

PART IV

*Long After
Consciousness*

Living with Consciousness

Why Consciousness Prevailed

Traits and functions rise or fall in the history of life depending on how much they contribute to the success of living organisms. The most direct way of explaining why consciousness has prevailed in evolution is to say that it has contributed significantly to the survival of the species so equipped. Consciousness came, saw, and conquered. It has flourished. It seems to be here to stay.

What did consciousness actually contribute? The answer is a large variety of apparent and not-so-apparent advantages in the management of life. Even at the simplest levels, consciousness helps the optimization of responses to environmental conditions. As processed in the conscious mind, images provide details about the environment, and those details can be used to increase the precision of a much-needed response, for example, the exact movement that will neutralize a threat or guarantee the capture of a prey. But image precision is only a part of the advantage of a conscious mind. The lion's share of the advantage, I suspect, comes from the fact that in a conscious mind the processing of environmental images is *oriented* by a particular set of internal images, those of the subject's living organism as represented in the self. The self focuses the mind process, it imbues the adventure of encountering other objects

and events with a motivation, it infuses the exploration of the world outside the brain with a *concern* for the first and foremost problem facing the organism: the successful regulation of life. That concern is naturally generated by the self process, whose foundation lies in bodily feelings, primordial and modified. The spontaneously, intrinsically feeling self signals directly, as a result of the valence and intensity of its affective states, the degree of concern and need that are present at every moment.

As the process of consciousness became more complex, and as co-evolved functions of memory, reasoning, and language were brought into play, further benefits of consciousness were introduced. Those benefits relate largely to planning and deliberation. The advantages here are legion. It became possible to survey the possible future and to either delay or inhibit automatic responses. An example of this evolutionarily novel capacity is delayed gratification, the calculated trading of something good now for something better later—or the forgoing of something good now when the survey of the future suggests that it will cause something bad as well. This is the trend of consciousness that brought us a finer management of basic homeostasis and, ultimately, the beginnings of sociocultural homeostasis (to which I will turn later in this chapter).

Plenty of conscious, highly successful behaviors are present in many nonhuman species with complex enough brains: the examples are evident all around us, most spectacularly in mammals. In humans, however, thanks to expanded memory, reasoning, and language, consciousness has reached its current peak. I suggest that the peak came from the strengthening of the knower self and of its ability to reveal the predicaments and opportunities of the human condition. Some may say that in that revelation lies a tragic loss, of innocence no less, for all that the revelation tells us of the flaws of nature and of the drama we face, for all the temptations it lays down before human eyes, for all the evil it unmasks. Be that as it may, it is not for us to choose. Consciousness certainly has allowed the growth of knowledge and the development of science and technology, two ways in which we can attempt to manage the predicaments and opportunities laid bare by the human conscious state.

Self and the Issue of Control

Any discussion of the advantages of consciousness must consider mounting evidence to the effect that, on many occasions, the execution of our actions is controlled by nonconscious processes. This does happen frequently enough, in all sorts of settings, and it deserves attention. It is apparent in the execution of skills, from driving a car to playing a musical instrument, and it is constantly present in our social interactions.

The evidence for nonconscious participation in our actions, solid and not so solid, can be easily misinterpreted. It is easy to downplay the value of self-directed conscious control, when it has been shown in numerous experiments, beginning with those of Benjamin Libet and including those of Dan Wegner and Patrick Haggard, that one's subjective impression of when or what initiated an action can be proven wrong.¹ It is just as easy to use such facts, along with evidence from social psychology, as an argument for the need to revise the traditional notion of human responsibility. If factors unknown to our conscious reasoning influence the shape of our acts, are we really responsible for our actions?

