A Critique of the Relationship between Scientific Cognitivism and Positive Aesthetics

The scientific cognitive (also referred to as ‘cognitive’ and ‘natural environmental model’) approach to environmental aesthetics requires that our appreciation of nature be informed by relevant scientific data about nature (from here on to be referred to as scientific cognitivism). Allen Carlson was the first to develop a comprehensive account of this theory. He holds that aesthetic appreciation of nature requires knowledge of natural history and science in the same way that appropriate aesthetic appreciation of art requires knowledge of art history and art criticism. The idea is that scientific knowledge (particularly in geology, biology, and ecology) about nature can reveal the actual aesthetic qualities of natural objects and environments. In short, to appropriately aesthetically appreciate nature is to appreciate it as it is characterized by natural science.

Carlson believes his own account of appropriate aesthetic appreciation results in consistently positive aesthetic judgments about nature. That is, if we view nature in light of biology, ecology, geology, etc., the result will always be the perception of beauty in nature. This thesis is called ‘positive aesthetics.’ It is important to note here that Carlson is making two distinct claims: scientific cognitivism is the appropriate way to aesthetically appreciate nature (a normative claim); and all of nature, when viewed appropriately, is aesthetically positive.

Critics of Carlson’s view have taken issue with either one or both of these claims. When challenging the first claim, critics consider whether scientific cognitivism is the single correct way to aesthetically appreciate nature when it is possible to aesthetically appreciate nature in other, non-cognitive ways (for instance, by appealing to the emotive properties of nature). As to the second claim, thinkers ask why aesthetic judgments about nature will be necessarily positive.

The purpose of this paper is to critique Carlson’s second claim, his justification for positive aesthetics. While I intend to focus my criticism on positive aesthetics and Carlson’s justification for it, it is impossible for me to do so without analyzing scientific cognitivism as well. This is because of the intimate relationship between positive aesthetics and scientific cognitivism in Carlson’s account of the theories. It is problematic to analyze either theory as an independent thesis since science and scientific virtues are central to both theories and since each theory plays a vital role in the justification of the other. Indeed, the relationship between the two at times appears to border on question-begging. While my account must, therefore, touch on scientific cognitivism, it will only critique it in so far as it is connected to and justifies positive aesthetics. This means that I will not ask whether or not scientific cognitivism reveals the qualities that Carlson claims it does, but rather, whether or not these qualities constitute a positive aesthetic experience.

I will present five objections to Carlson’s justification for positive aesthetics: under certain descriptions, the account appears circular; it fails to establish a necessary connection between proper appreciation and positive aesthetic experience (that is, it ignores the intuitive possibility of legitimate negative judgments); the elements that lead to (or are constitutive of) a positive
aesthetic experience of nature might be more properly construed as epistemic rather than aesthetic qualities; the qualities enjoyed in/constitutive of a positive experience are socially dependent, and hence fail to make positive experiences necessary; and lastly, there are aesthetic qualities commonly accepted as good that are diminished under Carlson’s account of proper appreciation. At the end of the paper, I will address the further concern as to whether or not we should always have a positive aesthetic experience of nature.

One of the first projects within the field of natural aesthetics was to show that nature, like art, can be aesthetically appreciated, but its appreciation is fundamentally different than that of art. R. W. Hepburn, in his influential article “Contemporary Aesthetics and the Neglect of Natural Beauty,” argued that the traditional models used in art appreciation are inappropriate for the appreciation of nature given fundamental differences between art and nature (nature lacks a creator, is ‘frameless,’ involves multi-sensory appreciation, etc.). When aesthetically contemplating a painting of a rock face, Hepburn says that reflecting on geological pressures is whimsical; it is merely an “extra-aesthetic reflection.” Yet, when gazing at a rock face in nature, such geological reflection “may determine for us how we see and respond to the object itself.”

This notion that the scientific data pertaining to natural objects is relevant to their aesthetic appreciation has become a common theme in environmental aesthetics. Scientific cognitivists push this idea even further by claiming that scientific data is not only relevant to appropriate aesthetic appreciation, it is central.

Carlson’s theory is based on an earlier cognitivist theory of art appreciation developed by Kendall Walton. Carlson believes that Walton’s cognitivist position supports claims for the objectivity of judgments about art and that developing a structurally similar account is appropriate for aesthetic judgments about nature. Carlson’s theory, like Walton’s theory, has both a descriptive, psychological part and a philosophical, normative part.

