

A Material Reading of Brenda Peterson's *Animal Heart*

Diana Villanueva Romero

Department of English Philology, University of Extremadura

GIECO-Franklin Institute, University of Alcalá

Alcalá de Henares, Madrid, 28801, Spain

Email: dvillanv@unex.es

Abstract This article analyzes the topic of xenotransplantation in American author Brenda Peterson's novel *Animal Heart* (2004). The transplanting of a baboon heart into a human patient is analyzed as a case of boundary crossing where the dualisms human/animal and spirit/matter are dismantled. Such a process challenges modern techno-science's use of human and nonhuman bodies, proposing instead a worldview where matter and its associated terms — animal and body — are reanimated by the practice of panpsychic and animist-relational epistemologies. In light of such a reanimation of matter, this article uses the framework of material ecocriticism to focus on the baboon heart's nonhuman agentic capacities, which the novelist describes in a way that illustrates the liberating power of literature.

Key words xenotransplantation; science; ecofeminist spirituality; panpsychism; animist-relational epistemology; material ecocriticism

“Life goes more smoothly without a heart”

— Margaret Atwood

In Brenda Peterson's *Animal Heart* (2004), topics such as science, animal experimentation, activism, and the ways of coping with coexisting identities are knitted together in order to reassess humans' relationship with nonhuman animals. The story develops around an episode in the life of animal rescuer and wildlife forensic pathologist Isabel Spinner that forces her to confront her past. She was an orphan who found refuge as a little girl in her connection with animals. Now in her late thirties, she realizes that her natural talent for empathizing with others, her *heart* that her grandfather called “her gift” (*AH* 126), has kept her unaware of her own needs and the possibility of finding someone to love. But this situation will change the moment

she meets her brother Andrew's friend Marshall McGreggor, an aquatic photographer to whom she is immediately drawn. This relationship, however, will take an unusual path after Marshall's heart attack and subsequent surgery, in the process of which he receives a transplanted baboon heart that will transform him in unexpected ways. He grows more conscious of the importance of family and friends, gives in to his feelings for Isabel, and responds to his new heart's demands of giving back to the animal that died for him.

Peterson presents two main instances of how dispassionate forms of science involving the use of animals lead to the erasure of their ethical significance. One is the xenotransplantation — the animal to human transplant — exemplified by Marshall's case; the other is the military use of active sonar and its consequences for marine mammals. Both practices involve the objectification of the animal. Xenotransplantation challenges the limits between the human and the nonhuman, exposing the lengths to which animal experimentation can go on behalf of a type of science that is oblivious to the essential unity of every living being. A similar consequence results from the naval testing of underwater sonar at Kiwanda Beach, Oregon, Isabel's homeplace. This testing affects the wellbeing of the marine wildlife of the area. Science, cast in this second example in the mold of the military, will not respond to the suffering of these creatures, either. It will merely see them as collateral damage of human progress.

In light of these examples, in the pages that follow, the objectification of animals by science, performed by medicine and the military, will be highlighted and contrasted throughout Peterson's novel with other modes of looking at nonhuman species, which may lead to what Henry Beston describes as "a more mystical concept of animals" (24). In these alternative approaches, animals are seen not as fragments of a whole that can be decomposed into repair parts, but as agentic beings with souls. In this article I intend to question the validity of our understanding of animals in today's scientific practices. Within this context, xenotransplantation is an especially suitable image of the contingent status of the species boundary and the instrumentalization of bodies typical of a Cartesian worldview. Reading *Animal Heart* through the lens of material ecocriticism, I will argue, inspired also by ecofeminist epistemologies, that the borders between the elements of the parallel dualisms mind/body, spirit/matter, and human/animal can be blurred by a paradigm shift emanating from contact with non-Western and non-anthropocentric ways of knowing.

Human Hearts and Animal Souls

The two human protagonists of this novel, Isabel and Marshall, come from similar backgrounds. Their respective cultural traditions attribute a great importance to

animals and place. Isabel's family comes from the Hebrides Islands, Scotland, from a culture of Norse and Celtic influence with strong ties with the sea and its creatures, especially the seal. When Isabel was little, her grandfather Ronald used to tell both her and her brother Andrew about their family as descendants of a selkie, a seal-woman called Finoola, who married their great-great-grandfather Angus.

Marshall McGreggor comes from a family where the ancient sea lore of Hawaii mixes with Western culture. His mother, Lillian, is a native Hawaiian who married a university professor from the mainland who also loved the sea. She claims to come from a family descending from the giant sea turtles. Marshall has lived far away from his homeland for years, but the heart attack he suffers while diving will make him reconnect with his roots. At the hospital his mother invokes the power of the sea animals, his *aumakua* or animal guardians, to bring him back to life. Once he has recovered, Marshall reunites with his family who welcomes him with open arms to a culture that makes no distinctions between human and nonhuman animals.

