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Body in Mind: The Role of the Body in Damasio's Theory of Emotion

Keywords
Antonio Damasio, emotions, body, mind, embodied cognition

Abstract
In the last few decades, emotion became one of the central topics in many scientific disciplines. Neuroscientific research has developed many tools and approaches for studying emotions in humans and animals. In this regard, the work of Antonio Damasio has been important for uncovering physiological mechanisms of emotions and feelings and their role in homeostatic regulation. In some aspects, his theory has challenged our own everyday intuitions about what emotions are. The aim of this article is to show that Damasio's account of affects has underlined the importance of the body in generating feelings and subjective conscious experience and that this view of the two-way communication between the body and brain can offer a fresh perspective on the mind-body problem.

Telo v umu: vloga telesa v Damasijevi teoriji čustev

Ključne besede
Antonio Damasio, čustva, telo, um, utelešena kognicija

Povzetek
V zadnjih nekaj desetletjih je čustvo postalo ena izmed osrednjih tem v številnih znanstvenih disciplinah. Nevroznanstvene raziskave so razvile veliko orodij in pristopov za preučevanje čustev pri ljudeh in živalih. V tem smislu je delo Antonia Damasia pomembno pri odkrivanju fizioloških mehanizmov čustev in občutkov ter njihove vloge pri homeostatski regulaciji. V nekaterih vidikih je njegova teorija izzvala našo vsakodnevno intuicijo o tem, kaj so čustva. Namen tega članka je pokazati, da Damasijev opis afektov poudarja pomen telesa pri generiranju občutkov in subjektivnih zavestnih

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izkušenj ter da lahko ta pogled na dvosmerno komunikacijo med telesom in možgani ponudi svež vpogled v dualizem uma in telesa.

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Introduction

Emotions are ubiquitous in our mental life and integral to our experience of the world. It seems surprising, therefore, that for most of the 20th century, they were excluded from any serious scientific research. One of the reasons for this seems to be that scientists, under the influence of behaviorist theories, generally rejected the study of mental phenomena such as feelings, perceptions, and volitions.[1] Also, at first glance, some aspects of human affect seem so closely related to strictly subjective experience that they cannot be studied scientifically. The situation has changed, however, and in recent decades, emotions have become one of the central topics in various scientific disciplines. In particular, neuroscience research has developed many efficient and rigorous methodologies for studying emotions in humans and animals.

Because we all experience affect,[2] we tend to hold on to our (often unjustified) intuitions about what emotions are. We may believe that they are irrational, irreducible, and purely subjective experiences triggered by certain stimuli, or that different emotions are located in different parts of the brain. Neuroscience research helps us figure out how emotions arise in the brain and what function they have in regulating life, which is not always what we believe. In this sense, the work of neuroscientist Antonio Damasio[3] has been indispensable in understanding the role and mechanisms of emotions and subjective feelings. It is argued in this text that his interdisciplinary research has underscored the fact that that emotions and feelings arise from the body, which is still sometimes neglected in our everyday thinking about human affect. Moreover, this understanding

1 Andrea Scarantino and Ronald de Sousa, "Emotions," Stanford Encyclopedia of Philosophy, September 25, 2018, https://plato.stanford.edu/entries/emotion/.

2 Here, the term "affect" is interchangeable with "emotion."

3 Antonio Damasio (1944) is a renowned Portuguese-American neuroscientist, professor, author of numerous books and research articles. His main focus has been on emotion, decision-making, memory, and consciousness.

can further explain how, through bodily experience, emotions and feelings help to generate the conscious mind.

In what follows, I will focus mainly on Damasio's contribution in his book *Looking for Spinoza*,[4] which discusses in more detail the architecture of emotions, feelings, and their role in life. In Damasio's work, there is a constant dialogue with his predecessors who were interested in the same questions (two of them, Descartes and Spinoza, even made it to the title of his books).

Damasio claims in an interview[5] that early in his career he studied neurological injuries. However, when he observed that patients who had suffered forebrain injury lacked normal emotional reactions, he became interested in how emotion influences high-level cognition, especially decision-making. This was the idea behind his "somatic marker" hypothesis, which led to many subsequent experiments in the United States and Europe and had a major impact on science and philosophy.