Descriptively speaking, when viewing objects we first observe non-aesthetic perceptual properties (such as size and shape), which are perceived under categories (such as stream, animal, or statue). These properties will have one of three different relations when compared to any given category. These relations are: standard, contra-standard, and variable. A specific non-aesthetic perceptual property \( x \) is standard with respect to a category \( T \) iff the nonexistence of \( x \) excludes an object from being a member of category \( T \). That is to say, in order for \( x \) to be standard, it must be a quality necessary for the identification of an object as a member of \( T \). Conversely, property \( x \) is contra-standard with respect to category \( T \) iff the presence of \( x \) excludes an object from being a member of \( T \). And if the existence or nonexistence of property \( x \) is inconsequential to an object’s status as a member of category \( T \) it is variable. For example, the property of ‘being a mammal’ is standard with respect to the category ‘dog,’ having red fur is variable, and having wings is contra-standard.

The aesthetic properties that an observer recognizes in an object on a particular occasion are the function of the non-aesthetic properties the object has and the set of categories under which the observer perceives the object. It is important to note that the non-aesthetic properties that an object has are empirical while the set of categories under which those properties are viewed is dependent upon the observer. Negative aesthetic judgments generally arise when the observer perceives some non-aesthetic property of an object as being contra-standard to some category under which he/she perceives it. To use the classic example in art criticism, when cubism was introduced at a show in the United States, critics condemned the paintings as being aesthetically awful because they employed the categories generally used to judge representational works of art. Yet, the art community now deems some of these works of art as priceless. Why? Because an entirely new category under which to judge them has since been established. It is now considered inappropriate to apply the representational standards to cubist works of art. It is here that we find the normative element of Walton’s theory. Walton claims that, when aesthetically evaluating a particular piece of art, there are correct and incorrect categories under which to evaluate it.
would be incorrect to judge a Waterhouse painting under the category of cubism as it would be incorrect to judge a cubist Picasso work under the category of representational art despite the fact that both artists were working in their respective areas at the same time.

Carlson broadens Walton’s theory to cover aesthetic appreciation of the natural world. Whereas Walton claims that the appropriate categories by which to aesthetically judge art are dictated by the conventions within the art world and the intentions of the artist, Carlson claims that the appropriate categories by which to aesthetically judge nature are dictated by the natural sciences. This is the traditional version of scientific cognitivism. Carlson makes the further claim that when we use scientific cognitivism in our aesthetic appreciation of nature, we will consistently make positive judgments about it.

According to Carlson, scientific cognitivism is the correct way to aesthetically appreciate nature for several reasons. Firstly, it approaches nature in a truthful manner. That is to say, by using scientific descriptions, it approaches nature for what it is. Carlson further believes that, secondly, the truthfulness of the approach enables us to make reliable, consistent judgments about nature’s beauty. In fact, aesthetically appreciating nature in this manner will, thirdly, justify Carlson’s independent thesis that all of nature is beautiful. That is to say, scientific cognitivism is correct because it will always result in a positive aesthetic experience. The problem with Carlson’s account is that he uses scientific cognitivism to justify positive aesthetics but he also uses positive aesthetics to justify scientific cognitivism.

This question-begging relationship is made reasonably apparent in the following passage.

Positive aesthetics claims that the natural world is essentially aesthetically good. It follows that the natural world must appear as such when it is appropriately aesthetically appreciated. If the view sketched above [a general cognitivist view] is to account for this, the natural world must appear aesthetically good when it is perceived in its correct categories, those given and informed by natural science. If this is the case [that the natural world does appear aesthetically positive with science] and we can understand how and why it is, we thereby have justification for the positive aesthetics position. However, if the natural world seems aesthetically good when perceived in its correct categories… it must be because of the kind of thing that nature is and the kinds of categories which are correct for it.

Using the above description we can write out Carlson’s account in argument form:

1.) The natural world is essentially aesthetically good. (positive aesthetics).
2.) Appropriate aesthetic appreciation should reveal what aesthetic properties an object has.