But the situation is far less problematic than it may seem from such superficial and unjustified reactions to findings whose interpretation is still being discussed. First, the reality of nonconscious processing and the fact that it can exert control over one's behavior are not in question. Not only that, such nonconscious control is a welcome reality from which we draw palpable advantages, as we shall see. Second, nonconscious processes are, in substantial part and in varied ways, under *conscious* guidance. In other words, there are two kinds of control of actions, conscious and nonconscious, but the nonconscious control can be partly shaped by the conscious variety. Human childhood and adolescence take the inordinate amount of time that they do because it takes a long, long time to educate the nonconscious processes of our brain

and to create, within that nonconscious brain space, a form of control that can, more or less faithfully, operate according to conscious intentions and goals. We can describe this slow education as a process of transferring part of the conscious control to an unconscious server, not as a surrender of conscious control to the unconscious forces that, to be sure, can wreak havoc in human behavior. Patricia Churchland has argued this position convincingly.²

Consciousness is not devalued by the presence of nonconscious processes. Instead, the reach of consciousness is amplified. And, assuming the presence of a normally functioning brain, the degree of one's responsibility for an action is not necessarily diminished by the presence of healthy and robust nonconscious execution of some actions.

In the end, the relationship between conscious and nonconscious processes is one more example of the odd functional partnerships that emerge as a result of coevolving processes. Of necessity, consciousness and direct conscious control of actions emerged after nonconscious minds were in place, running the show with plenty of good results but not always. The show could be improved. Consciousness came of age by first restraining part of the nonconscious executives and then exploring them mercilessly to carry out preplanned, predecided actions. Nonconscious processes became a suitable and convenient means to execute behavior and give consciousness more time for further analysis and planning.

When we walk home thinking about the solution of a problem rather than about the route we take, but still do get home safe and sound, we have accepted the benefits of a nonconscious skill that was acquired in many previous conscious exercises, following a learning curve. While we were walking home, all that our consciousness needed to monitor was the general goal of the trip. The rest of our conscious processes were free for creative use.

Much the same applies to the professional behaviors of musicians and athletes. Their conscious processing is focused on achieving goals, reaching certain marks at certain epochs, avoiding some perils of execu-

tion, and detecting unforeseen circumstances. The rest is practice, practice, practice, the second nature that can guide you to Carnegie Hall.

Last, the conscious-unconscious cooperative interplay also applies in full to moral behaviors. Moral behaviors are a skill set, acquired over repeated practice sessions and over a long time, informed by consciously articulated principles and reasons but otherwise "second-natured" into the cognitive unconscious.

In conclusion, what is meant by conscious deliberation has little to do with the ability to control actions in the moment and everything to do with the ability to plan ahead and decide which actions we want or do not want to carry out. Conscious deliberation is largely about decisions taken over extended periods of time, as much as days or weeks in the case of some decisions, and rarely less than minutes or seconds. It is not about split-second decisions. Common knowledge regards lightning-speed choices as "thoughtless" and "automatic."³ Conscious deliberation is about *reflection over knowledge*. We apply reflection and knowledge when we decide on important matters in our lives. We use conscious deliberation to govern our loves and friendships, our education, our professional activities, our relations to others. Decisions pertaining to moral behavior, narrowly or broadly defined, involve conscious deliberation and take place over extended time periods. Not only that, such decisions are processed in an offline mental space that overwhelms external perception. The subject at the center of conscious deliberations, the self in charge of the prospection of the future, is often distracted from external perception, inattentive to its vagaries. And there is a very good reason for this distraction in terms of brain physiology: the image-processing brain space, as we have seen, is the sum total of early sensory cortices; this same space needs to be shared by conscious reflection processes *and* direct perception; it is hardly up to the task of handling both without favoring one or the other.

Conscious deliberation, under the guidance of a robust self built on an organized autobiography and a defined identity, is a major consequence of consciousness, precisely the kind of achievement that gives

the lie to the notion that consciousness is a useless epiphenomenon, a decoration without which brains would run the life-management business just as effectively and without the hassle. We cannot run our kind of life, in the physical and social environments that have become the human habitat, without reflective, conscious deliberation. But it is also the case that the products of conscious deliberation are significantly limited by a large array of nonconscious biases, some biologically set, some culturally acquired, and that the nonconscious control of action is also an issue to contend with.