The Legacy of William James

The theory of emotions by William James, an American philosopher and psychologist, is often cited, acknowledged, and commented upon in Damasio's work. James argued that unlike his time, bodily changes precede the emotional state and not vice versa: "We feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful, as the case may be. Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colourless, destitute of emotional warmth."[6] To his scientific colleagues, James' theory of emotion seemed quite shocking, and he faced much criticism, even from leading physiologists of his time such as Charles Sherrington and Walter Cannon. Indeed, controversies and misunderstandings about James' theory contin-

4 Antonio Damasio, *Looking for Spinoza: Joy, Sorrow and the Feeling Brain* (Orlando: Harvest, 2003).

5 Antonio Damasio, "Feeling Our Emotions," interview by Manuela Lenzen, *Scientific American Mind* 16, no. 1 (April 2005): 14–15, https://doi.org/10.1038/scientificamericanmind0405-14.

6 William James, "What is an Emotion?," *Mind* 9, no. 34 (April 1884): 190, https://doi.org/10.1093/mind/os-IX.34.188.

ue to this day, although there has been a recent renewal of interest in his positions. However, the importance of his ideas cannot be ignored: he was one of the first to emphasize the role of the felt, lived body: "Our whole cubic capacity is sensibly alive; and each morsel of it contributes its pulsations of feeling, dim or sharp, pleasant, painful, or dubious, to that sense of personality that every one of us unfailingly carries with him."[7]

Damasio's position is in some ways an elaboration of James' original proposal, although in his later work he made some of his own criticisms, such as James giving too little importance to the evaluative phase or to cognitive changes.[8] But none of these comments in any way detract from James' contribution to the theory of emotion. Like James, Damasio also foregrounds the role of the body in human affect, which I will discuss in more detail in the following sections.

Emotions and Feelings

One of the most important points in Damasio's theory of emotion is the distinction he establishes between emotion and feeling for the purpose of his analysis. This is in fact in contrast to our everyday language, where we often use the two words interchangeably. Emotions, which precede feelings in the complex chain of events, are what he calls "public" and "visible" (be it inside or outside) because they consist of complex reactions that take place in our bodies in response to certain stimuli. They include all kinds of physiological changes, such as heart rate, blood pressure, sweating, dilation or contraction of muscles, etc. This part of affect occurs automatically, and we usually have little or no control over it. Feelings, on the other hand, are conscious experiences of emotion and arise only after we have become aware of our altered physiological state. They are always hidden and known only to the owner in whose brain they occur.

This distinction between the physiological manifestation of affect and its conscious experience is generally well accepted in academic literature, but there

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7 James, 192.

8 See Antonio Damasio, "Toward a Neurobiology of Emotion and Feeling: Operational Concepts and Hypotheses," *Neuroscientist* 1, no. 1 (January 1995): 19–25, https://doi.org/10.1177/107385849500100104.

is often little agreement on the use of terminology.[9] Some scientists, such as Joseph E. LeDoux, who has conducted some of the most influential studies on fear conditioning in rats, even want to do away with the use of the word "emotion" altogether. He argues that the term is not well defined and that scientists disagree on what emotions actually are and how they differ from other aspects of mind and behavior.[10] Instead, for the purposes of animal research, he suggests the terms "survival circuits" and "behavioral responses," while the word "emotion" should be reserved for subjective experiences, because in LeDoux's opinion, subjective emotions in animals are only assumed based on our intuitions and assumptions, since the way we humans respond behaviorally to certain stimuli is similar.[11] In terms of terminology, the problem raised by LeDoux can be avoided: it is important to clearly define the scientific use of terms such as "emotion" and "feeling." If, according to Damasio (and numerous other scientists), emotional states compared to feelings are observable and thus measurable in different ways (externally through behavior and internally through physiological changes), we can study their implementation in both humans and animals. On the other hand, the scientific study of subjective feelings is limited to humans because they are the only ones who possess language. In contemporary neurocognitive research, first-person verbal reports are often combined with non-invasive brain imaging techniques.

Mechanisms of Emotion

Every emotional process begins with an emotionally salient stimulus and some of these triggers are set by evolution. For example, Melis Yilmas and Markus Meister[12] describe innate defensive behavioral response elicited in lab mice when a looming visual disk, simulating a flying hawk, is produced, even though the mice have never encountered that predator in the wild before. Other triggers

9 See Ralph Adolphs and David J. Anderson, *The Neuroscience of Emotion: A New Synthesis* (Princeton: Princeton University Press, 2018).