⇒ 3.) Appropriate aesthetic appreciation of nature should reveal nature as aesthetically good. (1,2)
⇒ 4.) If a cognitivist view is to account for positive aesthetics, then nature must appear aesthetically good when viewed under its correct categories. (3)
5.) Nature’s correct categories are those given and informed by science.
6.) Using scientific categories makes nature appear aesthetically good.
/⇒ 7.) Nature is aesthetically good.

This is a clear case of piggybacking. Simply put, Carlson claims that all of nature is aesthetically good and if we are to create a cognitivist account of aesthetic appreciation of nature,
it must account for this fact. If we do find the correct categories and they result in the natural world seeming essentially beautiful, then nature is aesthetically good.

To be completely fair to Carlson, I must admit that the above passage is a rare example in his literature. When reading his papers one is certainly struck by the intimate relationship between scientific cognitivism and positive aesthetics, but nowhere else is it so nakedly exposed as question-begging. In general, Carlson only characterizes positive aesthetics as independent thesis that is justified by scientific cognitivism. However, others have made more recent attempts at bolstering Carlson’s account by essentially codifying this question-begging relationship. Even if one were to ignore this question-begging element of Carlson’s account, other arguments for the validity of both scientific cognitivism and positive aesthetics are tenuous.

By contrast, Yuriko Saito argues that even if we use the appropriate scientific data in our aesthetic appreciation of nature, we may nevertheless arrive at negative aesthetic judgments about nature. When gazing upon the rotting carcass of an elk (Holmes Rolson’s example), I may fully realize the ecological systems going on (i.e., the passing on of nutrients), but still find the scene to be repulsive (an obvious negative judgment). Carlson would reply that while I am focusing on scientific data, I am also allowing my personal sentiments to influence my aesthetic judgment. Perhaps I associate maggots with some painful childhood memory, or perhaps I understandably recoil at the scent of rotting flesh. When I do so, I am no longer using only the scientific data to come to an aesthetic judgment. Carlson would argue that I must use only the scientific data if I want to reliably come to positive aesthetic judgments about nature.

Yet, this reply is not strong enough. Let us look at a state of affairs in which I am to aesthetically judge yellow jackets. I have prepared myself for a scientific cognitivist approach of aesthetic appreciation by reading a book entirely on the evolutionary struggle of yellow jackets, their chemical makeup, biology, and place in ecology. I know everything there is to know about yellow jackets. Let’s say further that I come from a place where there are no yellow jackets so that I have never been stung by a yellow jacket, nor do I know anyone who has. I gaze upon them for the first time (all the time drawing upon the scientific knowledge gained from my book) and yet I do not come to a positive aesthetic judgment about them. Perhaps I do not come to a negative judgment either—I may just find that yellow jackets are aesthetically negligible. Have I made a mistake? I have no cultural milieu from which to view the yellow jackets nor do I have any personal experience with them, so I am not guilty of muddying my aesthetic lens with incorrect categories. Yet, I believe that it is completely possible, despite using scientific data, to come to aesthetically neutral, if not negative, conclusions about elements of the natural world.

What is it about scientific data that it should always cause nature to appear aesthetically positive? Carlson believes that scientific descriptions should make the natural world appear more unified, orderly, or harmonious. When I gaze at the yellow jackets, perhaps I do see the world as more unified (realizing how yellow jackets are a link in a gigantic ecological chain), more orderly (realizing how perfect yellow jackets fit into their niche), and more harmonious (realizing that yellow jackets represent a class of creatures necessary for the predation of other insects). Although I see the world as more orderly, harmonious, and unified given my approach, my approach does not necessitate that I have a positive aesthetic experience as well. These qualities could perhaps help us better understand nature, but they do not necessarily lead to a positive aesthetic experience, as Carlson believes.

Yet, Carlson would claim that I, in experiencing unity, harmony, and order in my evaluation of yellow jackets, have had a paradigmatic positive aesthetic encounter with yellow jackets. Carlson argues that qualities like unity, order, and harmony are hallmark aspects of positive aesthetic judgments. “In linking the appreciation of nature to science, the approach suggests the possibility that positive aesthetic appreciation is nurtured by the scientific worldview which increasingly interprets the natural world as having aesthetically positive properties such as order, balance, unity, and harmony.” His defense for this claim consists in an appeal to the purely
descriptive fact that harmony, unity, and other qualities like them make the world more understandable, and it is because of this that we value them. Yet, even if it is defensible to say that people value qualities that help them better comprehend the world, the value that we are speaking of is not necessarily aesthetic; we could instead call it epistemic. When gazing upon my yellow jackets, I may experience a rush of comprehension due to the newly noticed properties of balance, order, and harmony, but how is one to argue that I am still doing aesthetics?