Still, most important decisions are taken long before the time of execution, within the conscious mind, when they can be simulated and tested and where conscious control can potentially minimize the effect of nonconscious biases. Eventually the exercise of decisions can be honed into a skill with the help of nonconscious mind processing, the submerged operations of our mind in matters of general knowledge and reasoning often referred to as the cognitive unconscious. Conscious decisions begin with reflection, simulation, and testing in the conscious mind; that process can be completed and rehearsed in the nonconscious mind, from which freshly selected actions can be executed. The conscious as well as the nonconscious components of this complex and fragile decision and execution device can be derailed by the machinery of appetites and desires, in which case a last recourse veto is not likely to be effective. Split-second vetoes remind us of a well-known recommendation on the matter of drug addiction: "Just say no." This strategy may be adequate when one has to preempt an innocuous finger movement, but not when one needs to stop an action urged by a strong desire or appetite, precisely the kind posed by any addiction to drugs, alcohol, attractive foods, or sex. Successful nay-saying requires a lengthy conscious preparation.

An Aside on the Unconscious

Thanks to the fact that our brains have successfully combined the new governance made possible by consciousness with the old governance that consisted of unconscious, automatic regulation, nonconscious brain processes are up to the tasks they are supposed to perform on behalf of conscious decisions. Some suitable evidence can be gleaned from a remarkable study by the Dutch psychologist Ap Dijksterhuis.⁴ To appreciate the importance of the results, we need to describe the setting. Dijksterhuis asked the normal subjects of his experiment to make purchasing decisions in two different conditions. In one condition, they applied mostly conscious deliberation; in the other, as a result of manipulated distraction, they could not deliberate consciously.

There were two kinds of items to purchase. One consisted of trivial household items, such as toasters and hand towels; the other consisted of big-ticket items, such as cars or houses. For either kind, the subject was given ample information about the pros and cons of each item, a sort of consumer report complete with price tag. Such information would have come in handy when asked to pick the "best" possible item for purchase. But when decision time came, Dijksterhuis allowed some subjects to study the item information for three minutes before making a choice, while he denied that privilege to the others and distracted them during those same three minutes. For both kinds of items, trite and nontrite, subjects were tested in both conditions, with an attentive three-minute study or with a distraction.

What would you predict regarding the quality of decisions? A perfectly reasonable prediction would be that when it comes to the trivial household items, subjects would make good picks in either conscious or unconscious deliberation, given the low import and complexity of the problem. Deciding between two toasters, even if you are fussy, is hardly rocket science. But, regarding the big-ticket items—like which four-door sedan to buy—one would expect that the subjects allowed to study the information would make the more successful decisions.

The results were surprisingly different from these predictions. Decisions made without conscious predeliberation fared better for both kinds of item but especially for the big-ticket items. The superficial conclusion is as follows: if you are buying a car or a house, get acquainted with the facts, but then don't fret and worry about minute comparisons along the matrix of possible advantages or disadvantages. Just do it. So much for the glories of conscious deliberation.

Needless to say, the intriguing results should not discourage anyone from conscious deliberation. What they do suggest is that nonconscious processes are capable of some sort of reasoning, far more than they are usually thought to be, and that this reasoning, once it has been properly trained by past experience and when time is scarce, may lead to beneficial decisions. In the circumstances of the experiment, the attentive, conscious pondering that goes on, especially with the big-ticket items, does not yield the best result. The high number of variables under consideration and the restricted space of conscious reasoning—restricted by the limited number of items that can be attended to at any given time—reduce the probability of making the best choice given the limited time window. The unconscious space, on the contrary, has a far larger capacity. It can hold and manipulate many variables, potentially producing the best choice in a small window of time.

Besides what it tells us about nonconscious processing in general, the Dijksterhuis study points to other important issues. One regards the amount of time needed for a decision. Perhaps you could pick the absolute best restaurant for tonight if you had all afternoon to examine the latest food reviews, the cost of items on the menus, and the locations, and compare these to your preferences, your mood, and the state of your bank account. But you do not have the entire afternoon. Time counts, and you must apportion only a “reasonable” amount of time to the decision. Reasonableness depends, of course, on the importance of the matter you are deciding. Given that you do not have all the time in the world and rather than making a huge investment in massive computation, a few shortcuts are in order. And the good news is that past emo-

tional records will help you with the shortcuts and that our cognitive unconscious is a good provider of such records.

