AN ENVIRONMENTAL PHILOSOPHICAL ANALYSIS OF ECOSYSTEM HEALTH

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ABSTRACT

AN ENVIRONMENTAL PHILOSOPHICAL ANALYSIS OF ECOSYSTEM HEALTH

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The aim of this study is to qualify the notion of ecosystem health by taking the origin of the 'health' concept into consideration and discuss how to find solutions to some environmental problems, arising from the combination of the individual terms of ‘ecosystem health’. With this intention, I evaluate the ethical theories of leading environmental philosophers about ecosystem health through an analytical inquiry.

Keywords: health, ecosystem, science, ethics, environment

ÖZ

EKOSİSTEM SAĞLIĞININ ÇEVRESEL VE FELSEFİ BİR ANALİZİ

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Yüksek Lisans, Felsefe Bölümü

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Bu çalışmanın amacı, sağlık kavramının kökenini dikkate alarak ekosistem sağlığı terimini karakterize etmek ve her iki terimin bir arada kullanılmasından kaynaklanan bazı çevresel sorunlara nasıl çözüm getirileceğini tartışmaktır. Bu amaçla, ekosistem sağlığı ile ilgili önde gelen çevre felsefecilerinin etik teorilerini analitik bir araştırma ile değerlendireceğim.

Anahtar Kelimeler: sağlık, ekosistem, bilim, etik, çevre

To my dear brother Semih,

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CHAPTER 1

INTRODUCTION

The concept of ecosystem health has emerged with the need to protect ecological systems but ambiguity in its meaning leads to many controversies in environmental philosophy. Although application of such a value-laden concept to ecosystems like the notion of human health may result in considerable effects at intuitive level, there is no overall agreement on the definition of health. Therefore, it is very difficult to decide what is healthy for ecosystems before defining what health means. While some environmental thinkers and policy makers used the concept in its literal sense, others used it metaphorically. Each of these different extreme senses has its own distinct advantages and disadvantages.

In its literal sense, science tells us about the objective conditions of health, but its normative character is always missing. On the other hand, metaphorically, it does not provide us with the same motivational power in human health even if it allows us to deal with the fact-value dichotomy. Hence, this ambiguity in the meaning causes difficulties in adapting the concept for non-medical areas, especially for ecosystems. Unless the concept is correctly defined, there is no way to deal with these difficulties. Therefore, investigation of the correct definition of health is the first step towards determinations of the conditions of being healthy. Afterwards, whether something is healthy or not, may be decided through the conditions of being healthy. As of this chronological progress, it becomes clear whether the concept will be adapted to non-medical areas such as ecosystems.

Like health concept, ecosystems have the basic questions to be addressed; for instance, it needs to be determined whether ecosystems are real entities and

explained why moral agents should care about ecosystems for the sake of ecosystems only. These are just a few examples of issues waiting to be solved for ecosystems.

I will try to qualify the notion of ecosystem health and discuss their (i.e. ‘ecosystem’ and ‘health’) use together in a broad spectrum by addressing basic questions about the traffic between science and ethics, and then its reflections on environmental ethics. This chapter presents a general introduction to the subject matter of this thesis. It includes an aim at the end of the chapter that it is to find the most appropriate explanation for health concept by taking previous definitions into consideration. In the second chapter, I’ll introduce two functionalist models in order to establish a common ground for ecosystems and health. Then, I’ll represent two ecological approaches that are community ecology and ecosystem ecology in response to these models. In the third chapter, my purpose is to assess whether the concept of health can be adopted to ecosystems by considering its correct meaning; in this respect, it is also to exemplify in literal, metaphorical, and both senses together through the views of some philosophers such as Bruce Morito, Katie McShane, Robert T. Lackey, Lawrence A. Kaputska, Wayne G. Landis, Dale Jamieson, and J. Baird Callicott. In the fourth chapter, I evaluate the core problems related with the combination of health and ecosystems, by discussing the normative and scientific dimensions of health. In this discussion, my intention is to stress and justify that applying health to ecosystems is plausible. The last chapter is the assessment of the discussion part. Let's continue to the first chapter under the next title.

1.1. Ambiguity in The Meaning of Health

Until 1948, 'health' had been defined as the absence of disease by health authorities because classical medical researchers focused mainly on disease conditions rather than health. They are antonyms and represent distinct

conditions. Disease is defined as “disorder of structure or function in an organism that produces specific symptoms and is not the result of physical injury” while health means “the state of being free from illness or injury” (The Oxford Dictionary).

From that year onwards, to overcome this disappointment, WHO* defined the concept “as a state of complete physical, mental, and social well-being, not merely the absence of disease and infirmity” (WHO, 1948). This definition emphasizes the holistic character of health by linking the concept with 'wholeness', but the scope and multidimensionality of the concept seem problematic for medical authorities due to being challenging for anyone to be healthy in every aspect. That's why, it has been severely criticized.

In 1986, WHO reviewed the concept of health and changed the definition as “a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities” (WHO, 1986). However, Harald Brüssow, who was involved in several clinical trials during his research career at Nestlé Research Center, criticized the definition as “the WHO definition has no direct operational value – it is so widely formulated that health outcome cannot easily be measured. Health like beauty is in the eyes of the beholder” (Brüssow, 2013, p. 343).

In medical sense, for many other researchers, dealing with the physical, social, and emotional challenges is more realistic and suitable than complete recovery which is emphasized in WHO's revised definition. Therefore, they have considered many other aspects and proposed other definitions of health as the capacity of a body to adopt and cope with new threats as well as maintain integrity and wellbeing. Such definitions make health concept operational and measurable.

*World Health Organization

In *British Medical Journal,* Machteld Huber and his colleagues have made an analysis of the health definitions, which has been discussed in a conference held in 2009 in Netherlands, and proposed a conclusion that "[health is] the resilience or capacity to cope and maintain and restore one's integrity, equilibrium, and sense of wellbeing" (Huber, 2011, p. 236).This most widely accepted view reflects itself similarly on all types of health such as physical health, mental health, social health, etc. To exemplify, for the physical health, the capacity to adopt and self-manage manifests itself as allostasis which means "the maintenance of physiological homeostasis through changing circumstances" (p. 343). Therefore, allostasis "as a modulator of homeostatic mechanisms" (Schulkin, 2004, p. 22) is a necessary condition for physical health. For mental health, "a sense of coherence" has been introduced as a determinant (Antonovsky, 1984). When confronted with psychological distresses, it helps cope with these stress disorders. As for social health, the most preferred determinant is "a dynamic balance between opportunities and limitations"; therefore, it requires to have "the capacity to fulfill their potentials and obligations, the ability to manage their life with some degree of independence […] and the ability to participate in social activities, including work" (Huber, 2011, p. 236).