In reply, Carlson would say that he does not claim that viewing nature using scientific categories is the appropriate way to aesthetically judge it; he is instead saying that aesthetically viewing nature while applying the relevant scientific categories is the appropriate way to aesthetically judge it. One must not merely look at a mountain and reflect on geological pressure etc. to aesthetically judge the mountain. To do so is to do geology, not aesthetics.

What then, is the difference between viewing and aesthetically viewing? One might guess that it is viewing with the expectation to of seeing beauty. Certainly that is what connotations for the word ‘appreciation’ would lead us to believe. But this is not so. The point to appreciation is not the expression of gratitude. Appreciation should instead be thought of as a logistical activity. For example, to appreciate being diagnosed with diabetes is not to be thankful for having diabetes; it is instead to be fully informed as to the ramifications of such a diagnosis. Carlson takes the activity of appreciation to have this cognitive element and a further responsive component. Appreciating being a diabetic involves having the relevant medical knowledge about diabetes and then using that knowledge to appropriately respond to the condition (changing one’s lifestyle and diet). Hence, to appreciate nature (aesthetically or not) involves having knowledge about nature and using that knowledge to then appropriately respond to nature. It is important to note that this model of appreciation treats the cognitive aspect as prior. One must first have relevant knowledge about something in order to then respond to it. “What indicates appropriate appreciation is that it involves correct, knowledge-based sizing up together with responsiveness appropriate in light of that sizing up.”

We still do not have a clear picture of what an ‘appropriate’ aesthetic response to nature is outside of the claim within positive aesthetics that such a response would be to necessarily see aesthetic goodness. This definition is not helpful considering that the appropriateness of always seeing aesthetic goodness is the subject of debate. Furthermore, the definition of aesthetic goodness is also debatable. Carlson, for his part, attempts to further theoretically justify the intimate relationship between scientific goodness and aesthetic goodness. According to Carlson, the cause for this relationship is rooted in the fact that the qualities sought in a good scientific explanation (those qualities indicative of scientific correctness) and the qualities associated with aesthetic goodness are the same. The “qualities which make the world seem comprehensible to us are also those which we find aesthetically good.” And it is for this reason that “scientific information and redescription make us see beauty where we could not see it before, pattern and harmony instead of meaningless jumble.” This is a different claim from before. Here, Carlson is claiming that qualities such as harmony, order, unity, etc. simply are aesthetically good and not that they are aesthetically good because they are scientifically good. However, while these qualities are aesthetically superior, they are not objectively so.

Carlson admits that the relationship between scientific correctness and aesthetically valuable properties is not apparent. It may be a result of culture, superstition, humanistic faith, or evolution (all Carlson’s examples). In any case, the relationship between scientific explanation and aesthetic goodness is contingent. If this is so, we can easily imagine a time when this relationship no longer holds. What if, one hundred years from now, due to a cultural revolution, we begin to identify beauty with disparity, chaos, and randomness? It would follow that the correct categories for the aesthetic appreciation of nature, those that accurately describe nature (assuming that our account
of correct scientific explanations is objective, and therefore, won’t change as well—a rather safe assumption I suppose) will consistently result in nature appearing ugly (or at least boring). If this is so, scientific cognitivism cannot result in objectively true responses. If our conception of aesthetic goodness is the product of contingent forces, then we cannot rely on scientific cognitivism for objectivity.

The other problem with this picture of aesthetic goodness is that it ignores certain qualities that elicit a positive aesthetic reaction in most people (at least for now). I am specifically thinking of qualities such as ‘uniqueness.’ That uniqueness contributes to considerations of beauty is obvious. The designation of National Parks relies heavily on such qualities. National Parks are preserved not only because they exemplify other (so called) aesthetic qualities such as harmony and balance between ecosystems, but also because they are places unlike any other. For example, there are sand dunes dotting much of the Eastern seaboard of the United States, but none of them are designated as National Parks partly because we can understand how there might be sand dunes near the ocean. Yet, when we encounter such dunes in landlocked areas hundreds of miles away from any ocean, we are inspired to preserve these areas as places of special beauty (for example, Great Sand Dunes National Park in Colorado and White Sands National Monument in New Mexico). Places such as these inspire us because they are unique—even random—relative to the landscape in which we find them.