All this goes to say that I very much like the notion that our cognitive unconscious is capable of reasoning and has a larger “space” for operations than the conscious counterpart. But a critical element for the explanation of these results relates to the subject's prior emotional experience with items similar to the varied big-ticket items in the experiment. The nonconscious space is wide open and suitable for this covert manipulation, but it works to one's advantage largely because certain options are nonconsciously marked by a bias connected to previously learned emotional-feeling factors. I believe that the conclusions on the merits of *un*-consciousness are correct, but our notion of what goes on beneath the glassy surface of consciousness is much enriched when we factor emotion and feeling into the nonconscious processes.

The Dijksterhuis experiment illustrates the combination of unconscious and conscious powers. Unconscious processing alone could not do the job. In these experiments, unconscious processes do a lot of work, but the subjects have benefited from years of conscious deliberation during which their nonconscious processes have been repeatedly trained. Moreover, while nonconscious processes do their due diligence, the subjects remain fully conscious. Unconscious patients under anesthesia or in coma do not make decisions about the real world any more than they enjoy sex. Again, it is the felicitous synergy of the covert and overt levels that carries the day. We feed on the cognitive unconscious quite regularly, throughout the day, and discreetly outsource a number of jobs, including the execution of responses, to its expertise.

Outsourcing expertise to the nonconscious space is what we do when we hone a skill so finely that we are no longer aware of the technical steps needed to be skillful. We develop skills in the clear light of consciousness, but then we let them go underground, into the roomy basement of our minds, where they do not clutter the exiguous square footage of conscious reflection space.

The Dijksterhuis experiment adds a flourish to an ongoing research effort regarding the role of nonconscious influences in decision tasks. Early in that effort, our research group had presented decisive evidence in this regard.⁵ For example, we showed that when normal subjects are playing a card game that involves both gains and losses under conditions of risk and uncertainty, the players begin to adopt a winning strategy slightly ahead of being able to articulate why they are doing so. For some minutes preceding their adoption of the advantageous strategy, the subjects' brains produce differential psychophysiological responses whenever they ponder taking a card from one of the bad decks, those that promote losses, while the prospect of lifting a card from a good deck generates no such response. The beauty of the result resides with the fact that the psychophysiological responses, which, in the original study were measured with skin conductance, are *not* perceivable by either the subject or the naked eyes of an observer. They occur under the radar of the subject's consciousness, just as stealthily as the behavioral drift toward the winning strategy.⁶

What exactly is going on is not entirely clear yet, but whatever it is, in-the-moment consciousness is not a requirement. It may be that the nonconscious equivalent of a conscious gut feeling "jolts" the decision-making process, as it were, biasing the nonconscious computation and preventing the selection of the wrong item. In all likelihood, there is an important reasoning process going on nonconsciously, in the subterranean mind, and the reasoning produces results without the intervening steps ever being known. Whatever the process is, it produces the equivalent of an *intuition* without the "aha" acknowledgment that the solution has arrived, just a quiet delivery of the solution.

The evidence for nonconscious processing has increased unabated. Our economic decisions are not guided by pure rationality and are significantly influenced by powerful biases such as the aversion to losses and the delight in gains.⁷ The way we interact with others is influenced by a large array of biases having to do with gender, race, manners, accents, and attire. The setting of the interaction brings its own set of

biases, linked to familiarity and design. The concerns and emotions we were experiencing prior to the interaction play an important role too, as does the hour of the day: Are we hungry? Are we sated? We express or give indirect signs of preferences for human faces at lightning speed without having had time to process consciously the data that would have backed up a corresponding reasoned inference, which is all the more reason to be extra careful with important decisions in our personal and civic lives.⁸ To let the unconscious sway of past emotion guide your choice of a house is fine, provided you stop and reflect carefully on what the unconscious is offering you as an option before you sign the contract. You may conclude that the choice is not valid based on the reanalysis of the data, regardless of how you intuitively judged the situation, because, for example, your past experiences in this domain are atypical, biased, or insufficient. This is all the more important if you are voting in an election or on a jury. One of the major problems faced by voters in political elections and in courtroom trials is the strength of emotional/nonconscious factors. The power of nonconscious, emotional factors is so well recognized that a perfectly monstrous machinery of electoral influence has developed as an industry over the past few decades, along with less publicized but equally sophisticated methods of influential jury selection.