Even if several proposals have been made for justified reasons to deal with the limitations of WHO's definition, it would be helpful investigating the origin of the health concept for further understanding.

The origin of 'health' in English comes from the Old English word 'hælth', which is associated with 'whole' that means "all of the parts of something considered together as one thing, or all of something" (Oxford Dictionary). Also, the origin of the English word 'whole' comes from the Old English word 'hal' which is of Germanic origin (Ibid.) Afterwards, the term 'hal' turned into 'hail' which means 'health' in the late Middle English period (Ibid.). 'Hail' is also associated with the German word 'heil' which more clearly reflects linguistic associations between health, wholeness and salvation than in English (Ibid. For instance, 'heil-kunde',

‘heil-kunst’, and ‘heiler’ are now used for medical sciences. (Ibid.). Moreover, the German ‘heilfroh’, that means wholly happy, indicates the connection between health and happiness. (Ibid.). The meaning of ‘heil’ is also related to religious use; for example, this word has the same meaning with the English 'holy'. (Ibid.)*

Such linguistic associations make WHO's definition of 'health' understandable because stating certain principles are primary to wholeness, happiness, and coherent relations. According to these connotations, what we understand from 'health' is related to be good in all. Although it is challenging to be healthy as a whole, we cannot just talk about the health of a part; rather, we can talk about the part of the whole that affects its health. It should not be forgotten that health is the ability to maintain the optimal state, it is not a state; rather, it is an ability to adapt and self-manage. That’s why, health is not the case for every whole even if they include functional parts. There must be some dynamic ability to maintain the optimal state by adapting to changing conditions. Restoring its equilibrium in accordance with external factors is, for instance, possible for economy not for computer systems. Both are complex systems which have integral parts and processes. In economy, there is “the structure of government institutions and of the political process” (Shleifer; Vishny, 1993, p. 599) and the ability to maintain its balance depending on whether state of supply and demand is steady. The multifaceted relations and influences in the economy can also be controlled by the price mechanism; thereby, any economic corruption can be prevented. If this economic balance cannot be achieved, the system collapses. Although economic fluctuations occur in the system, it has the ability or potential to absorb it and sustain its existence by reaching a new equilibrium. On the other hand, computer systems are not self-maintaining and adaptable to a number of interruptions or disturbances occurring in the system because they lack a purpose for attaining a new balance. Any disturbance emerged in such systems means to lose all the work; namely, the system collapse.

*Oxford Dictionary contains brief but useful information about the origins of these terms.

With these examples, I have tried to emphasize that if an organism or system is adapting to internal and external influences, to which it is exposed, in order to maintain its existence and to create a new balance within itself, we can apply the concept of health to them.

As for the subject matter of this study, the simple question here is: is it possible to use the word 'health' for ecosystems if its meaning is only for the whole which has these abilities explained above? To answer this question; first, the term 'function' needs to be explained in relation to the whole-part and then must be grounded on the core element of health concept.

CHAPTER 2

TWO MAIN MODELS FOR FUNCTION IN RESPONSE TO THE WHOLE-PART RELATIONS

I just mentioned in the previous chapter that it might be possible to talk about the health of a whole, not that of a part or piece. However, the whole-part relation is not enough to be healthy, the whole must have the ability of self-maintenance by attaining a new balance within itself in case of exposure to the internal and external effects.

It is now time to address the types of functional explanations to see how applicable health to ecosystems, because whole-part relations imply a kind of functional relationship. There are many functional types; therefore, first the term 'function' needs to be explained in the whole-part relationship, and then it should be concluded by assessing which type is the ability to self-manage and establish a balance.

2.1. Causal Role Model vs. Etiological Model

Despite the vast philosophical literature on function, the two are the best known and accepted among philosophers and scientists. The first one is often called causal role model which helps to explain the function of a trait within a complex system in terms of its effects on the behavior of the whole. That's why it is an

ahistorical explanation considering the parts' relation to the whole. Contrary to ‘proper function’ which I’ll explain later, it is especially used “in physiology and developmental biology to explain the causal contribution of a functional item to a complex process” (Millikan, 1989, pp. 175–176).

After defenders of this model have brought the functional analysis of Robert Cummins (1975) into life, they used the term ‘function’ as activities that all physical systems have and proceeded that not all activities themselves are enough to be functions unless they contribute to overall system. Cummins' theory presents itself in a wide range of phenomena such as “economic, administrative, cognitive, respiratory, or internal combustion [when they] contribute to their overall capacities and dispositions” (Buller, 1998, p. 514), no matter where the complex systems are. Therefore, it is also used outside the field of biology.

The second explanation of function is, on the other hand, called etiological function which analyzes the function of a biological feature within its natural history. Larry Wright (1973), who is the first to analyze the concept of function in its natural history, insisted that the causal explanations is insufficient to identify the function of something. He argues this insufficiency as follows:

> We have seen that no matter how useful it is for X to do Z, or what contribution X's doing Z makes within a complex system, these sorts of consideration are never sufficient for saying that the function of X is Z. It could still turn out that X did Z only by accident. But all of the accident counterexamples can be avoided if we include as part of the analysis something about how X came to be there (wherever): namely, that it is there because it does Z with an etiological "because." (p. 156)

Accordingly, Wright preferred to use ‘conscious function’ instead of ‘Cummins function’ to “distinguish between functions and things done by accident” (Wright, 1973, p. 150). With conscious function, he intended to avoid saying as "a function of the heart is to make heart sounds" (Ibid.) In addition, all mechanistic functions can be explained by ‘in order to’ instead of ‘because’. The answers to the

questions starting with ‘What?’ and ‘Why?’ are somehow parallel to each other. Consider the following example:

1. What is the function of X?
2. Why do C's have X's?
3. Why do X's do Y? (examples from Wright, 1973, p. 155)

Each question has the same answer because they are just different ways of asking the function of X. If the example given above is applied to the most familiar context:

What is the function of the heart?
Why do humans have a heart?
Why does the heart beat? (examples from Wright, 1973, p. 155)

Accordingly, the answer is “to pump blood" (Ibid.) because the question that starts with ‘What?’ requires indirectly explanatory answer and; therefore, can be satisfied with the same answer to the question that starts with ‘Why?’. Such explanatory answers provide a norm so as to differentiate a function from a mere effect. In addition, it also holds the normativity of the functional explanations; i.e., the precise assumptions that the malfunction is always probabilistic. Namely, a particular object can have a function and still may not perform that function. There is a concept for this model: ‘proper function’ which is especially used in evolutionary theory, behavioral ecology, and even evolutionary ecology to explicate the existence of a functional trait.