In the novel, these worldviews that concede spiritual power to animals and place are contrasted with the disembodied experience of the universe enforced by the Enlightenment and carried forward by modern techno-science. As feminist biologist Lynda Birke explains, the beginnings of laboratory animal production and the rise of pathology in the late eighteenth century and throughout the nineteenth century produced "an understanding of the body in fragments — and in turn fragmentable; both shift[ed] the gaze away from the individual, experiencing, contextualized, [sic] self and toward definable symptoms" ("Animal Bodies" 170-71). Animals became a conglomerate of body parts ready to be used at humans' convenience, not a source of wisdom or healing. Images of these fragmented bodies abound in *Animal Heart*. These are present even in the description of Isabel's forensic laboratory where she performs autopsies of the animals that have died as a result of human cruelty. She knows that this place could be mistaken "for a taxidermy shop, with its organized clutter of animal parts" (AH 27) but, as it will be later shown, she approaches these dead bodies with the outmost respect in order to restore them to their integrity. Parallel to this are the descriptions of the bodies of stranded animals lying on the beach in chapter eight or that of the baboon used for experimentation in the laboratory at Roseland Research in chapter fourteen who "[lies] strapped down on a steel operating table" with a "pig heart attached to his own neck artery" (AH 243). Even Marshall's body, a human one, is treated by medicine during his operation more as a composite of parts than as a whole. He sees himself as a body "being harvested organ-by-organ while still alive" (AH 83).

These images serve to present the conflict between two opposing worldviews. One is the reductionistic, fragmented, and mechanistic view of Western science

represented by male scientists like Dr. Lamb, who performs Marshall's surgery, and Dr. Sharp, the expert on bioacoustics who works for the Navy. The other is the holistic, integrated, and organic view of the indigenous people and the women of the story. Animals for them are both kin and spiritual guides with the power to heal. Such an understanding emanates from belief systems, usually referred to as animism, "[involving] the concept that all living creatures, as well as other natural objects and phenomena, are imbued with an invisible soul, spirit or 'essence' that animates the conscious body, but that is able to move about and act independently of the body when the bearer is either dreaming or otherwise unconscious" (Serpell 4). This belief is shared by indigenous approaches as well as by the kind of spirituality endorsed by ecofeminists. Gloria F. Orenstein describes, for instance, how she spent nearly five years studying with Sami Shaman Ellen Maret Gaup-Dunfjeld from Norway, and found that shamanistic practice is ecofeminist because it bridges the distances imposed by Western religious practices between spirit and matter (173). This materialist spirituality,¹ although controversial due to its associations with positions described as essentialist (Warren 119), "recognises that spirit is not a hyper-separated extra ingredient but a certain mode of organisation of a material body, unable to exist separately from it" (Plumwood 223). Through this sensibility, the materiality of bodies acquires meaning as an agentic force, much in the manner in which environmental philosopher Freya Mathews refers to matter when defining panpsychism as a metaphysic that reanimates matter by making it "actually [matter], morally and spiritually speaking" (29). According to her, understanding the world in panpsychist terms implies "a profound shift" in Western thought, for it is compelled to "a shift away from the direction in which it has been drifting since the time of the scientific revolution" (4). It means moving away from the exclusive power of human reason and accepting the idea that matter can also be morally significant. As she contends, we must transcend the will to know and dominate the other and substitute it with a desire for the other. This is *orexis*, a term derived from the Greek *orektos* meaning "longed for" or literally "stretched out for" and normally translated as *appetite*, but which really "embraces three functions: desire, spirit, and wish" (Mathews 60-61). This *orexis* or desire for the other makes possible an appropriate approach to the nonhuman world once is reanimated through a panpsychic perspective. Mathews calls this *encounter* and for her it substitutes knowledge. As a way of illustration she tells her own personal experience of encounter with a solandra, a flowering plant native to warm latitudes. Mathews explains how she had grown especially fond of that plant after having had to relocate it in different places of her garden to protect it. But, when Mathews's neighbor decided one day to lay a concrete trench on his side of the boundary that separated his property from Mathews's, she realized the solandra will

die since the trench will cut through the plant's root system. Mathews thought this was not a plant that could bloom so far south, but the unexpected happened when "the morning of the execution" the solandra offered "a single, extraordinary bloom, a huge yellow trumpet flower" that touched her more deeply than many human responses had before (Mathews 81).