10 Joseph E. LeDoux, "Rethinking the Emotional Brain," *Neuron* 73, no. 4 (February 2012): 653–76, https://doi.org/10.1016/j.neuron.2012.02.004.

11 Joseph E. LeDoux, "What Emotions Might Be Like in Other Animals," *Current Biology* 31 (July 2021): R821–37, https://doi.org/10.1016/j.cub.2021.05.005.

12 Melis Yilmaz and Markus Meister, "Rapid Innate Defensive Responses of Mice to Looming Visual Stimuli," *Current Biology* 23, no. 20 (October 2013): 2011–15, https://doi.org/10.1016/j.cub.2013.08.015.

come with experience and are learned later in life when our brains associate emotions with certain salient objects, people or situations (e.g. in PTSD).

Next, the stimulus is processed in one of the sensory systems, such as the auditory or visual cortices.[13] The neural representations of the stimulus in the sensory regions are quickly made available, and the corresponding neuronal patterns[14] are transmitted to other brain areas that are the immediate cause of an emotion. Activity at these sites can also be induced by applying electrical stimulation[15] of the corresponding brain regions. The two most important emotion-triggering sites are the amygdala, located deep in the temporal lobe, and the ventromedial prefrontal cortex.[16]

The Amygdala

The amygdala, a complex neural formation with at least twelve subdivisions, is probably one of the most studied brain structures; a quick PubMed search with keywords "amygdala" and "emotion" generates more than 10,000 results. It has received a lot of attention in the popular press as well, largely due to the work of LeDoux,[17] who suggested that the amygdala plays an important role in fear conditioning and emotional memory. That the amygdala can be equated with the processing of fear, or even called "the seat of emotions" as some people believe,

13 The cerebral cortex (pl. cortices), also called grey matter, is the outermost layer of nerve cell tissue in the brain. It is divided into four lobes, each of which is central for processing different types of information. The visual cortex is located in the occipital lobe at the back of the brain and is responsible for receiving, integrating and processing visual input from the retina, while the auditory cortices, located in the temporal lobes that sit behind each ear, process auditory input from the cochlea.

14 Neural means belonging to nerves, which is made up of neurons coming together. Neuronal means belonging to neurons which are actually cells—the building blocks of the nervous system (note by the eds.).

15 Direct electrical stimulation (DES) of the brain remains the clinical gold standard for mapping cognitive functions and testing hypotheses about brain organization. Because it is considered invasive, it is often performed while patients are undergoing awake neurosurgery anyway. See Bradford Z. Mahon, Michelle Miozzo, and Webster H. Pilcher, "Direct Electrical Stimulation Mapping of Cognitive Functions in the Human Brain," *Cognitive Neuropsychology* 36, no. 3–4 (2019): 97–102, https://doi.org/10.1080/02643294.2019.1630375.

16 See Damasio, *Looking for Spinoza*, 57–65.

17 See Joseph E. LeDoux, "The Emotional Brain, Fear, and the Amygdala," *Cellular and Molecular Neurobiology* 23, no. 4–5 (October 2003): 727–38, https://doi.org/10.1023/A:1025048802629.

is a gross oversimplification, but there is no denying that this brain structure plays a key role in learned fear.[18]

The Ventromedial Prefrontal Cortex

However, the other important brain region, the ventromedial prefrontal complex (vmPFC), located in the frontal lobe, is associated with the activation of social emotions. Damasio and his team have shown that lesions in this part of the brain demonstrate an inability to elicit an appropriate emotional response such as guilt, embarrassment or despair in various social situations.[19] That emotions are not just irrational impulses but are actually important for our social behavior and decision-making is the key idea behind Damasio's somatic marker hypothesis.[20] The idea arose from observing patients with vmPFC lesions (usually caused by resection of a tumor or aneurysm) whose cognitive thinking appeared to be intact, but who showed an impaired ability to express feelings in situations where this type of emotional behavior was expected of them, and this despite the fact that these abilities were probably present in the patients before the injury. Since emotions are associated with past situations and their outcomes and are thus so-called somatic ("soma" is Greek for body) markers, emotional states and the corresponding bodily changes (consciously or unconsciously) influence our behavior in subsequent decision-making.