Accordingly, a function of a trait is the effect that this trait is selected for. If we check the meaning of the term ‘function’, the definition of function in etiological theory seems to be semantically similar with that of dictionary which defines ‘function’ as “an activity that is natural to or the purpose of a person or thing” (Oxford Dictionary). That’s why every function is somehow related to purpose whether it is intended or natural. As Ruth Garret Millikan explains this with the following:

> [I]tems have functions when their being there depends on reproduction from ancestors having similar traits, these traits having been causally efficacious in helping to produce these items, and these traits having been selected at some point in this history for their capacity to make this kind of contribution (Millikan, 1993, p. 41).

Of course, this type of explanation is teleological because it answers "why" and "what for" questions by using the word 'in order to'. Robert N. Brandon (2006) exemplifies this such that "the function of a trait is that effect (or effects) that caused(es) the trait to have higher fitness than alternative competing versions of the trait" (p. 268). Therefore, the effect of a trait, which has higher fitness among other traits, becomes proper function or the purpose of that trait.

Among these explanations, only etiological model allows to talk about purpose. It seems to be applied to living things because natural selection operates only upon them. In addition, only this model is capable of explaining malfunctions in complex systems. Causal model evaluates activities as functions only when they contribute to overall system while etiological model explains both functions and malfunctions in complex systems from evolutionary perspective. The latter highlights that an effect of a trait may not always accomplish its functional activity, and therefore be incapable of that function. That's why, etiological explanations of function have normative side emphasizing malfunction as a possibility. On the other hand, causal theory of function does not have normative content since it was openly against to functional explanations in terms of a past history of a system and proponent of explaining according to the current situation of that system.

Recently, it is being discussed how to bridge or combine these two theories of function and subscribe to a kind of pluralism in order to deal with inadequacies of both theories. Though there are also those who think otherwise, some theorists, like Paul E. Griffiths (2006) and Arno Wouters (2012), suggested that both models should be combined because they need each other in their analysis. The

combination of these models would be able to meet shortcomings of each other since a single analysis is insufficient to explain role cases of trait effects.

According to Griffiths (1993), causal explanation of function is also suitable to the naturally evolving systems. He combines Cummins' theory of function with the etiological theory such that "[t]he proper functions of a biological trait are the functions it is ascribed in a [Cummins-style] functional analysis of the capacity to survive and reproduce (fitness) which has been displayed by animals with that feature" (Griffiths, 1993, quoted in Buller, 1998, p. 526). In other words, he ascribes functions to the parts of ancestral systems in terms of their contributions to the fitness of that system.

We have already handled the parallel between two types of questions starting with 'What' and 'Why'. Wouters (2012) argues that this parallelism is also appropriate to the definition of 'function as activity' and 'function as purpose'. Just as activity and purpose is included in the function of antivirus, such that the function of antivirus is to protect computer against counterfeiting, to create a personal firewall and to detect and remove malware, both are also included in biological explanations.

For biologists, there are also mechanistic or causal explanations for questions about "how a certain biological role is performed […], by describing a mechanism that produces the behavior that enables that system to perform this role" (Wouters, 2012). According to Wouters, in the causal explanation of function as biological role, it is pointed to the advantage of performing that trait or behavior among other alternative ones. This biological advantage is the 'survival value'* of the organism. As explained above, causal roles are ascribed to

*The term is mentioned by many authors in different ways. Some of whom are Michael Ruse (1973), John Bigelow and Robert Pargetter (1987), and Karen Neander (1991). Ruse states that to say that something has a function means that it has adaptive value since he regards survival value as an adaptation which leads to increase survival and reproduction. Likewise, Bigelow and Pargetter (1987) regard function as that it promotes survival *propensity* of something. They

a part or behavioral model because function as a biological role "refers to the role of a system in enabling life" (Ibid.). In contrast, survival value is attributed to a certain trait in terms of the survival or reproduction of that part or behavioral model. Although ascriptions of causal roles are related to how a part or behavior suits to a machinery structure of the whole, attribution of survival value is related to how a part contributes to the survival, reproduction or fitness of an organism. Such kind of explanation which is based on evolutionary theory leads to the teleological assumptions in biology. This teleological character of living things makes sense to us to get moral impulse toward them.

Considering all these explanations, a number of questions need to be answered for the core problem of this study: Which theory of function is suitable for ecosystems? Do ecosystems have survival value? Do ecosystems really have a goal? Do they evolve? What/How do the unified functionalist explanations contribute to applying health to ecosystems? There are many other issues that need to be addressed and taken into account, but it exceeds the scope of this study.

2.1.1. Community Ecology and Ecosystem Ecology

As a branch of biology, ecology is an academic field which studies organisms and interactions with their environment in which they live. Basically, there are three main branches of ecology: community ecology, ecosystems ecology, and population ecology (Sarkar, 2005). Population ecology is interested in how population and distribution of species interact with the environment. Community

somehow use causal role and etiological role in the same sense. They suggest that an effect is a function only when it is sufficient to increase and enhance *chances* of the survival of organism. Thus, a trait has a survival value only if it has greater survival propensity among others. Neander (1991) supposes that selected functions have survival value. Her view is called *functional minimalism* which relies on the idea that biological characters in an organism may be partly explained by means of selected functions.

ecology is interested in individuals in an environment and their interactions. Ecosystem ecology examines interactions of living and non-living parts within ecosystems.

Ecosystem ecology and community ecology are more important to emphasize in the study of ecosystem health. As we outlined in the previous section, importance of the relation between a whole and its parts cannot be underestimated in asking how to determine healthy conditions. Ecosystem ecology also somehow includes community ecology because it focuses on living populations, too. When both levels of ecology examine the relationship of their parts with the environment, these interactive relationships position the parts and their environment as "both causes and effects" (Lewontin, 2000, p. 126) in ecological investigation. To explain those sciences in detail, it is necessary for associating with functional models explained in the previous section before understanding of how 'health' is applicable to ecosystems.

2.1.1.1. Community Ecology

Community ecology is about groups of organisms aggregated into different populations in a particular environment and investigates their relations with both biotic and abiotic environment. Community ecology is an ecological unit that is related contingently but not necessarily to evolutionary ecology which unifies evolutionary biology with ecology. Callicott et al. (1999) explain this as follows:

> Changes in the biota that people routinely impose do not always affect the ecological processes that compose ecosystems. When human changes in the biota do not adversely alter ecosystem functions, people may appear to live in harmony with nature even though they are significantly altering the composition of biotic communities (p. 24).