A similar story of human-plant encounter is described by nature writer Priscilla Stuckey who combines animism and feminist epistemology to propose a different approach to the more-than-human world. She explains how she was intrigued by the strength with which the image of a birch tree she knew since childhood appeared suddenly in her mind one day after having lived for many years away from the place where she was raised. This happened only weeks before her brother announced to her that they had to cut the tree down because it had a disease. Stuckey's interpretation was that the tree "had come to say good-bye" and that all the years she had spent living around that tree had created a relationship between them of which she was not aware of (183).

Stuckey realizes that this event is difficult to explain from a Western point of view where dualisms such as body/spirit, human/nature, and subject/object are primordial. Nonetheless, she gains full comprehension of it by looking at it from the perspective of new animism and the epistemology based on personal knowing proposed by feminist philosopher Lorraine Code.

Stuckey explains that new animism was defined in the work of anthropologists Graham Harvey and Nurit Bird-David (188). They both departed from Edward Tylor's definition of animism as "a belief in souls and spirits," but added to this "the prism of relationship for understanding interconnections with beings of all sorts, including human and other than human" (Stuckey 188). This was done because his definition reproduced dualisms typical of the West and inapplicable to the beliefs of many indigenous peoples. This was so simply because Tylor's animism was "focused on the immaterial side of a material-immaterial split," but actually such a divide was not part of many of the indigenous worldviews (Stuckey 188). The determining category was not body or spirit, not materiality or immateriality, but as A. Irving Hallowell explained in his work about the Northern Ojibwe of south-central Canada, that of *person*. These persons may be human but many are not; they are "animal, mineral, plant, cloud, dream, or spirit persons" (Stuckey 188). Of further importance, according to Stuckey, is also the fact that what matters in this kind of worldview is not the physical presence of these persons, but their ability to interact or engage in relationships. This is why Stuckey also resorts to an epistemology based on personal knowing as the one proposed by Lorraine Code who, like Mathews, challenges the objective/subjective dichotomy by considering the knowledge of objects as

independent of the knower. In Code's model subjective elements of knowing are always present: "how to be with [the other], respond to [the other], act toward [the other]" (Code 39). Furthermore, persons are considered as always evolving. And ultimately, both partners in this process of knowing must be open to exchange the "subject" and "object" positions (Code 53).

Ultimately, Stuckey concludes that her experience with a birch tree challenges Cartesian dualism because the knowledge she has gained of it can be defined as: 1) relational rather than objective; 2) contextual, not abstract; 3) built through inner or intuitive attention as well as outer, empirical methods; and 4) communicated through story rather than abstract theory or principles (191).

In the following sections, I will argue that in *Animal Heart* the main characters engage with the animals of the story in experiences of mutual understanding that can be framed within the animist-relational epistemology characteristic of an ecofeminist sensibility and illustrated by Mathews's and Stuckey's works. This reaches a special significance in the relationship between Marshall and his new heart because this organ comes to stand as an agentic part of the baboon Sol, the animal that is sacrificed to prolong the life of the human. By dealing with the difficult exchanges involved in xenotransplantation from an animist-relational point of view, Marshall will manage to make peace between the human and the nonhuman. Matter in the form of the baboon heart will also become enlivened, making science resonate with the need to redefine itself into a more comprehensive and empathic practice.

Xenotransplantation as the Encounter Between the Human and the Nonhuman

Animal Heart revolves around the issue of xenotransplantation. What could seem part of a science fiction story actually responds to, for many, one of the most promising directions of current medical practice: using animal organs or tissue as spare parts for humans. This technique is rendered as revolutionary by some because it may provide humans with an endless source of organs, although it is true that there are some risks involved such as zoonosis or the transmission to humans of diseases specific to the species of the animal donor.² In this respect, for example, in 1999 the Parliamentary Assembly of the Council of Europe issued Recommendation 1399 on xenotransplantation, stating that it was in favor of a moratorium on the clinical applications of xenotransplantation given the risks to public health it could involve. Nevertheless, the media abounds with frequent examples of animal-to-human transplantation where generally the risks are "downplayed," as Marie Fox explains, by the emphasis put on the scientific breakthrough implied in such attempts and the benefits for an aging human population in need of organ replacements (154).

The truth is that the use of animal parts for human regeneration and the

prolongation of life is not something new. As David C. K. Cooper and Robert P. Lanza acknowledge, the earliest attempts at xenotransplantation date back to the seventeenth century (27-28). These first attempts took place in 1628 in Padua and later in London, and consisted in transfusions of animal blood to humans. In Russia, almost six decades later a nobleman who had lost part of his skull in battle had it replaced with a piece of bone taken from a dog (Cooper and Lanza 27-28). These exchanges increased dramatically in the twentieth century due to the hopes placed by scientists on this technique as a way to find a limitless source of organs for humans. Indeed, the first successful attempt at organ transplant was made using the heart of a chimpanzee.³ But xenotransplantation has never been exempt from criticism because it touches on the legal and ethical limits of medical research⁴ and goes against the interests of the animals used in medical procedures.⁵ Furthermore, xenotransplantation implies, as Fox contends, a blurring of boundaries between the human and the nonhuman (149). It consists, using Stuart A. Newman's expression, in a "commingling of bodies" that shapes hybrids where the boundary between the human and nonhuman categories are erased and hence provokes an uneasiness difficult to escape (192).