Yet, scientific explanations do not rely on considerations of uniqueness. In fact, the quality of uniqueness tends to disqualify explanations as correct in so far as uniqueness leads to explanations that do not fit with other already accepted explanations. A geological explanation that posits the existence of invisible cave-digging trolls to account for a newly discovered cave system may be unique (while also explaining the existence of the caves), but that uniqueness in no way counts toward the explanation’s correctness.

Now, one might object by claiming that “uniqueness” is not a quality that we can directly perceive, and so does not qualify as aesthetic. To be sure, the perception of uniqueness involves a definite cognitive element. It requires background beliefs about the type of object/scene viewed. The relevant beliefs will include beliefs about not remembering having ever seen such a thing before, beliefs about the lack of knowledge of the existence of other things/scenes of a same or similar type, or beliefs about the existence of only a few tokens of such types. In this sense, one cannot possibly experience something as unique without informing one’s experience with background information. But this is exactly what Carlson’s account asks of us. Being cognitivist in nature, Carlson’s account requires the mediation of beliefs in the act of appreciation (in this case, justified, true beliefs, the content of which is scientific information). Carlson even tells us that “the approach suggests the possibility that positive aesthetic appreciation is nurtured by the scientific worldview which increasingly interprets the natural world as having aesthetically positive properties such as order, balance, unity, and harmony.” Scientific information informs our experience, and allows us to interpret the world as having certain properties. It is just that, as Carlson argues, the world does have these properties; but one must have the relevant knowledge to see that. But the same is true for uniqueness. For this reason, if uniqueness is disqualified as an aesthetical property, then so are order, balance, unity, and harmony.

I should mention the fact that Carlson’s account of scientific cognitivism is not weakened by the existence of positive aesthetic qualities that are not revealed by the scientific categories used to judge them. Carlson does not claim that scientific knowledge is necessary for the appreciation of every aesthetic quality in nature; it is only necessary for some of these qualities. Presumably, there could be some aesthetic qualities that are category insensitive. That is to say, there could be qualities that can be appreciated without knowledge of scientific categories. For example, one can be impressed by the sheer size of the Tetons relative to the Snake River Valley below without relying on geologic knowledge relevant to the Tetons. Here Carlson would argue that such
knowledge would enhance and justify the initial sense of wonderment (the darn things are still growing).

If we are to take Carlson’s cognitive account seriously, we should at least employ the standard, variable, and contra-standard designations in our examination of aesthetic goodness. Carlson claims that under scientific cognitivism, negative aesthetic judgments become inappropriate. One example of a negative aesthetic judgment that Carlson uses is that of discovering properties in a viewed subject that are contra-standard relative to the categories used. “Contra-standard properties are ones we tend to find ―shocking, disconcerting, startling, or upsetting.” These, it seems, are the marks of a negative aesthetic judgment. However, if we only use scientific categories by which to aesthetically view nature, then rarely running into contra-standards should not be startling. Science, as Carlson is quick to point out, appeals to qualities such as order, regularity, and harmony. Science is an activity that makes the world more intelligible; it is an activity that attempts do away with contra-standards.

Moreover, there are examples of contra-standards that we do not find aesthetically negative. In fact, there are examples of contra-standards in nature that seem to have a special aesthetic status. The examples I am thinking of include four leaf clovers, albino snakes, old fish, and larger-than-normal animals. In the case of old fish and large animals Carlson would claim that these properties would be viewed as highly variable and not as contra-standard. The discovery of a Golden Eagle with an eight-foot wingspan would not be considered contra-standard, even if no specimen that large had previously been recorded. Such a discovery would merely widen the parameter of the size variable. Albino snakes and four leaf clovers are no longer contra-standard once we understand genetic mutation and recessive genes.