Other living beings also shape their environment by structuring or constructing. If the degree of impacts is bigger or stronger, the potential of these organisms for 'niche construction' will be higher. Therefore, the possibility of evolution in a species or organisms depends on their niche construction which is the result of organisms' or species' strong impacts on the communities to which they belong; in other words, "short-term and small size effects on an ecosystem or community may not be sufficient to produce selection and subsequent evolution" (Post and Palkovacs, 2009, p. 1630). Provided that size and duration of an effect is sufficient to cause evolution, "changes in the environment cause selection on the population […] and […] the population has sufficient genetic capacity to evolve in response to changes in its environment" (Ibid.).

Ecological properties of a community do not only contribute to evolutionary patterns but are also under the influence of them over long timescales. Namely, ecological characteristics of a community are under the influences of "evolutionary change on organismal traits" (Ibid., p. 1629) in that community. Genetic variations within the population can be considered as the total variation in community variables. Like genetic heritability, keystone species which have strong effects on the community ecology are regarded as community heritability that helps us predict whether evolution in a population will lead to changes in the ecological characteristics of community variables (Rolston, 1975). These species, which are dominant in their habitats, are more likely to change their niches and to generate eco-evolutionary feedbacks to govern evolutionary changes in organismal traits. On the other hand, if a species has weak impacts on its community or ecosystem, it is due to being a rare member of the community and having less potential for creating eco-evolutionary feedbacks. Thus, it can be concluded that the function of a species in a community can be measured by the extent to which it bears the community heritability. Therefore, it would not be radical to say that functional relations in community ecology can be explained by etiological model.

2.1.1.2. Ecosystem Ecology

Ecosystem is an ecological unit that consists of biological, chemical, physical components and their interactions. Ecosystem ecology is about functions of all components and their interactions in an ecosystem. For this reason, functions are central to ecosystem ecology unlike community ecology.

In an ecosystem, biotic components generally or more dominantly influence abiotic components such as thermodynamic energy flow, nutrient cycles, water, soil, rock, etc. Some species which shape the environment as such are called "ecosystem engineers" (Callicott et al., 1999). If these keystone species are detached from their habitats, both parts and functions of the ecosystem in the area strongly changes.

In the study of ecosystem health, it is disputable to adopt the view that healthy conditions for ecosystems are determined through only one functional explanation before specifying certain health criteria. Even etiological model of function seems to be inappropriate to explain systemic function, "[e]cosystems do depend on evolved entities for some of their functions, [but] evolution is only tenuously connected to ecosystems" (Allen and Hoekstra, 1992, cited in Callicott et al., 1999, p. 30). Thus, it can be suggested that ecosystem ecology needs both functional models as I will explain in detail in the discussion chapter.

There are two new schools of conservation philosophy* which are important to be explicated here for further understanding the debates around the ecosystem health: Compositionalism and Functionalism.

* The first quarter of the 20th century was dominated by two conservation philosophy: Resource Conservation (resourcism) and Wilderness Preservation (preservationism). Resourcism is

2.1.2. Two New Conservation Philosophies: Compositionalism and Functionalism

Compositionalism is inclined towards both evolutionary ecology and community ecology while functionalism is inclined only towards ecosystem ecology. The former is concerned about organisms and species but not functions; on the other hand, species are not in the interest of functionalism, but processes are.

On compositionalist side, species which are about to disappear matter to compositionalism for which biological integrity is the norm. Only nonhuman species at which its continuity is aimed are the interest of this approach, because man is separate from nature. It is "essentially entity-oriented" (Callicott et al., 1999, p. 23). Accordingly, changes made by humans are not natural.

As for functionalist side, man is part of nature and legitimately affects his environment; therefore, changes made by humans are regarded as natural. This is also called 'thermodynamic approach' in which man has a role on energy flowing within the ecosystem. Therefore, species that are about to disappear are out of consideration for the functionalist. It is "essentially process-oriented" (Ibid.). Fundamental norms are both ecological integrity and ecosystem health, but this is arguable issue about which I'll talk in the next chapter.

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completely anthropocentric for which nature is valuable if it is beneficial for human beings. Therefore, biotic communities and ecosystems are incidentally valuable. Gifford Pinchot was the leading proponent of this approach. On the other hand, preservationism is completely biocentric for which nature is valuable for its own sake. Natural areas are called wilderness as a goal or reference state to be achieved or protected. John Muir was the leading proponent of this approach. These two approaches have been reformed by getting conservation concept to have a more accurate meaning. For many environmental scholars, resourcism is an anthropocentric approach that sees nature as a resource for human use. To avoid this danger, functionalism has been presented for human use in sustainable ways. On the other hand, compositionalism has been presented for replacing preservationism since its core idea of wilderness serves to biological conservation.

Callicott et al. 1999 try to synthesize functionalism with compositionalism to establish a unified environmental theory because they insist that these two conservation philosophies are dependent on each other. They attempt to complement functionalist approach with compositionalist one, even if both theories are applied to different ontologies and have different norms, such that:

> Biological diversity, biological integrity, and ecological restoration are more at home in the compositionalist glossary. Ecosystem health, ecological services, adaptive management, ecosystem management, ecological rehabilitation, sustainable development, and ecological sustainability are more at home in the functionalist approach (p. 29).

It would not be so wrong to claim that they act eclectically because they seem to use different ontologies to achieve a univocal ethical theory. Undoubtedly, to set out a monistic moral theory requires a single ontology, one metaphysics, and one epistemology. However, Callicott's environmental theory moves from the plural ethical principles to achieve a kind of moral unity even if he does not object to a kind of pluralism. I will not discuss this issue in detail, but I will argue how to determine consistent norms for ecosystem health further partly in response to deficiencies of his theory.

CHAPTER 3

APPLICABILITY OF THE HEALTH CONCEPT TO THE ECOSYSTEMS

3.1. Using 'Health' In a Literal Sense

James Hutton developed “a theory of the earth as a superorganism capable of self-maintenance” (Hutton, 1788; quoted in Lovelock, 1988). As I will point out in the next part of this section, there are both weak and strong interpretations of this analogy. Clements, at first, adopted the weak one but later he took his ideas even further and turned to the strong analogy. In contrast, Tansley criticized Clements’ strong interpretation and embraced the weak analogy. Indeed, weak one is about metaphorical use of health, but I’ll talk about the organismic view both in this section and in the next for the development of the subject matter. On the other hand, Peter Calow (1992) evaluates both ideas and sees ecosystems as biological machines which are not explained from evolutionary perspective. His cybernetic approach is based on the strong interpretation of analogy which is purified from evolutionary aspects.