In his book *Descartes' Error*,[21] Damasio further developed the idea that, contrary to Cartesian mind-body dualism, emotions are consciously or unconsciously involved in our mental reasoning, and provided subsequent experimental evidence for his hypothesis. The leitmotif of the book is the curious case of Phineas Gauge, who suffered an accident while working on a railway line in Vermont in 1848 when an explosion drove an iron bar through his head. Reconstructions of Gauge's skull seem to indicate that certain parts of his prefrontal cortex (es-

18 See Adolphs and Anderson, *Neuroscience of Emotion*, 163–64.

19 Liane Young et al., "Damage to Ventromedial Prefrontal Cortex Impairs Judgment of Harmful Intent," *Neuron* 65, no. 6 (March 2010): 845–51, https://doi.org/10.1016/j.neuron.2010.03.003.

20 Antonio Damasio, Daniel Tranel, and Hanna Damasio, "Somatic Markers and the Guidance of Behavior: Theory and Preliminary Testing," in *Frontal Lobe Function and Dysfunction*, ed. Harvey S. Levin, Howard M. Eisenberg, and Arthur L. Benton (New York: Oxford University Press, 1991), 217–29.

21 Antonio Damasio, *Descartes' Error: Emotion, Reason and the Human Brain* (London: Vintage Books, 2006).

pecially vmPFC) were damaged. Strangely, Gauge did not die, but according to medical reports and anecdotes, his behavior changed due to the brain lesion.[22] Even though today's research on vmPFC lesions is much more extensive and methodologically robust (the lesions can be assessed with MRI or CT brain scans at adequate resolution), Ralph Adolphs and David J. Anderson underline the fact that assessing emotions and feelings in humans is still quite difficult and problematic because researchers have to rely on oral reports and because there are no sufficient equivalent measures of emotion before and after the lesion.[23]

Emotion-Executing Sites

Yet none of these emotion-triggering sites triggers emotions by themselves. Other, subsequent brain regions connected to the trigger sites through neural pathways have to be activated in order to create an emotional state. For example, a deep-brain structure called the hypothalamus is responsible for releasing certain hormones (such as oxytocin and vasopressin), while the release of the neuromodulator dopamine is controlled by the ventral tagmental area of the brainstem. These molecules are important in changing the state of the body in many ways: its internal environments, musculoskeletal system, viscera, and the nervous system itself. Various specific behavioral patterns such as facial expressions, vocalizations, body postures and other behaviors are thus initiated.[24] For example, when we see a snake, the emotions of fear and anxiety are expressed in all kinds of bodily and cognitive responses: stress hormones such as cortisol and adrenaline begin to circulate in the bloodstream, the sympathetic nervous system responsible for the fight-or-flight mode is activated, blood flows towards the limbs, heart rate and blood pressure increase, palms become sweaty, concentration and attention increase. When we become aware of all these physiological and cognitive changes, the feelings of fear and anxiety are experienced subjectively.

Feelings

Damasio defines feeling as "the perception of a certain state of the body along with the perception of a certain mode of thinking and thoughts with certain

22 Damasio, *Descartes' Error*, 8.
23 Adolphs and Anderson, *Neuroscience of Emotion*, 221.
24 Damasio, *Looking for Spinoza*, 63.

themes."[25] But how is the brain capable of perceiving and representing body states at all? What are the neural mechanisms behind it? Damasio argues that the ability to create brain-maps for various body states is one of the most distinctive features of the brain, as the mapping scheme applies to every pattern having to do with body structure, such as moving the limbs or touching objects.[26] Research has shown that in both animal and human brains there is a strong correlation between the mapped patterns and the actual object. For example, brain map representations of the medial and proximal phalanges of all five human fingers showed a well-ordered sequence along the central sulcus that is a prominent landmark of the brain separating motor and sensory areas.[27] The mind, argues Damasio, is "a spectacular consequence of the brain's incessant and dynamic mapping."[28]

Still, Damasio's view is not compatible with the intuitive argument many people have about the feeling being a mere collection of thoughts: sadness equals sad thoughts, happiness equals happy thoughts, etc.:

> I believe the latter view empties the concept of feeling hopelessly. If feelings were merely clusters of thoughts with certain themes, how could they be distinguished from any other thoughts? How would they retain the functional individuality that justifies their status as a special mind process? My view is that feelings are functionally distinctive because their essence consists of the thoughts that represent the body involved in a reactive process. Remove that essence and the notion of feeling vanishes. Remove that essence and one should never again be allowed to say "I feel" happy, but rather, "I think" happy.[29]