Consequently, in *Animal Heart*, xenotransplantation can be analyzed as a boundary case, that is, a case of boundary crossing where the dualisms human/animal and spirit/matter are dismantled thanks to the animist-relational perspective that informs the main characters' approach to animals. Such a deconstruction of barriers is especially meaningful in light of the tenets of the new materialism. In this respect, material ecocriticism, a new form of ecocritical studies being currently developed by Serenella Iovino and Serpil Oppermann and others, seems especially apt for such an endeavor. Material ecocriticism emerges as a response to the "innovative ways of considering matter and material relations" by the new materialist theory, which has led to "the re-definitions of concepts like matter, agency, discursivity, and intentionality" and thus has affected ecocritical studies (Iovino and Oppermann 75). Through material ecocriticism, Iovino and Oppermann propose to focus "on the way matter's (or nature's) nonhuman agentic capacities are described and represented in narrative texts" (79). In their article "Material Ecocriticism: Materiality, Agency, and Models of Narrativity," they pay attention to various examples of "the representations of nature's agentic powers" in different literary traditions. Some of them refer to nature's manifestations through the power of electricity, landscapes, rivers, and the sea, which can be seen as "examples of ecological nonhuman agents projecting themselves as 'textual forms' of matter and telling their stories through the material imagination of their human counterparts" (Iovino and Oppermann 82). Such a statement brings to mind Mathews's encounter with the dying solandra she had protected for years and Stuckey's experience with a birch tree as a relational agent communicating with her

through the common story they shared. If such an approach is applied to Peterson's novel, especially to the way in which the baboon Sol, the donor, communicates with Marshall through his transplanted heart, it can be argued that the heart of the animal *matters* in this novel as a communicative agent. This allows for an interpretation of xenotransplantation as a bodily text where not only the frontier between the human and the nonhuman is crossed, but the distinctions between matter and spirit are also erased.

As Newman explains, the Christian world has often had an ambiguous relationship with the notions of flesh and matter. In general, in pre-Enlightenment Europe, the Church sustained "the Aristotelian notion that during the conception and development of all living beings matter is provided by the female but remains inert without the animating principle supplied by the male" (Newman 198). Such a vision was later emphasized by Manichaeism, which identified spirit with Good and the male principle, and matter with Evil and the female principle. It is easy to see that this understanding of polarities coincides with the traditional identification woman-nature-animal. Later, in the seventeenth century, Descartes saw the body as a machine that in the case of humans was inhabited by an immortal soul, which redeemed the materiality in which it was contained. The body of the animal, however, was devoid of a soul and therefore of a consciousness. Such approach led to the development of practices such as vivisection. Over time, the comparative study of species, to which Darwin's publication of the *Origins of the Species* (1859) led, laid the foundation for the development of fields such as cognitive ethology as well as concepts such as the embodied mind, among other things, making it possible to envision matter and all its associated terms (body, animal, nature, woman...) as alive. This material turn makes possible to say that there is not such a thing as the spirit/matter divide but that matter is spiritual in the sense that it interacts with other agents. Seen from this perspective, it is possible to contend that alternative epistemologies, like Mathews's pansychism and Stuckey's animist-relationality as well as many of those traditionally held by indigenous people, are verging on the same direction. This is happening thanks to a broadening of perspectives that allows for a deconstruction of dualisms and a more holistic understanding of the forces at play in the world where opposites are replaced by a continuum of intra-actions.⁶

In *Animal Heart* matter manifests itself through the transplanted heart of the dead baboon. The violated bodies of the human transplant recipient and the animal donor become texts in which modern biotechnological practices are inscribed to the effect of showing the contradictions inherent to science and its understanding of bodies. Since one of the ways in which material ecocriticism proposes to interpret the agency of matter is by focusing "on the way matter's (or nature's) nonhuman agentic capacities

are described and represented in narrative texts” (Iovino and Opperman 79), I intend here to analyze the bodies of humans and animals as texts where xenotransplantation opens a space of reflection on the blurring of the boundaries between the elements of the pairs human/animal and spirit/matter. Through this experience, notions of kinship are redefined, and most of all, models of fragmentation characteristic of Western science are substituted by alternative models of integration inspired by indigenous and ecofeminist spiritualities.