Unlike organismic view of nature, Bruce Morito (1999) explains the reason why health can be literally used for ecosystems through the source of its value. It will be very helpful to talk about discussions revolving around the literal sense of health for the sake of the core problem of this study. Their common aim was to

methodologically use power of science, in order to get objective information independent from social values.

In weak interpretation of organismic view of natural environment, biotic communities are regarded as organisms and their healthy states are determinable through the normality criterion. The characteristics that a system must have in the absence of disruptive or destructive situations are considered to be normality criteria. This is what exactly happened in the history of medicine. In early medicine, doctors associated body states with conditions of health.

Similar attempts on ecosystems have been encouraged to observe certain states of ecosystems in order to identify healthy conditions. Like organisms, the conditions of ecosystem health can be determined in terms of certain signs of pathology mostly caused by humans. Rapport (2009) exemplifies as:

> the release of waste residuals (e.g. release of contaminants to air, water, and land); overharvesting and the physical restructuring of both terrestrial and aquatic ecosystems (dams, water diversions, roads, and utility corridors which fragment the landscape); and the introduction of exotics. (p.329)

This idea stems from a kind of Clementstian strategy that represents "the holistic nature of communities as organisms and of the plant formation as a superorganism" (Willis, 1997, p. 268). However, the distinctive characteristic of Clements' view is that communities are real organisms and "[t]he climax is a steady-state of community productivity, structure, and population, with the dynamic balance of its populations determined in relation to its site" (Meeker and Merkel, 1984, p. 428). Here, Clements' community as real organism is named as quasi-organism by A. G. Tansley, who is the first to use ecosystem concept in his writings. According to him, Clements ignores physical components that contribute to the whole system. Tansley welcomes using this analogy only as a heuristic tool but rejects its literal use to the extent that Clements did. He suggested using "a non-community-based descriptor of a wide nature" (Willis,

1997, p. 268) to recognize both organisms and the complex interactions between biota and abiota.

In strong interpretation of the analogy, health is defined as "a condition favorable (i.e. optimum) for the functioning of the whole organism that is actively defended by homeostatic processes" (Calow, 1992, p. 1). This interpretation regards ecosystems as biological machines in which the dynamics of all interacting "components fit and work together to maintain" (Scrimgeour and Wicklum, 1996, p. 255) an equilibrium state. Calow (1976) presents a cybernetic approach to life according to which organisms are preprogrammed "because they contain molecular systems that code for phenotypes that are capable of replicating molecular programs to a greater or lesser extent" (Calow, 1992, p. 1).

There are biophysically and socioeconomically three attributions of health to ecosystems: organization, resilience and productivity. When ecosystem is not influenced by any perturbation, it has the characteristic of 'resilience' which is the ability of returning to early state. When ecosystem sustains reproduction of living components, it has the characteristic of productivity. When ecosystem includes diversity of lifeforms and their interactions, it has the characteristic of organization.

If we apply health to ecosystems, a controlled optimum state is important to be emphasized. According to Calow (1992), the capacity of resilience determines a controlled optimum state in ecosystems. However, ecosystems are passive control systems because they achieve their equilibria by means of ecosystem engineers. They lack active feedback in contrast to organisms. Organisms that are active control systems have a 'goal state' towards which they move; on the other hand, ecosystems have no such a form of teleology. Therefore, ecosystem health cannot be explained from evolutionary perspective. He continues that "[t]he outcome, in terms of system' dynamics, is similar to that for active control; but the way that it is achieved is different" (p. 2). Therefore, they have different principles in

application because 'health states' are more difficult and less objectively determinable for ecosystems unless it is emphasized as a management goal.

Discussions about the applicability of the concept of health in literal sense sometimes revolve around the source of its value. Bruce Morito (1999) is one of the environmental philosophers who base their defense on the value of ecosystems. He uses *ecosystem autonomy* instead of ecosystem health because it is more relevant to obligations for respect. For analyzing autonomy of an ecosystem, he proposes ecosystem integrity as a basis for developing imperative statements. According to Morito, integrity is more likely to be identified as universal value than health since "ecosystem health approaches appeal to a plurality of values, which [also] include economic and social goods" (pp. 59-60). He argues that environmental policy makers should focus only on environmental values instead of economic and utilitarian purposes. Hence, Morito proposes a post-modern constructivist theory of ecological values after explaining how values are made, what is valued, and how we humans value other things or processes. Owing to the heavy influence of the thoughts of Laura Westra (1994), he clearly emphasizes the importance of ecosystem integrity for ecosystem autonomy by stating that:

> Ecosystem integrity will form the springboard for the analysis not only because it has intuitive appeal, but because Laura Westra's representative work […] is a more argumentatively focused recognition of our dependency relation to the environment than can be found in the health approach. (p. 60)

Moving from Westra's acceptance of wilderness as a reference model for ecosystem, Morito proposes "an autonomous system with resiliency, historical continuity guided by internal determinants" (Ibid., 61) as a crucial point to create a categorical imperative. Accordingly, for Morito, it is possible to ascribe a prescription to description of ecosystem integrity in order to protect it, if and only if ecosystem integrity is seen as a *foundation of value* rather than *foundational*

value. This is the only way of eliminating the fact-value dichotomy because such a foundation and of value give normativity as well.

Morito applies Westra's 'freedom argument' to attribute a moral prescription to ecosystem integrity. Accordingly, every individual organism or whole maintains its existence through freedom from any internal or external obstruction and actualize itself. He comprehends this argument as follow:

> [I]f we respect the freedom of human agents who display the property of retaining an identity through time by virtue of having structural and functional integrity, [...] the same respect [is given for] organisms and systems that display the need for freedom to maintain structural and functional integrity. Furthermore, […] integrity can compete with other ultimates such as happiness or rationality as an ultimate ground for values, rights, and moral responsibilities. The principle, then, can be seen as serving to protect fundamental values, thereby gaining moral force. (p. 63)

Unlike Westra, Morito claims that any human activity including valuation must be identified as ecosystem activity; therefore, such an extreme holism bears a kind of potential for commitment to ecofascism which claims superiority of community or species to individual beings.

Robert T. Lackey (2001), however, claims that such value-based concepts should be abandoned from use in scientific realm because "value-based assumptions masquerade as science" (p. 439) which is often called normative science. Policymakers use human societal values and opinions to make certain value judgments that lead to contradictory senses of ecosystem health. However, the real "[s]cience can delineate the possibilities and describe the system that is likely to result from a policy, but it cannot decide if the resulting system is good or bad" (Rykiel, 1998, p. 486). In other words, human societal values determine what is good and what is bad while the real science only determines what is true and what is false. That's the difference between science and the so-called normative science

in which “value-based assumptions masquerade as science" (Lackey, 2001, p. 439). That's why the 'health' concept should not be literally applied to ecosystems.