In one of the experiments, Damasio and his colleagues tried to uncover the neural correlates behind the feelings. Participants were asked to recall a strong emo-

25 Damasio, 83.

26 Antonio Damasio, *Self Comes to Mind: Constructing the Conscious Brain* (London: Vintage Books, 2012), 69.

27 Meike A. Schweisfurth, Jens Frahm, and Renate Schweizer, "Individual fMRI Maps of All Phalanges and Digit Bases of All Fingers in Human Primary Somatosensory Cortex," *Frontiers in Human Neuroscience* 8 (September 2014): article 658, https://doi.org/10.3389/fnhum.2014.00658.

28 Damasio, *Self Comes to Mind*, 70.

29 Damasio, 91.

tional episode in their lives, and then studied using PET scan.[30] Short for positron emission tomography, PET scan is an imaging technique that uses radioactive substances called radiotracers to measure changes in metabolic processes (e.g. the amount of blood flow to certain brain tissues) that are correlated with higher brain activity in those regions. Accordingly, there are several brain regions that show a significant pattern of activation and are thought to be involved in the generation of feelings. These regions are the cingulate cortex, two of the somatosensory cortices (insula and SII), the hypothalamus and some nuclei in the tegmentum of the brainstem—regions that are also involved in homeostatic regulation.

"As-if" Body Loop

We have seen the importance Damasio attaches to the body. Nevertheless, one of his criticisms of James relates to the idea that subjective feelings *always* stem from body states. Although he generally holds this to be true, Damasio mentions a case where the brain is able to bypass the body. He calls it an "as-if" body loop, when the brain, by activating neurotransmitter nuclei in the brainstem, is able to simulate certain body states and their responses without them being elicited (for example, when we imagine an unpleasant, emotionally stimulating situation).[31] Such a device would help us to feel "as if" we were in an emotional state, thus avoiding a slow and energy-consuming process of actual physiological changes and allowing individuals to respond more faster. The two emotion-triggering sites, amygdala and vmPFC, remain essential components of this pathway.

Other Interoceptive Theories

Damasio was not alone in emphasizing the importance of body perception for emotions and feelings. There are few other interoceptive or "neo-Jamesian" theories;[32] the most notable examples are those of neuroscientist A. D. (Bud) Craig and philosopher Jesse J. Prinz. In his work, Craig[33] emphasized the role of neural

30 Antonio Damasio et al., "Subcortical and Cortical Brain Activity During the Feeling of Self-Generated Emotions," *Nature Neuroscience* 3 (October 2000): 1049–56, https://doi.org/10.1038/79871.

31 Damasio, *Descartes' Error*, 155–60.

32 See Scarantino and de Sousa, "Emotions"; Adolphs and Anderson, *Neuroscience of Emotion*.

33 See A. D. (Bud) Craig, *How do You Feel? An Interoceptive Moment with Your Neurobiological Self* (Princeton: Princeton University Press, 2015); A. D. (Bud) Craig, "Interoception: The Sense of the Physiological Condition of the Body," *Current Opinion in Neurobiology* 13, no. 4 (August 2003): 500–5, https://doi.org/10.1016/S0959-4388(03)00090-4.

pathways known as the interoceptive system, which process the physiological condition of all bodily tissues (such as temperature, pain, visceral and muscular sensation, etc.) and provide the basis for the subjective image of the sentient self. Craig identified the region of the brain called the insular cortex (more specifically, in the right anterior insula), shared by all mammals, as the main area of interoception that generates feelings. In contrast to Craig, Damasio argues that feelings of bodily states do not arise only in the insular cortex but are distributed throughout the nervous system and include the brainstem, midbrain and cortex; this view also appears to be supported by experimental evidence.[34] Prinz's theory, which goes back to pioneers such as William James and Karl Lange, attempts to reconcile the ideas that emotions are like other bodily perceptions, but that they are nevertheless meaningful, and enable us to evaluate the issues that concern us.[35] In the field of affective neuroscience, theories about our subjective experience of emotions are a valuable contribution to predominantly animal-oriented research.