Open Minds, Open Hearts: Redefining Science

“The heart of science is feminine. [...] The science I have come to know and love is unifying, spontaneous, intuitive, caring — a process more akin to surrender than domination.”

— Candance B. Pert

In the West, science tends to look at the body from a mechanistic point of view. It is seen as a construct of parts that can be repaired or substituted without paying much attention to the consequences. The result of this Frankensteinian illusion is often that the more advanced scientific techniques are, the more dangerous their outcomes result for human and nonhuman animals.

In *Animal Heart*, the bodies of the human Marshall and of the nonhuman animals used in experimentation become sites where science writes its manifesto. They are literally fragmented by a kind of science that commodifies its subjects in its pretense of progress. Both the human and the nonhuman animals dissolve in the maneuverings of a science that sees no limits in pursuit of its goals. Marshall is given a heart he did not ask for. When he asks Dr. Lamb why they did the transplant, his answer, “We do it, [...] because we can” (*AH* 88), reveals the scientist’s arrogance as the representative of a profession that sometimes forgets it is dealing not only with *the heart* but also with *the soul* of the patient. In a similar manner, the bodies of the animals at Roseland Research Laboratory, from which Marshall with Isabel’s help will eventually rescue the family of his donor, are exploited to create new possibilities for science. These experiments imply the creation of grotesque hybrids which resonate with images Peterson herself recalls in the acknowledgements of her book where she thanks Dan Lyons of England’s Uncaged Campaigns for his “courageous activism on primate labs” and for his “groundbreaking Website ‘Xeno Diaries.’”⁷ This site denounces the xenotransplantation research done by the biotechnology company Imutran Ltd. between 1994 and 2000 in Huntingdon Life Sciences laboratories (Cambridgeshire, UK). These experiments involved the transplant of the hearts and kidneys of

genetically engineered piglets into the necks, abdomens, and chests of hundreds of monkeys captured from the wild.

All this violence renders bodies as desacralized sites for scientific experimentation. Nevertheless, throughout the novel, the heart as flesh-matter imbued with the soul of the baboon and manifesting itself in the life of Marshall, as well as Isabel's compassionate model of science, will serve to counteract the effects of mainstream Western science.

In Marshall's case, the heart transplant has serious implications for him. He is troubled by a surgery that has left him feeling used and disempowered, "not only part baboon," but "also a guinea pig" (*AH* 87). Likewise, as time goes by, he also becomes aware of changes in his personality that make him feel uncertain about his true identity: he evolves from being a detached and independent man to becoming closer to his family as well as a better friend. Interestingly, the women who are close to him and who have a special sensitivity to animals — Isabel, his mother Lillian, and his sister Nohelani — notice right away that something has been altered in him. Isabel and his mother sense as if a "frantic animal" had been placed inside him (*AH* 91). His sister Nohelani feels it too, but believes her brother Marshall is still "the same soul she had loved all her short life" (*AH* 99).

Marshall's transformation began on the operating table. At that moment, he is described as floating above the body of a man he does not recognize as himself at first. The only thing he sees is "emptiness" as if a body without a heart were just a dead piece of flesh. Furthermore, by having his body manipulated by science, he is estranged from it. There is no feeling for the man lying on the table whose "chest [feels] raw, split open like a melon" (*AH* 84). After the surgery Marshall notices that he has changed. He now "[longs] for daily society and family," as if he were feeling more with "the heart of another primate" rather than with his own (*AH* 102). He is also haunted by visions of someone else's life, the baboon that was killed to give him his heart. This happens mainly in his sleep or when he loses consciousness as a result of his dose of immunodepressants. The heart reveals itself to him then. It tries to tell him something in a similar manner to the solandra or the birch tree that startled Mathews and Stuckey, respectively. In Marshall's case the animal heart pleads with him to reestablish a balance lost with the killing of the baboon. This becomes especially clear at a time when Marshall is diving to take some shots of a giant Pacific octopus, Ursula. After a while she dares to hold him with one of her tentacles. This "strange undersea embrace" provokes in him a kind of trance where the boundaries between the baboon and the human vanish and it is difficult to discern a separation between the two:

He felt suction and pressure along his legs and torso as Ursula's arms now gracefully wrapped around him — and then the rectangular pupil floated inches from his mask. His chest expanded, yellow blotches floating before his eyes. But this time Marshall did not lose consciousness. No blackout. No dream. This time, Marshall clearly remembered:

[...]

Then bright lights overhead. His heart is beating strongly again. But he is not the same. He is not on a surgical table or in a tiny steel cage, yet he is alive, conscious. He is somehow inside another's body. Man-animal. He cannot get out. Over time he finds that he can get out when the man dreams or is floating and forgets himself. Like now. Here is another animal. Another kind of mask. He can see everything now. But it is liquid.