Reflection and reassessment, fact checks, and reconsideration are of the essence. Here is a great occasion to invest in extra decision time, preferably before entering the voting booth or handing your vote to the jury foreman.

All these findings exemplify situations in which nonconscious influences, emotional or not, and nonconscious reasoning steps have a bearing on the outcome of a task. But the subjects are very much conscious when they are given the premises of the task, as well as when the decision occurs, and they are informed of the outcomes of their actions. It is clear that these are examples of nonconscious components of otherwise conscious decisions. They let us glean the complexity and variety of mechanisms behind the facade of allegedly perfect conscious control,

but they do not deny our deliberative powers and do not free us from responsibility for our actions.

A Note on the Genomic Unconscious

A brief note is in order regarding the genomic unconscious, one of the hidden forces that conscious deliberation needs to contend with. What do I mean by genomic unconscious? Quite simply, the colossal number of instructions that are contained in our genome and that guide the construction of the organism with the distinctive features of our phenotype, in both body proper and brain, and that further assist with the operation of the organism. The basic design of our brain circuitries is instructed by the genome, and that basic design contains the very first repertoire of nonconscious know-how with which our organisms can be governed. The know-how has to do first and foremost with life regulation, issues of life and death, and reproduction; but precisely because of the centrality of those issues, the design promotes a number of behaviors that may appear to be decided by conscious cognition but are in fact driven by nonconscious dispositions. The spontaneous preferences one manifests early in life, regarding food and drink and mates and habitats, are driven in part from the genomic unconscious, although they can be modulated and modified by individual experience throughout development.

Psychology has long recognized the existence of unconscious foundations of behavior and studied them under the rubrics of instinct, automatic behaviors, drives, and motivations. What has changed recently is the realization that the early placement of such dispositions in the human brain is under considerable genetic influence and that, notwithstanding all the shaping and remodeling we undertake as conscious individuals, the thematic scope of such dispositions is wide and their pervasiveness astonishing. This is especially notable regarding some of the dispositions on which cultural structures have been built. The genetic unconscious had something to say about the early shaping

of the arts, from music and painting to poetry. It had something to do with the early structuring of the social space, including its conventions and rules. It had something to do, as both Freud and Jung certainly sensed, with many aspects of human sexuality. It had a lot to contribute to the fundamental narratives of religion and to the time-honored plots of plays and novels, which revolve in no small part around the force of genomically inspired emotional programs. Blindly set jealousy, impervious to common sense, hard evidence, and reason, drives Othello to kill the perfectly innocent Desdemona, and Karenin to punish the adulterous Anna Karenina so harshly. Iago's monumental malevolence would probably not have worked were it not for Othello's natural vulnerability to jealousy. The cognitive asymmetry of sexuality in men and women, many parameters of which are engraved in our genomes, lurks behind the behavior of these characters and keeps them ever modern. The intense male aggression of Achilles, Hector, and Ulysses has equally deep roots in the genetic unconscious. The same may be said of two characters, Oedipus and Hamlet, destroyed either by the breaking of the incest taboo or by the unstated inclination to break it. The Freudian interpretation of these timeless characters merges with their evolutionary origins, pointing to some highly frequent features of human nature. Theater and the novel, as well as film, their twentieth-century heir, have greatly benefited from the genomic unconscious.

The genomic unconscious is partly responsible for the sameness that hallmarks the repertoire of human behavior. How remarkable it is, then, that we consistently break away from monotonous universals and instead, by dint of artistry or the sheer magic of a human encounter, create an infinite set of life variations that delights and astonishes.

The Feeling of Conscious Will

How frequently are we guided by a well-rehearsed cognitive unconscious, trained under the supervision of conscious reflection to observe consciously conceived ideals, wants, and plans? How frequently are

we guided by unconscious, deeply set, biologically ancient biases, appetites, desires? I suspect that most of us, weak but well-meaning sinners, operate on both registers, more on one or more on the other, depending on the situation and the hour of the day.