There are also other environmental thinkers who oppose to trying to identify the objective conditions of ecosystem health from different angles. They propound that the notion of health can be metaphorically attributed to ecosystems even if its use has also some disadvantages.

3.2. Using 'Health' in a Metaphorical Sense

Metaphorical sense of health for ecosystems is firstly suggested by Aldo Leopold, who is regarded as the prophet of conservation philosophy by Callicott. I will examine Leopold’s understanding of the land health by Callicott’s presentation of it, since Callicott is the most important Leopold scholar. He ascribed health to the land by comparing characteristics of organisms and community but his metaphorical approach has been challenged by Dale Jamieson, Kaputska and Landis and other philosophers. Therefore, I’ll review the opinions of these opponents after introducing Leopold’s land health from Callicott’s point of view.

According to Callicott, Aldo Leopold used the 'health' concept for ecosystems as a conservation advantage, because the concept includes normative character and scientific articulation. In his later writings in *A Sand County Almanac* (1949), he talks about 'land health' instead of ecosystem health. According to him, the norms of the land health are determined through the symptoms of ‘land-sickness’ such as “soil erosion and loss of fertility, hydrologic abnormalities, and the occasional irruptions of some species and the mysterious local extinctions of others” (Callicott, 1991, p. 339). He proposes 'wilderness' as a benchmark of health conditions for land; however, Callicott rejects taking wilderness as a normality criterion by claiming that wilderness never exists. Of course, Leopold does not

regard wilderness as a health condition; rather, he regards it as a land laboratory to determine ecological parameters for human occupation without making the land dysfunctional.

For Callicott, Leopold explains the land health "as a state of vigorous self-renewal" (Ibid., 340) which implies a functional process in which integral parts of the whole are collectively functioning so as to maintain the whole itself. This reflects a characteristic of an organism, as Leopold says that “land is an organism, and conservation deals with its functional integrity or health" (Ibid.).

Callicott thinks that Leopold uses stability, integrity, and health interchangeably in his expressions and emphasizes active role of diversity for ecological function. Leopold *cautiously* combines health or integrity with diversity or complexity in order to avoid claiming that diversity causes health or stability. According to Callicott, his attempt to associate diversity with stability as follows:

> The net trend of the original community was […] toward more and more diversity of native forms, and more and more complex relations between them. […] The circumstantial evidence is that stability and diversity in the native community were associated for 20,000 years, and presumably depended on each other. Both now are partly lost, presumably because the original community has been partly lost and greatly altered. Presumably, the greater the losses and alterations, the greater the risks of impairments and disorganizations. (Ibid., 340-341)

After 1930s, Leopold assimilated a more holistic approach such that “[a] thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise” (Leopold, 1966, p. 262). Although Leopold was a proponent of wilderness preservation and co-founder of the North American Wilderness movement, he paid more attention to ecosystems that humans are active in and use. He argues that as long as human economic activities and introducing domestic or exotic species do not interrupt ecosystem functions, they are consistent with land health. Leopold elaborates this as follows:

> A science of land health needs, first of all, a base datum of normality, a picture how healthy land maintains itself as an organism. We have two available norms. One is found where land physiology remains largely normal despite centuries of human occupation. The other and most perfect norm is wilderness. (Ibid., 274)

Although, according to Callicott, the aim of using health metaphor for ecosystems "is to assimilate ecosystem functions to organismic functions, without claiming that the former are special case of the latter" (Callicott, 1999, p. 351), using 'health' as a metaphor isn't enough to create unproblematic ethical theory about ecosystems due to the shortcomings of strong motivations. We usually talk about and care of health of living beings whose existence is explained from evolutionary perspective. Motivational power in health of these living beings is more than that of non-living things because evolution informs us about our common ancestral history, and therefore, gives us respect for our fellowships. As for ecosystems, someone may claim that no one attributes anything to ecosystems that are not even existent. Indeed, even that they exist, it is not definite whether they are living things. Of course, ecosystems are not tangible things and do not have spatial boundaries, but they are hierarchically ordered processes or functions and interacting with each other. Nevertheless, disadvantage of sharing no evolutionary history with us lead them not to be morally considerable.

Some of the proponents of this idea are Kaputska and Landis, who strongly object to metaphorical use of 'health' for ecosystems. They claim that ecosystems are not organisms or living systems because natural selection doesn't operate on them contrary to biological systems. Therefore, characteristics related with living beings cannot be ascribed to ecosystems even if biological beings are included in them. Thus, according to them, questions like "Is the ecosystem healthy?", "Is your car healthy?" or "Is the stock market healthy?" have the same form (examples from Kaputska and Landis, 1998, p. 835) because "the danger of the health metaphor is that it is based upon selected human values and judgements, not upon scientific reality" (Ibid.). This car or the stock market is healthy if and only if it performs its purpose or function assigned by us. For instance, the car

transports somebody to intended place despite of its harmful effects on air, it is healthy. Thus, the criteria of health "are biased by the underlying values assigned to the system" (Ibid.). In other words, Kaputska and Landis seem to be against defining ecosystem health with the help of beliefs, morals, values, desires or myths because science focuses on reality not on human opinions and morality. They argue that;

> Ecology as a science does not present moral and ethical guidance for societal use in environmental management. Moral, ethical, economic, and political values are integral parts of environmental management, but they are derived outside the realm of science. We emphasize the importance of preserving the power of science as a methodology to acquire objective information separated from societal values. (Ibid., 829)

Accordingly, all scientific disciplines as well as ecology explain and "define reality, not public opinion or fashionable morality" (Ibid., 835); therefore, all moral and aesthetical judgements are different from and not included in scientific explanations. Otherwise, an effort of deriving all environmental moral norms from ecology, namely, this kind of misrepresenting science, may lead to such conclusions like that higher level of biodiversity has better conditions of health than lower level of biodiversity and that only wilderness is a benchmark for healthy ecosystems. For Kaputska and Landis, ecology as a science does not investigate ecosystems through evolutionary theory; rather, it defines them as "functions achieved by species complexes, not by the taxonomic diversity" (Ibid.).