Adaptive Role of Emotions and Feelings

But why do we have emotions and feelings? Throughout his work, Damasio supports the view that affects arose through natural selection and because they have shown to be efficient in regulating life or homeostasis. Homeostasis, from the Greek word for "same" (homo) and "steady" (stasis), refers to dynamic, self-regulating processes that keep living organisms within optimal ranges necessary for survival. These include the appropriate presence of nutrients, certain temperature or pH levels, defense against dangerous external agents such as viruses and pathogens, etc. The term was first introduced in 1932 by the physician Walter Cannon in his book *The Wisdom of the Body*,[36] but the idea of physiological regulation appeared as early as ancient Greece, where physicians argued that four different "humors" regulated the body. Today, homeostasis is considered "the central unifying concept of physiology."[37]

34 See Adolphs and Anderson, *Neuroscience of Emotion*, 287.

35 Jesse J. Prinz, *Gut Reactions: A Perceptual Theory of Emotion* (Oxford: Oxford University Press, 2004).

36 Walter B. Cannon, *The Wisdom of the Body* (New York: W. W. Norton, 1932).

37 George E. Billman, "Homeostasis: The Underappreciated and Far Too Often Ignored Central Organizing Principle of Physiology," *Frontiers of Physiology* 11 (March 2020): article 200, https://doi.org/10.3389/fphys.2020.00200.

Homeostatic regulation ranges from innate and automatic to more complex responses. From the bottom up, Damasio[38] mentions the following biological processes in multicellular organisms: at the lowest level, metabolic regulation, basic reflexes and immune responses, then pain and pleasure behavior. Then come drives and motivations, and, finally emotion proper: emotions and feelings. There seems to be a construction plan in which simpler regulatory processes (such as metabolism and reflexes) are "nested" within more complex processes, so that the ensemble is not a simple linear hierarchy.

This view is also supported by other neuroscientists. Adolphs and Anderson[39] compare emotions with reflexes and conclude that the latter are not able to deal with all kinds of stimuli because the world around us is too complex and unpredictable, so evolution had to equip us with much more adaptive behavior in order for an organism to survive. In this respect, emotions are much more flexible and go far beyond what reflexes can handle; their level of complexity lies somewhere between reflexes and volitional deliberations. The authors argue for a *functional* account of emotions; that means that they are defined by what they do and what their role is, rather than by how they are implemented.[40] They are *adaptive* in nature and carry out specific functions that contribute to the survival of the organism. However, this does not mean that every time we feel something, it directly promotes our survival and well-being. Having an emotion that may be inappropriate on certain occasions does not mean that it was not evolutionarily beneficial in other circumstances. The emotion of fear can save our lives when we encounter a wild boar in the forest, but fear manifested as social anxiety, on the other hand, can be a serious obstacle in everyday life.

Can Simpler Organisms Feel?

That seems to suggest that some forms of proto-emotional behavior are already present in simple organisms. Despite their lack of a nervous system and any premediated choices, they have some innate intelligence that promotes their well-being and keeps them away from potentially harmful stimuli. These

38 Damasio, *Looking for Spinoza*, 31–34.

39 Adolphs and Anderson, *Neuroscience of Emotion*, 19.

40 Adolphs and Anderson, 57.

behaviors are innate in brainless living beings and as such are part of their "gene-driven machinery."[41]

However, having a nervous system and a brain, as more complex organisms have, is a much greater advantage in a struggle for survival. Neurons support all other body tissues, they map the body, make movements happen, and promote the release of different molecules; Damasio claims that neurons are "*about* the body, and this 'aboutness,' this relentless pointing to the body, is the defining trait of neurons, neuron circuits, and brains."[42]

Organisms like a kind of fruit fly, *Drosophila melanogaster*, or the marine snail *Aplysia californica* do not appear to be very intelligent, but they already have very simple nervous systems that make their reactions much more coordinated and complex. Nobel Prize-winning neuroscientist Eric Kandel, whose life-long interest has been in researching learning and memory, has demonstrated the role of conditioned learning and its neuronal mechanisms in *Aplysia californica*.[43] When you touch the snail's gills, its heart rate and blood pressure increase and the organism folds up. Can this be called fear? Damasio thinks that these reactions are not the result of deliberation, but they are nevertheless still too complex and too well coordinated to be called reflexes. However, we *could* say that organisms with simple nervous systems already have emotions, but they probably cannot experience them consciously because they lack the necessary brain architecture.[44]