Whatever register we operate on, somewhat virtuous or somewhat not, in-the-moment acting is inevitably accompanied by the impression, sometimes false, sometimes not, that we acted there and then, under full conscious control our self plunged headlong into whatever we did. That impression is a *feeling*, a feeling that arises when our organisms engage in a new perception or initiate a new action, none other than the feeling of knowing that I discussed earlier as part and parcel of the assembled self. Someone who shares this view is Dan Wegner, who describes conscious will as “the somatic marker of personal authorship, an emotion that authenticates the action’s owner as the self. With the feeling of doing an act, we get a conscious sensation of will attached to the action.”⁹ In other words, we are not mere “conscious automata,” as T. H. Huxley considered us to be, a century ago, unable to control our existence.¹⁰ When the mind is informed of the actions taken by our organism, the feeling associated with the information signifies that the actions were engendered by our self. Both information and authentication of ongoing actions are essential to motivate the deliberation of future actions. Without that sort of felt, validated information, we would not be able to assume moral responsibility for the actions taken by our organism.

Educating the Cognitive Unconscious

Greater control over the vagaries of human behavior can come only from an accumulation of knowledge and from consideration of the discovered facts. Taking the time to analyze facts, to evaluate the outcome of decisions, and to ponder the emotional results of those decisions is the path to building a practical guide otherwise known as wisdom. On the basis of wisdom, we can deliberate and hope to steer our behavior

within the frame of cultural conventions and ethical rules that have informed our biographies and the world we live in. We can also react to those conventions and rules, face the conflict that ensues when we disagree with them, and even attempt to modify them. A good example is the conflict faced by conscientious objectors.

No less important, we need to be aware of the peculiar hurdle faced by our consciously deliberated decisions—they have to find a way into the cognitive unconscious in order to permeate the action machinery—and we need to facilitate that influence. One way to transpose the hurdle would be the intense conscious rehearsal of the procedures and actions we wish to see nonconsciously realized, a process of repeated practice that results in mastering a *performing skill*, a consciously composed psychological action program gone underground.

I am not inventing anything new here but merely outlining a practical mechanism deduced from what I presume the neural operations of decision and action must be like. For millennia wise leaders have turned to a comparable solution when they asked followers to observe disciplined rituals whose side effect must have been a gradual imposition of consciously willed decisions on nonconscious action processes. Not surprisingly, those rituals often involved the creation of heightened emotions, even pain, an empirically discovered means of etching the desired mechanism in the human mind. What I am envisioning, however, extends well beyond religious and civic rituals to encompass day-to-day life matters bearing on a variety of areas. I am thinking, in particular, about matters of health and social behavior. Our insufficient education of nonconscious processes probably explains, for example, why so many of us fail miserably to do what we are supposed to do regarding diet and exercise. *We think* we are in control, but we often are not, and the epidemics of obesity, hypertension, and heart disease prove that we are not. Our biological makeup inclines us to consume what we should not, but so do the cultural traditions that have drawn on that biological makeup and been shaped by it, and even the advertising industry that exploits it. There is no conspiracy here. It is only natural. Perhaps this is a good place for ritualized skill building, if that is what it takes.

The same applies to the epidemic of drug addiction. One reason so many individuals become addicted to all manner of drugs, not to mention alcohol, has to do with the pressures of homeostasis. In the natural course of a day, we inevitably face frustrations, anxieties, and difficulties that throw homeostasis off balance and consequently may make us feel unwell, perhaps anguished, discouraged, or sad. One effect of the so-called substances of abuse is to restore the lost balance rapidly and transiently. How do they do so? I believe they change the felt image that the brain is currently forming of its body. The state of off-balance homeostasis is neurally represented as an impeded, troubled body landscape. After certain drugs, at certain dosages, the brain represents a more smoothly functioning organism. The suffering that corresponds to the former felt image morphs into temporary pleasure. The brain's appetite system has been hijacked, and the eventual result is not quite the sought-after rebalancing of homeostasis, at least not for long. Nonetheless, rejecting the possibility of rapid correction of suffering takes enormous effort, even for those who already know that the correction is short-lived and the consequences of the choice may be dire. In the framework I have outlined, there is an obvious reason for this state of affairs. The nonconscious homeostatic demand is in natural control and can be opposed only by a well-trained and powerful counterforce. Spinoza seems to have had the right idea when he said that an emotion with negative consequences could be countered only by another, more powerful emotion. What this possibly means is that merely training the nonconscious process to politely decline is hardly a solution. The nonconscious device must be trained by the conscious mind to deliver an emotional counterpunch.