Dale Jamieson (1995) also argues that the health concept gets a weaker outlook when it is generalized to ecosystems because our generalizations about health are local and culture-bound. When the concept of health is ascribed to ecosystems as to human beings and other living things, the same motivational power does not emerge in us due to not having preferences and self-caring character. Jamieson explain this problem as follows:

> Ecosystems don't mind being diseased [...] because they are not the sorts of things that can mind anything. This is an obvious but important difference between humans and ecosystems. Since ecosystems have no preferences about their states, appreciating their desires does not provide a reason for action. (p. 337)

Although the point of preferences is not necessary for objectification, according to Callicott, Jamieson goes further in saying that objectivity itself comes from our culture not from our nature. In other words, objectivity is based on the roles played by various values in the evaluation view of a society. Therefore, more or less objectiveness of values depends on the dynamic characteristic of them. That's why Callicott accuses him of vulgar relativism and conventionalism by explicating the situation as that "[a]mong the ancient Greeks, slavery was a way of life, a foundational aspect of a common culture. Hence by Jamieson's account, in that time and place, slavery was good, objectively good" (Ibid., 340). In this sense, Callicott claims that it would not be wrong to say that defending the cast system in India or assimilation of human rights in China is acceptable.

Another problem with this discussion is whether moral agents can have profound or substantial normative values if they are defender of relativist outlook in every aspect. Contrary to Callicott's view, Jamieson shares the idea with Hume, Ayer, and Stevenson that the way morality is constructed is totally different from what its contents are. In other words, values are the result of evaluations of our emotional attitudes which reflect a kind of approval or disapproval feelings expressed through moral judgements. This is "occasioned by the rise of emotivism in the second third of this century" (Ibid., 341). The aim of the moral judgements is to affect others' attitudes to cause agreement or disagreement situations. This serves to "how morality is constructed" (Ibid.) whereas the source of moral values is based on our feelings which provide content for morality. Therefore, the source of normative values does not constitute as an obstacle to achieve deep normative values.

Moreover, Jamieson points to two risks in applying the notion of health to ecosystems. The first is that it leads to medicalizing our relationship with nature, so that, its evaluation should be leaved to ecodocs. The other risk is that it makes difficult for us what we value because of its scientific outlook. Recently, for Jamieson, some illness – like behaviors has been leaved to science experts to explain these "behavior[s] and treat the disorder[s]" (Ibid.) because we ordinary people are unable to comprehend and explain this kind of behaviors such as child abuse and crime. Similarly, environmental issues like healthy state of ecosystems, then, should be leaved to 'ecodocs' to comprehend, explain, and restore them. In addition, such a medicalized relationship with nature causes "driving out the idea of individual responsibility" (Ibid., 342) and the conclusion as follows:

> It is not our fault that some ecosystems have been struck by disease, nor do we have expertise or responsibility to fix them. This thought, which is invited by the language of ecosystem health, is an entirely wrong way of thinking about environmental problems. Diseased ecosystems are not primarily challenges to the resourcefulness of 'ecodocs', but challenges to our way of life. (Ibid.)

Accordingly, we understand that ecosystem health cannot be fundamentally comprehended and explained by science. Rather, according to Jamieson, this and other environmental affairs are the problems that concern the human heart.

3.3. Using 'Health' Both Metaphorical and Literal Sense

Major environmental philosophers accept that the notion of 'health' can be both literally and metaphorically ascribed to ecosystems. This idea was especially held by Katie McShane, D. J. Rapport, H. A. Regier, T.C. Hutchinson, and J. Baird Callicott. Although they framed their ideas about ecosystem health in different ways, they are in agreement in emphasizing both objective and subjective characteristics of health.

In this section, I will review these environmental thinkers' views in order to clarify different trends revolving around applying the health both literally and metaphorically. Firstly, I'll talk about Katie McShane's view and then I will move on to the views of D. J. Rapport, H. A. Regier, and T.C. Hutchinson. Lastly, I'll give some information about the ideas of J. Baird Callicott on the subject matter of this chapter.

There are those who claim that the concept of health can only be attributed to organisms in a literal sense, and that ecosystems are not superorganisms, and therefore this concept can only be attributed metaphorically. Although Katie McShane (2004) participates in the idea that ecosystems are not superorganisms, she asserts that the concept of health can be also literally used for those who are not organisms if the definition of 'organism' is examined well. McShane uses *The Oxford Dictionary of Biology* which gives the definition of organism such that "to be an organism, something must be capable of reproduction, growth, and maintenance" (McShane, 2004, p. 229). Moreover, some ecologists and biologists have also described health with other criteria such as goal-directedness, homeostatic nature, system feedbacks, etc. However, according to McShane, these criteria are not necessary for attributions of health. She gives an example of tomato which can be healthy or unhealthy regardless of its reproductive activity. Ascription of health to tomatoes is possible even they lack reproductive capacities. For this reason, we should think about what characteristics something has before we say it is healthy or unhealthy.

According to McShane, being a bearer of health requires health-related structures, health-related functions, and "the ability to be better/worse off" (Ibid., 230) since not all structures and functions of things are good for themselves. Only some structures and functions may provide ecosystems with the maintenance of its existence. That's the difference between an ecosystem and a computer. For McShane, some of the behaviors that are seen as function may not be regarded as functions to maintain health. This means that we should only find more conditions

in which we can find health-related structures and functions. Namely, the important thing is how to find out which structures and functions are health-related. She says that we should look at the normative nature of health in order to be successful in this task.

According to McShane, the concept of health is normative by nature, and good by definition. Here, 'goodness' is problematic. We do not mean anything that is considered good because there are situations in which we can reasonably think that goodness in health is outweighed by other good. For instance, it may be reasonable for someone to make a little health-related sacrifice to influence "political change or [to] complete a great work of art" (Ibid., 233). Thus, McShane means health as "a state that is inherently good in the sense of '*prima facie good'*, or 'good, all other things being equal'. That is to say, health is by definition valuable, although this value can be outweighed by other values" (Ibid.). According to him, the concept of 'good' has three types of use. The first type serves to the meaning of "morally good", the second type serves to the meaning of "a good of its kind", and the third one serves to the meaning of "good for what has/does it" (Ibid.). For McShane, health is only used in the third sense by emphasizing that:

> While it is true that health requires having a structure which meets a certain standard, this standard is itself set by yet another standard – one that's rooted in a different kind of goodness, namely, *goodness for*. This third sense is the primary sense in which health is inherently good. In saying that to be healthy is […] to be good in a certain way, we are saying that it is to be good for that which has it. Now, again, this is *prima facie* good, not all-things-considered good. (Ibid., 234)

McShane continues to describe a way of determining health-related structures and functions with the help of 'good' theme. To achieve this task, she acknowledges Stephen Darwall's explanation of 'good for'. Accordingly, "[s]omething is good for you if it would make sense for someone who cared for you to want it for you for your sake" (Darwall, 2002: 9, cited in McShane, 2004, p. 234). This analysis

of 'good for' makes sense for the health of ecosystems and other things such as plants, newborns, animals which do not have any subjective point of view.