For *feeling* an emotion, we need another special ingredient: consciousness. Even though emotions and feelings have often been neglected in consciousness research, Damasio argues that they are closely related phenomena. When we feel an emotion and we apprehend the state of our body in mind, we realize that we are the *possessor* of these feelings and mental images. Damasio also claims that the basic sense of self is constructed through bodily interception and expe-

41 Damasio, *Looking for Spinoza*, 41.

42 Damasio, *Self Comes to Mind*, 39.

43 Irving Kupfermann et al., "Neuronal Correlates of Habituation and Dishabituation of the Gill-Withdrawal Reflex in *Aplysia*," *Science* 167, no. 3926 (March 1970): 1743–45, https://doi.org/10.1126/science.167.3926.1743; Eric R. Kandel, *In Search of Memory: The Emergence of a New Science of Mind* (New York: W. W. Norton, 2006).

44 Damasio, *Looking for Spinoza*, 42.

rience that reflects the state of life in the body. Emotion and consciousness require some of the same neural substrates, and when consciousness is impaired, so is emotion.[45] He hypothesizes that consciousness has prevailed in evolution because organisms endowed with conscious minds gain "remarkable advantages," and they can "struggle for life in more varied settings."[46]

Like emotions and feelings, consciousness necessarily depends on neural anatomy. The simplest living organisms, lacking a nervous system, are still subject to homeostatic regulation—they are born, live, try to live well, and die—but their choices lack premeditation and reflection, and their abilities are limited to efficient perception of nutrients, defense against pathogens, etc. The minimum criterion for a creature to have an emotion is to have a nervous system that enables more complex movements, guides automatic responses to the environmental stimuli, and enables innate representations in the form of brain maps. Damasio thus argues that organisms with adequate neural anatomy (such as the brain) are indeed conscious and capable of experiencing conscious feelings.[47] The view that most animals with nervous systems are indeed capable feeling emotions such as fear, and that this ability is genetically ingrained by evolutionary design, is supported by one of the leading neuroscientist of emotion, Jaak Panksepp: "An organism's ability to perceive and anticipate dangers was of such obvious importance during evolution that it was not simply left to the vagaries of individual learning."[48]

Discussion: Body in Mind

As I have shown, Damasio's theory of emotion does not limit itself to neurobiological problems but tackles some important philosophical questions, especially the problem of the mind-body connection. Before consciousness became the central issue in mind and brain research, philosophers tried to understand the relation between mind and body and whether mental phenomena are of the same or a different substance than physical phenomena. René Descartes' take

45 See Damasio et al., "Subcortical and Cortical Brain Activity."

46 Antonio Damasio, *Feeling and Knowing: Making Minds Conscious* (London: Robinson, 2021), 133–34.

47 See Damasio, *Feeling and Knowing*.

48 Jaak Panksepp, *Affective Neuroscience: The Foundations of Human and Animal Emotions* (Oxford: Oxford University Press, 1998), 206.

on this problem is known as "Cartesian dualism," and although modern scientific theories generally do not support this view, it still influences our everyday thinking and even our use of language. If throughout history the mind-body problem was the domain of philosophy, in the 21st century researchers began addressing the problem with the use of scientific methods. For example, one of the current approaches is to study the neural correlates of subjective phenomena, defined as the neural mechanisms behind the conscious experience.[49]

"The Hard Problem"

Explaining the connection between physical and mental phenomena is referred to as "the hard problem of consciousness" (as opposed to the "easy problems" such as the study of attention, integration of information, etc.). The name was coined by the philosopher David Chalmers in 1995:

> How can we explain why there is something it is like to entertain a mental image, or to experience an emotion? It is widely agreed that experience arises from a physical basis, but we do not have a good explanation of why and how it so arises. Why should physical processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does. If any problem qualifies as the problem of consciousness, it is this one.[50]

Damasio believes that solving the hard problem is "central to the understanding of who we are,"[51] but the way it is formulated makes it look like the consciousness is unsolvable, even though other comparable mysteries have gradually been solved by science.[52] It asks the wrong question because it leaves out other important components that are equally indispensable to the emergence of consciousness besides the brain.[53] In this regard, emotions and feelings are the key contributors to the conscious mind, because they supply the brain with

49 See Christof Koch, Marcello Massimini, Melanie Boly, and Giulio Tononi, "Neural Correlates of Consciousness: Progress and Problems," *Nature Reviews Neuroscience* 17 (May 2016): 307–21, https://doi.org/10.1038/nrn.2016.22.