Brain and Justice

Biologically informed conceptions of conscious and unconscious control are relevant to how we live and especially to how we should live.

But perhaps the relevance is nowhere more important than on issues that regard social behavior—in particular, the sector of social behavior known as moral behavior—and the breaking of the social agreements codified in laws.

Civilization, and in particular the aspect of civilization that has to do with justice, revolves around the notion that humans are conscious in ways in which animals are not. By and large, cultures have evolved justice systems that take a commonsense approach to the complexities of decision-making and aim at protecting societies from those who violate established laws. Understandably, and with rare exceptions, the weight given to evidence coming from brain science and cognitive science has been negligible.

Now there is a growing fear that evidence regarding brain function, as it becomes more widely known, may undermine the application of laws, something that legal systems have by and large avoided by not taking such evidence into account. But the response has to be nuanced. The fact that everyone capable of knowing is responsible for his actions does not mean that the neurobiology of consciousness is irrelevant to the process of justice and to the process of education charged with preparing future adults to an adaptive social existence. On the contrary, lawyers, judges, legislators, policy-makers, and educators need to acquaint themselves with the neurobiology of consciousness and decision-making. This is important to promote the writing of realistic laws and to prepare future generations for responsible control of their actions.

In certain cases of brain dysfunction, even the best-exercised deliberation may fail to overpower forces either nonconscious or conscious, it does not matter. We are barely beginning to glean the profile of such cases, but we do know, for example, that patients with certain kinds of prefrontal damage may be unable to control their impulsivity. The way in which such individuals control their actions is not normal. How are they to be judged when they come under the purview of justice? As criminals or as neurological patients? Perhaps both, I would say. Their

neurological disease should in no way pardon their actions, even if it may explain aspects of a crime. But if they are neurologically sick, then they are indeed patients, and society needs to handle them accordingly. A current tragedy in this regard is that we are just beginning to understand these facets of neurological disease; once the conditions are diagnosed, we have very little to offer in terms of treatment. But that in no way limits society's responsibility regarding the understanding and public debate of the available knowledge, and the need for further research on these matters.¹¹

Some other patients, in whom the prefrontal damage is concentrated on the ventromedial sector, judge hypothetical moral dilemmas in a very practical, utilitarian manner that has little or no use for the better angels of the human spirit. And when such patients are confronted with, say, a hypothetical case of attempted murder that did not result in death in spite of a murderous intent, they do not judge the situation as significantly different from that of an accidental and unintended killing. In fact, they may even find the former situation more permissible.¹² The way in which such individuals understand motives, intents, and consequences is unconventional, to say the least, even if in their daily lives they probably would not harm a fly. We still have much to learn about how the human brain processes judgments of behavior and controls actions.

Nature and Culture

The history of life is shaped like a tree with numerous branches, each leading out to different species. Even species that are not at the end of a high branch can be superbly intelligent within their own zoological neighborhood. Their achievements should be judged relative to that neighborhood. Still, when we take the long view of the tree of life, we cannot fail to recognize that organisms do progress from simple to complex. In that perspective it is reasonable to wonder when consciousness

appeared in the history of life. What did it do for life? If we scan biological evolution as an unpremeditated march up the tree of life, the sensible answer is that consciousness appeared quite late, high in the tree. There is no sign of consciousness in the primordial soup or in bacteria, in unicellular or simple multicellular organisms, in fungi or plants, all interesting organisms that exhibit elaborate life-regulation devices, precisely those devices whose accomplishments consciousness will improve upon at a later date. None of those organisms has a brain, let alone a mind. In the absence of neurons, behavior is limited and mind not possible, and if there is no mind, there is no consciousness as such, only precursors of consciousness.