This last point further forces my earlier claim that Carlson’s conception of aesthetic goodness as applied to nature ignores some qualities normally deemed aesthetically positive. The gigantic albino boa constrictor at the Chattanooga Warner Park Zoo is there precisely because it seems contra-standard to our normal conception of ‘snake.’ Not only is it larger than usual, but its markings are also an unusual combination of iridescent yellow and cream. When we apply scientific understanding to our initial aesthetic response, we understand how the snake came to look the way it does. At the same time, we also take away from our initial sense of wonderment and that detracts from its aesthetic merit. This is an interesting consequence of using scientific cognitivism in our appreciation. As stated before, it is not a problem for Carlson’s theory that there exist positive aesthetic properties not discovered via scientific cognitivism, however, it is problematic that there are aesthetically good qualities that may be diminished by this mode of appreciation given his further claim that it justifies positive aesthetics.

My last consideration against positive aesthetics does not focus on whether scientific cognitivism does result in positive aesthetics, but on whether it should. One of Carlson’s justifications for employing scientific categories in aesthetic appreciation of nature is an ethical one. We should appreciate nature as it is (and science helps us to do this) rather than as it may appear to be or as we may want it to be because “our aesthetic appreciation is a significant factor in shaping and forming our ethical views.” Because ethical views are molded by our aesthetic appreciation of objects, we are obligated to appreciate nature as it is. Scientific categories are the correct categories to use for aesthetic appreciation of nature because science is an activity that aims to accurately describe the world. If we use a model that appreciates the natural world for what it is, we are better equipped to ethically respond to nature regarding questions of environmental concern. If Carlson is correct and we mold our ethics alongside our aesthetics then perhaps it is inappropriate to view all of nature as being inherently aesthetically positive. To do so requires us to find beauty in the 2004 tsunami that killed over 225,000 people. It is true that we can find qualities like order, unity, and harmony in a scientific approach to the tsunami, but in this
case it should not dispel the emotional response to the natural disaster. To do so for the sake of being aesthetically ‘correct’ seems callous, even cruel. One could claim that we have an indirect obligation to others to find certain aspects of nature to be aesthetically negative. To find value in a tsunami that resulted in such a massive loss of life could presumably deaden a person’s sensitivity to the pain of others. Furthermore, denying the positive aesthetic aspects of these events can also be motivated by concern about one’s character. The idea behind this is that the proclivity to find beauty in natural disasters or even the ‘nature’ scene of a decaying human body is a reflection of bad character which, if not curtailed, may result in by far worse acts.

One can certainly sympathize with Carlson’s wish to justify positive aesthetics. It would supply a useful, new argument for environmentalists to utilize in conservationist debates. Of course, conservation entails that some parts of nature win, and others lose. This hard fact immobilizes positive aesthetics for it says nothing about the amount of aesthetic value in nature. One would have to create an account that quantifies aesthetic value or deal with the fact that everything in nature is equally beautiful and we are going to have to destroy something beautiful. Perhaps this reason alone compels Carlson to rarely mention conservation as a motivation for his views. And yet, the wish for an objective account of nature’s beauty, which is a motivation for his theories, also proves untenable.

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3. Ibid., 301.
8. Glen Parsons, “Nature Appreciation, Science, and Positive Aesthetics,” British Journal of Aesthetics 42 (2002): 293–295. Parsons believes we should modify the normative constraint within scientific cognitivism in order to include positive aesthetics. He holds that we should take the existence of deep beauty in the natural world as indubitable and that our aesthetic models should be created so as to find this already existent beauty. We should do this by including a ‘beauty making criterion’ in scientific cognitivism that would obligate us to aesthetically view nature under its correct (scientific) categories and under such categories that would make it appear aesthetically best. He then claims that this would make the universal beauty of natural objects seem less mysterious. Yet, this is to merely state a tautology. Of course we are not going to be surprised by the fact that nature always appears beautiful if we are obligated to only employ such categories that make it thus.

13. Ibid., 397.


15. Ibid., 24.

16. I make no assumptions about theories within the philosophy of perception here, and am aware of considerations in support of the view that nothing is directly perceived. I mean only to address an objection that was helpfully brought to my attention by Nola Semczyszyn.


20. Carlson, “Nature, Aesthetic Judgment, and Objectivity,” 24. Consider also the following quote found on the same page: “It is clear that we do not aesthetically appreciate simply with our five senses, but rather with an important part of our whole emotional and psychological selves. Consequently, what and how we aesthetically appreciate cannot but play a role in the shaping of our emotional and psychological being.” Notice that Carlson claims that we appreciate with our *emotional* selves. If this is true, then why are emotive aesthetic responses to nature patently incorrect?

**Bibliography**


