves, to play with greater foresight than a human. Such a computer playing against itself or against another comparable (or more complex) computer would presumably often play the same sequence of moves.

A human cannot achieve this predictability because, with its more limited foresight, it cannot predict winning moves of a computer. A human's decisions are nevertheless determined. For a computer to predict every decision by a human, it would require even greater complexity. Such a machine would have to learn the relevant parameters of a human's brain and its context. With anything short of such complexity, a machine must make decisions based on its own formidable foresight and its human opponents' unpredictability.

The under-specified complexity of human behavior that humans and machines fail to predict is the same as noise, errors in reception and perception, as discussed above. This complexity is determined by physical laws. Nevertheless, for any particular brain or machine, if the parameters of this complexity are incompletely known, then the resulting unpredictability (noise) requires decisions.

In such a noisy world, we can legitimately judge competence at chess based on the decisions a player makes. In a similar way, we can judge moral competence based on a person's decisions in other situations. These judgments are our own decisions, our own responses to perceptions of other people in a noisy context, under-specified and thus partially unpredictable. Holding a person accountable for decisions in particular situations might require an additional decision on our part. We might require, for instance, a supplementary judgment of the person's competence for rational thought. These thoughts would also be determined, as discussed above. Nevertheless, our only evidence for another person's thoughts comes from our noisy perceptions of that person's responses. For nonhuman animals, for machines, and in some situations for humans, including ourselves, we might withhold such judgments of rationality and accountability. All of these judgments, it is important to realize, are decisions in under-specified situations, in other words, in response to noisy perceptions. They are not an indefinite regression of determinism, just responses to pervasive unpredictability in a noisy world. Noise affects everything we do.

As for the evolution of free will, this analysis of communication and perception in noise opens the possibility for comparative studies of decision-making and prediction. Indeed the fields of comparative psychology and ethology, as well as neurobiology, have made important progress. More could be done by including noise as well as signals in the comparative study of behavior or brains. The effects of noise only become apparent in the real, unpredictable world where a brain never knows as much as it would like about the source of the next sensation. It is important to investigate communication and perception in situations with multiple signals and receptors and variable sensations.

Cross-References

► Evolution of Communication
► Evolution of Free Will

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