When neurons make their appearance, life changes remarkably. Neurons emerge as a variation on the theme of other body cells. They are made up of the same components as other cells, they go about their general business in the very same way, and yet they are special. Neurons become carriers of signals, processing devices capable of transmitting messages and receiving them. By virtue of those signaling capabilities, neurons organize themselves in complex circuits and networks. In turn, circuits and networks represent events occurring in other cells and, directly or indirectly, influence the function of other cells and even their own function. Neurons are through and through *about* other cells in the body, although they do not lose their body cell status just because they have acquired the ability to transmit signals electrochemically, dispatch those signals to a variety of places in an organism, and constitute circuits and systems of enormous complexity. They are body cells, exquisitely dependent on nutrients as all body cells are, differing mostly in their ability to play tricks that other body cells cannot play, and firmly set on their attitude to live long, if possible as long as their owners. The body-brain separation has been somewhat exaggerated since the neurons that make up the brain *are* body cells, something that does have a bearing on the body-mind problem.

Once neurons are in place inside organisms capable of movement, life changes in a way that nature denied to plants. A relentless progres-

sion of functional complexity begins, from ever more elaborate behaviors to mind processes and eventually to consciousness. One secret behind this complexification is now clear. It has to do both with the sheer number of neurons available in a given organism and, just as important, with the patterns in which they are organized as circuits of gradually larger and larger scales, all the way up into macroscopic brain regions that form systems with intricate functional articulations. The combined significance of neuron numbers and organization pattern is the reason why it is not possible to approach the problems of behavior and mind by relying exclusively on the investigation of individual neurons, or of the molecules that act on them, or of the genes involved in the running of their life. Studying individual neurons, microcircuits, molecules, and genes is indispensable in order to understand the problem comprehensively. But the mind and behavior of apes and humans are so different because of the *number* of brain elements and the *pattern* of organization of those elements.

Nervous systems developed as managers of life and curators of biological value, assisted at first by unbrained dispositions but eventually by images, that is, minds. The emergence of mind produced spectacular improvements in life regulation for numerous species, even when images lacked fine detail and lasted only during the perceptual moment, entirely vanishing thereafter. The brains of social insects are an example of those achievements, amazingly sophisticated and yet somewhat inflexible, vulnerable to interruptions of their behavioral sequences, and not yet capable of holding representations in a temporary working memory space. Minded behavior became very complex in numerous nonhuman species, but it is arguable that the flexibility and creativity that hallmark human performance could not have emerged from a generic mind alone. The mind had to be protagonized, had to be enriched by a self process arising in its midst.

Once self comes to mind, the game of life changes, albeit timidly at

first. Images of the internal and external worlds can be organized in a cohesive way around the protoself and become oriented by the homeostatic requirements of the organism. Then the devices of reward and punishment and drives and motivations, which had been shaping the life process in earlier stages of evolution, help with the development of complex emotions. Then social intelligence begins to be flexible. The eventual presence of the core self is followed by an expansion of mental processing space, of conventional memory and recall, of working memory, and of reasoning. Life regulation focuses on a gradually more well-defined individual. Eventually the autobiographical self emerges, and with its arrival the regulation of life changes radically.

If nature can be regarded as indifferent, careless, and unconscionable, then human consciousness creates the possibility of questioning nature's ways. The emergence of human consciousness is associated with evolutionary developments in brain, behavior, and mind that ultimately lead to the creation of culture, a radical novelty in the sweep of natural history. The appearance of neurons, with its attending diversification of behavior and paving of the way into minds, constitutes a momentous event in the grand trajectory. But the appearance of conscious brains eventually capable of flexible self-reflection is the next momentous event. It is the opening of the way into a rebellious, albeit imperfect response to the dictates of a careless nature.

How did the independent and rebellious mind develop? One can only speculate, and the pages ahead are a mere sketch of an immensely complex picture that cannot be accommodated in a single book, let alone a chapter. Nonetheless we can be certain that the rebel did not develop suddenly. Minds constituted by maps of diverse sensory modalities were helpful in improving life regulation, but even when the maps became properly felt mental images, they were not independent, let alone rebellious. Felt images of the organism's interior made for improved survival and created a potentially nice spectacle but there was no one to watch it. When minds first added a core self to their stock, which is when consciousness really began, we were getting closer to the