How can he get away from the prison of this man's body to find Hara? If he can only make this man see what he sees, and feel what he feels, he might find his family again. They have stolen his body, but not his heart. Not his memory.

Fathoms deep, Marshall remembered the intelligent face, a long primate body stretched out on a steel table. *Hara*, he signed her name. Marshall closed his eyes. Cold deep in his bones. Heat in his heart. The words he once rejected when others spoke them now wafted through Marshall's mind and he shuddered: *I am a transplant. I acknowledge the sacrifice of the dead.* (AH 229)

Thus, the baboon heart becomes an agentic material force in the story, complying in this way with Iovino's and Oppermann's analysis of matter as agentic and as having "‘narrative’ power itself"(83). This force leads Marshall in the end to a personal transformation and a commitment to liberate Sol's family from the laboratory where they are captive.

Marshall's post-transplant confusion is also in accordance with the description of some of the real psychological problems transplant patients find after surgery. Approaches to transplantation from the social sciences abound with descriptions of the uneasiness the reception of a foreign organ causes in the patient (Birke and Michael 259-60; Sharp 365-66; Woods 52, 54). In the novel, Irene, a young woman Marshall befriends in group therapy, explains to him that this may be due to "cellular memory," meaning that "every cell remembers who it belongs to" (AH 117). This explanation is plausible according to studies conducted with heart transplant recipients in various hospitals of the United States. Paul Pearsall, Gary E. R. Schwartz, and Linda G. S. Russek, for example, showed in 1999 that some patients had dreams related to the lives of the donors but not their own, and that some even experienced changes in

food, music, art, or even career preferences that were not explicable by contact with the donor or her family prior to the transplant (65-72). Independently of what the explanation might be, what is interesting is how matter, in this case a heart, manifests itself in a meaningful interaction with the protagonist, as seems to happen with some actual transplant patients.

The heart is certainly a powerful cultural symbol as well as an organ that has traditionally intrigued scientists. From a cultural perspective, according to Juan E. Cirlot, in the vertical scheme of human organs the heart is the central point and as a consequence it also evokes the meanings of the other two important organs: the brain and the sexual organs (141). The brain, in traditional ways of thought, was actually considered as “being mainly instrumental,” while the heart was seen as “the true seat of intelligence” (Cirlot 142). This centrality of the heart implies that “[all] representations of the ‘Centre’ have been related to the heart, either through correspondences or through substitution” (Cirlot 142). This also made possible the connection, in the mystic doctrine of unity, between the heart-symbolism and the love-symbolism “for to love is only to experience a force which urges the lover towards a given centre” (Cirlot 142). Furthermore, according to Jack Tressider, the heart is also considered as “[t]he symbolic source of affections — love, compassion, charity, joy or sorrow — but also of spiritual illumination, truth and intelligence” (n. pag.). As a consequence, as this author explains, it is often equated with the soul. Such identification lies behind the fact that many ancient traditions did not make a sharp distinction between feelings and thought, and considered that a person who “let the heart rule the head” was acting in a rather sensible manner (Tressider n. pag.).

From a scientific perspective, although one that connects with the cultural meaning of the heart, psychiatrist Mohamed Omar Salem reports on the connections between the heart and the brain. He explains that the heart determines, to a certain extent, the functioning of the latter. According to him, some studies show how the heart communicates with the brain in ways that influence “information processing, emotions and health” (Salem 1). He speaks of how John A. Armour in 1994 introduced the concept of the “heart brain” based on the heart’s complex intrinsic nervous system, very similar to that of the brain, which “enables it to act independently of the cranial brain — to learn, remember, and even feel and sense” (Salem 2). This is what makes possible to describe the heart as a “little brain” affecting perception, decision-making, and even creativity (Salem 3). Furthermore, Salem insists that there are other attributes that make the heart a distinct organ. It works as an endocrine gland able to produce hormones like oxytocin, commonly known as the “love” or bonding hormone, that can be found in the heart in higher concentrations than in the brain. It also “generates the body’s most powerful and most extensive rhythmic

electromagnetic field” five hundred times stronger than the brain’s magnetic field (Salem 2). This makes the heart act as a carrier wave for information that provides a global synchronizing signal for the entire body and affects “the ‘magnetic’ attractions or repulsions that occur between individuals” (McCraty, Bradley, and Tomasino qtd. in Salem 2). Furthermore, it participates also in “the processing and decoding of intuitive information” which the brain also receives but often after getting first to the heart. Finally, as Salem concludes, the heart is as determinant of conscious awareness as the brain since increasingly studies show that the brain and the body act together, so the heart is not just another organ but a part of a whole where all its parts are interrelated in what seems an almost cosmic connection (4).