50 David Chalmers, "Facing up to the Problem of Consciousness," *Journal of Consciousness Studies* 2, no. 3 (1995): 212.

51 Damasio, *Looking for Spinoza*, 183.

52 Antonio Damasio and Anil Seth, "What's so Hard About Understanding Consciousness?," interview by Kristen French, *Nautilus*, February 2, 2022, https://nautil.us/whats-so-hard-about-understanding-consciousness-238421/.

53 Damasio, *Feeling and Knowing*, 127–28.

information critical for life regulation and help to establish the sense of self. Or, as neuroscientist Alan Jasanoff argues, "nowhere is the integration of brain and body more apparent than in the domain of our emotions."[54]

Embodied Cognition

The idea that the body is indispensable for the formation of the mind is not unfamiliar. The interdisciplinary field at the intersection of neuroscience, philosophy, linguistics and artificial intelligence called embodied cognition, has investigated how the body and its interactions with the environment shape different aspects of cognition. The embodied mind thesis challenges some early theories of cognitive science and philosophy of mind, such as cognitivism and computationalism, which held that the human mind is an information-processing system and that cognitive processes can be understood as a series of inputs and outputs or the manipulation of symbols.[55] In contrast, embodied cognition, which is now a fairly prominent theory, emphasizes the significance of one's physical body and its immersion in the world.

However, the indispensable role of the body in shaping our lived experience was already emphasized by the phenomenological tradition, which was also one of the sources of inspiration for thinking about embodied cognition.[56] One of its most important philosophers, Maurice Merleau-Ponty, argued that the body necessarily shapes our perception and is therefore inseparable from the subject.[57]

Damasio's argument follows the same logic when he claims that "body and mind are different aspects of specific biological processes."[58] A similar view regarding the mind-body problem was held by Baruch Spinoza, who Damasio deemed was very much ahead of his time. He quotes a sentence from the second part of Spi-

54 Alan Jasanoff, *The Biological Mind: How Brain, Body, and Environment Collaborate to Make Us Who We Are* (New York: Basic Books, 2018), 97.

55 See Warren S. McCulloch and Walter Pitts, "A Logical Calculus of the Ideas Immanent in Nervous Activity," *The Bulletin of Mathematical Biophysics* 5 (December 1943): 115–33, https://doi.org/10.1007/BF02478259.

56 See Lawrence Shapiro and Shannon Spaulding, "Embodied Cognition," Stanford Encyclopedia of Philosophy, June 25, 2021, https://plato.stanford.edu/entries/embodied-cognition/.

57 See Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 1962).

58 Damasio, "Feeling Our Emotions," 15.

noza's *Ethics*, which reads: "The object of the idea constituting the human Mind is the Body."[59] Damasio's view is relevant because he tries to address the mind-body problem through an evolutionary lens: we have our body in mind because "life regulation is the need and motivation. Brain mapping is the enabler, the engine that transforms plain life regulation into minded regulation and, eventually, into consciously minded regulation."[60]

Conclusions

In our everyday beliefs about emotions and feelings, we sometimes tend to forget the key role played by the physical body. Following William James, Damasio argued that physiological bodily states such as heart rate, blood pressure, hormonal and neuromodulatory changes, etc., with which our bodies respond to emotionally salient stimuli, are the basis for feeling emotions. Furthermore, *knowing* that we are the proprietor of the body we feel constitutes the base for constructing the sense of selfhood. Damasio's view that consciousness arises in an interplay between neural and bodily processes is critical, since most modern scientific theories limit their explanation of conscious experience to neural processing and computation. For Damasio, the question of how the brain generates the subjective mind is not the correct one, because he argues that there are multiple other non-neural tissues that, through brain-mapping ability, help to create mental contents and consciousness. In this aspect, this "body-mindedness" is an evolutionary consequence of natural selection, because having feelings and consciousness can help organisms regulate life more efficiently. For a complete account of human affective experience, it is therefore crucial to take a broader view and address questions that are usually outside the scope of strictly scientific research. Damasio's interdisciplinary work, supported by the research of other scientists in the field, is valuable not only for the discipline of affective neuroscience, but also because it addresses some major philosophical questions, such as the mind-body problem. As such, it helps us to better understand affective experience, a ubiquitous part of the human condition.

59 Quoted in Damasio, *Looking for Spinoza*, 211.

60 Damasio, *Self Comes to Mind*, 107.

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