Salem’s study is in line with the field of bodymind⁸ medicine according to which bodies are endowed with a bodymind intelligence that seeks wellness (Pert 18). According to neuroscientist and pharmacologist Candace B. Pert, one of the expressions of this form of intelligence is the neuropeptide molecules that she creatively calls “molecules of emotion.” These chemicals and their receptors determine “our emotions, beliefs, and expectations” (Pert 47). They are an instance of how there is not such a thing as the body and the mind working separately since the neuropeptides and their receptors, that for a while were thought to be found exclusively in the brain, are also found in other parts of the body as well (Pert 187). Thus, as it can be deduced, not only the heart functions as a brain, as Salem explains, but the whole body, as Pert sustains, functions as a mind: “the *mind* is in the body, in the same sense that the mind is in the brain” (Pert 187).

These sort of scientific findings that highlight the body-mind continuity further support the role as agentic matter played by the baboon heart in Peterson’s novel. Moreover, throughout the novel the heart also has an important function because it works on different levels of meaning, which highlight the polysemic nature of this word. On a superficial level, the heart in the book can be taken at face value, literally meaning the “hollow muscular organ that pumps blood through the circulatory system by rhythmic contraction and dilation” (*Oxford English Dictionary* 801). By revealing that both Isabel’s and Marshall’s fathers died as a consequence of a heart attack, the reader is reminded of its essential function for the sustaining of life. Marshall’s massive heart attack will only emphasize such role and become pivotal for the development of the story.

On a deeper level, the heart also symbolizes love, caring, and affection. These feelings are described as central to the lives of both the humans and the nonhuman animals of the story, but are mainly associated with Isabel who is “haunted” by questions of the human heart she is not able to solve through science (*AH* 182). Isabel has a profoundly nurturing way of being, especially with regard to animals. Her job

as forensic pathologist is aimed at investigating crimes against animals and she is also a volunteer in a wildlife organization for which she often looks after rescued sea animals. But deep inside of her is a fear of being personally involved that is born out of the loss of her parents at a very young age. This makes her keep a comfortable distance, especially after her failed marriage, from men like Marshall to whom she might be attracted. At the same time, she has found in science, as her brother Andrew guesses, a kind of protection that allows her to “[run] away from life” and escape “messy stuff — like love” (AH 16). She is easily inclined to love and affection, but knows the possible suffering and uneasiness derived from giving free rein to those feelings. That is why her practice of science as forensic pathologist as well as her activism, which is intrinsically linked to the former, are not devoid of conflict. Both confront her with the tension derived from following the strict protocols of science and the rules of her volunteer work with animals, and being guided by the dictates of her heart. Such tension accompanies her throughout the book, but is progressively dissolved by the need to respond to the practical conflicts the novel describes. In this sense the heart is opposed to the mind, emotion is contrasted with reason. The result of this is a redefinition of both science and activism in light of more integrative and holistic practices. This is best seen in Isabel’s treatment of dead bodies after the massive stranding of whales and dolphins on Kiwanda Beach described in chapter eight.

Isabel and her colleague Marian find that there is not much else they can do for the dead animals except trying to investigate the cause of their demise. Thus, without waiting to have official authorization to conduct such procedure and therefore leaving aside the rules that govern their work, they take the dead body of a Pacific white-sided dolphin to the pathology laboratory and prepare to perform an autopsy. In a very powerful scene, they conduct themselves as if the autopsy were the occasion of a sacred ritual they were about to celebrate: “With a slight bow of her head, Isabel rested both gloved hands on the body of the female Pacific white-sided dolphin and said very softly, ‘I am so sorry for the violence of your death.’ Her words were formal, almost an incantation” (AH 184). Both Isabel and Marian manipulate the dead body as if it were a sacred object that deserves all their respect. This is partly derived from Marian’s indigenous culture — she belongs to the Oskeena Tribe — in which animals are understood as persons, but also emerges out of Isabel’s understanding of her profession.

Before becoming a veterinarian and pathologist, Isabel went first to medical school. There she learned anatomy from Dr. Grayson Elliot who defined this work as a “dying art” and advised his students that, when working with a body, they had to “Be gentle” because “Every body once belonged to somebody” (AH 184). This spiritual

practice of science contrasts with the kind of science practiced by other characters in the book. Both Dr. Lamb, in charge of Marshall's transplant, and Dr. Sharp, the Navy's expert on bioacoustics, go as far as science permits without harboring any moral concerns. In contrast, Isabel and Marian's model of science is more in line with alternative notions of science like the one ethologist Marc Bekoff refers to as "deep science" (635). Such a term, as he explains, is inspired by the ideas behind the "deep ecology" movement, which calls attention to the inherent value of each living being without consideration of their utilitarian value. With this in mind, Bekoff calls for a new model of science where the fragmented and reductionistic framework typical of modern science is substituted by a "holistic and heart-driven science," a "deep science that is impregnated with spirit and compassion" (635). This type of science, according to him, "reinforces a sense of togetherness in which the seer and seen are one," while at the same time "fosters the development of deep and reciprocal relationships among humans, other animals, and other nature, softening our tendencies to control and manage almost everything in sight" (635). As a consequence of these ideas, Bekoff proposes a kind of science led by principles that bring to mind Stuckey's description of an epistemological model that needs to be relational, contextual, built through intuitive attention as well as empirical methods, and communicated through story (Stuckey 191). In this new form of science, using Karen Barad's words, "matter comes to matter" because the other is taken into account (Loc. 2563).

A similar vivification of matter happens in literature, as it has been shown through this analysis of Peterson's novel. This vivification or reanimation in panpsychic terms means "a culture of encounter," "a culture of poetry and song" where by singing the world up is possible "to attune ourselves to the inexhaustible layers of its own unconscious-but-simultaneously-all conscious song" (Mathews 88). William Rueckert contends that "science and poetry [...] can be persuaded to lie down together and be generative after all" (107). As he puts it, a poem or any kind of literature is stored energy and reading is the act of energy transfer from the poem "into the language centers and creative imaginations of the readers" (110). In classical times poetry was understood as a kind of sacred ritual through which the true nature of things was conveyed to the audience. These ideas make possible to argue that knowledge of what is outside of ourselves can be mediated not only through rationalistic modes but also through opening our hearts to the stories matter-body-animal tells us. Such narratives, as Iovino and Oppermann contend, "are *de facto* part of a project of liberation — a cultural, ecological, ontological, and material liberation" (87). Let us then be liberated through literature.

Notes

1. I borrow this term from Val Plumwood who uses it in chapter ten of *Environmental Culture: The Ecological Crisis of Reason* (218-35).
2. Given the irony implied in the use of the term “donor” to refer to the nonhuman animal from whom the organs and tissue are removed — they certainly do not freely decide on such donation — critical attention has been paid to the kind of language used in the medical literature on xenotransplantation. Of special interests are Lynda Birke and Mike Michael’s “The Heart of the Matter: Animal Bodies, Ethics, and Species Boundaries.” *Society and Animals* 6.3 (1998): 245-61 and Marie Fox’s article “Reconfiguring the Animal/Human Boundary: The Impact of Xeno Technologies.” *Liverpool Law Review* 26 (2005): 149-67.
3. This first heart transplant happened at the University of Mississippi Medical Center in 1963 and was performed by Dr. James D. Hardy on a 68 year-old patient, Boyd Rush. Since there was not a heart available for Mr. Rush, as a last chance resort, surgeon James Hardy and his team decided to implant in his chest the heart of a genetically close animal, a chimpanzee. Ultimately, the smaller heart of the animal could not pump the volume of blood required by a human body and Rush died ninety minutes after surgery (McLean and Williamson 49).
4. An analysis of the legal and ethical questions involved in the practice of xenotransplantation is offered in Marie Fox’s “Reconfiguring the Animal/Human Boundary: The Impact of Xeno Technologies.” *Liverpool Law Review* 26 (2005): 149-67 and in Sheila McLean and Laura Williamson’s *Xenotransplantation: Law and Ethics* (Hants UK: Ashgate, 2005).
5. Especially helpful for an understanding of xenotransplantation from an animal rights point of view are Lynda Birke and Mike Michael’s “The Heart of the Matter: Animal Bodies, Ethics and Species Boundaries.” *Society and Animals* 6.3 (1998): 245-61 and Tania Woods’s “Have a Heart: Xenotransplantation, Nonhuman Death, Human Distress.” *Society and Animals* 6.1 (1998): 47-65.
6. Karen Barad develops the concept of intra-action in contrast with that of interactions which “presumes the prior existence of independent entities/relata” (Loc. 2405). Intra-action means a process through which “the boundaries and properties of the ‘components’ of phenomena become determinate and [...] particular embodied concepts become meaningful” (Loc. 2405-27). This implies that the traditional Cartesian divide between subject and object does not exist prior to the establishment of these relations or intra-actions since both are part of the same material continuum, which is organized through these intra-actions.
7. <<http://www.xenodiaries.org/>>.
8. The term bodymind was first proposed by acupuncture expert Dianne Connelly “[to reflect] the understanding, derived from Chinese medicine, that the body is inseparable from the mind” (Pert 187).

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