Apart from health-related structures, there have to be health-related functions for being healthy because "not all structures/functions are constitutive of health" (Ibid., 235); otherwise, health can be also ascribed to computers owing to its ecosystem like structures and functions. McShane repeats Larry Wright's account of function and adds that "[w]hether or not something counts as having a particular function is determined by looking at its history and/or its ancestors. But decisions about what to want for those you care for are frequently forward looking" (Ibid.). In other words, the question of whether this function is performed as in the past is important to the extent that it carries the question of whether the fulfillment of the function benefits only what it is now cared, rather than contributing to the existence of things as in the past. Of course, McShane admits that natural selection does not operate on ecosystems but she is also proponent of the idea that "there must be *some* causal mechanism" (Ibid., 238) on Wright's view by giving 'the regeneration process' as an example. Accordingly, she invites us to conceive a forest ecosystem that is often burned. This forest regenerates immediately after burning incidences. The fire leads to seeds to be uncovered; the light in the burned forest pervades the forest floor to be germinated and grown. This regeneration process continues till the burned place is reforested. Here, we tend to think that "function of this regeneration process is to reforest the burned-out areas" (Ibid.). However, there is also different mechanism in this process according to McShane. She clarifies:

> [T]here must be *some* causal mechanism by which reforestation is responsible for the presence of the regeneration process. It could be the case that selection at gene level (in different organisms) selected for the behaviors constitutive of the regeneration process. Because reforestation was advantageous to the genes that caused these behaviors, they survived and reproduced. (Ibid.)

Briefly, both parts and functions are mutually responsible for each other; namely, parts are the causes of their functions although they also need to perform their

functions so as to exist. Ecosystems too have such parts with function. McShane defines 'health' as "a matter of retaining those structures and functions that are good for it" (Ibid., 227), even if what is good for an ecosystem is determined by our definition of the system and eventually by our interests based on facts. However, this view should not be understood as a denial of the fact that ecosystems have a good of their own. Just as how we care for the health of other people, we may as well care for the health of ecosystems because it is not true that only organisms can be healthy. So, McShane proceeds that we may scientifically and metaphorically refer to the health of ecosystems with regard to their health-related properties and our interests based on facts about us.

For McShane, what is good for persons or ecosystems depends upon our interests. This does not mean that ecosystems have no good of their own; rather, they have good of their own which is based on our facts about what is in our interests. Thereby, just as our health is based on the facts about our own interests, ecosystem health is also based on the facts about our own interests even they have no interest of their own. To know "which structures and functions that are good for the ecosystem, we should ask what it make sense for someone who cared for the ecosystem to want for it for its sake" (Ibid., 245). Hence, for ecosystems, for living organisms, or for other wholes with integral parts and functions, health is based on their health-related structures and health- related functions, which determined by our own interests.

D. J. Rapport, H. A. Regier, and T.C. Hutchinson (1985) point out that both ecosystems and organisms have parallel properties and mechanisms, but this parallelism does not imply that conditions of both are the same. Authors elaborate this as follows:

> Ecosystems are, to be sure, a supraorganismic level of organization, but are not superorganisms since each level in a hierarchy has both unique properties found only at that level, and parallel properties with other levels. […] Since ecosystems in common with organisms are cybernetic (but not necessarily by the same mechanisms), and thereby

> have the potential to mitigate many stressors imposed from outside. (pp. 617-618)

Like ‘disease’ or ‘illness’ in organisms, ecosystems may have stress which are called perturbation or dysfunction. These thinkers use these concepts in order “to denote an external force or factor, or stimulus that causes changes in the ecosystem, or causes the ecosystem to respond” (Ibid.). Lacking any stress represents a criterion for health in ecosystems; however, not all stresses have to be catastrophic or destructive because some types of them contribute to healthy state of the ecosystems. For instance, in case of fire in a forest, “[s]ome species depend upon fire for seed release from cones […]. Periodic burns release minerals stored in the soils and in tree biomass, create space, and reduce competition for moisture, nutrients, heat, and light” (Ibid., 619). Thereby, identifying which stresses destructively impact the structural and functional mechanisms of terrestrial and aquatic ecosystems is very important to find health criteria. However, Rapport, Regier, and Hutchinson believe that recognition of stress in ecosystems or disorder in organisms are based on objective scientific criteria, but healthy state is determined through the subjective views of persons. Even though the signs of disease in organisms or ecosystem distress are scientifically recognizable, health criterion depends upon the judgments of people. As I explained in the third chapter, compositionalism and functionalism suggest different criteria for health even though both approaches only include scientific basis.

For the thermodynamic approach or functionalism, states of nutrient cycle and productivity are core determinants of health because a dramatical change in one of them affects the state of ecosystem as well as species. As for compositionalists or naturalists, biological diversity is a core determinant of health because they value varieties in and between species. They consider that there would be dramatic degradation in case of losing one species. It is not important which approach is able to define health criterion better because both requires a scientific investigation and subjective view on health norms.

Unlike some approaches claiming that health is only a subjective or objective concept, Callicott asserts that 'health' is a thick descriptor because it is a value-laden concept and has both subjective and objective characteristics. He agrees with Rapport's view (1995) on the grounds that "ecosystem health is partly a matter of social values and partly a matter of the requirements for persistence or resilience of ecosystems" (Callicott, 1995, p. 353). To be explicit, conditions of health are objective whereas the value of health is subjective but universal or intersubjective; therefore, to justify that 'health' consists of both objective and subjective characters, he compares the health of ecosystems with the health of organisms.

Instead of land health which is the paradigm of organismic ecology, Callicott uses the term 'autopoiesis' which “permits a more limited comparison between organisms proper and larger living systems” (Callicott, 1991, p. 342). He considers that this term delineates ecosystems better and is more scientific. Assimilating land health in the scientific concept of autopoiesis “as the capacity of land for self-renewal” (Ibid.) provides a better understanding of Leopold’s land health. According to Callicott, Leopold did not intend to claim that ecosystems “are just larger and more diffuse versions of” the organisms (Ibid.). He argues that "organisms and ecosystems are both autopoietic, self-organizing and self-recreating." (Ibid., 343). In addition, Callicott proposes autopoiesis in order to indicate dynamic side of ecosystems unlike health. Although health is a static condition of both ecosystems and organisms “to maintain certain continuity and order” (Ibid.), autopoiesis indicates dynamic change over time only in ecosystems.

The problem of normativity arises from 'autopoiesis' not from 'health' since autopoiesis is a fairly objective concept. So then, does autopoiesis have intrinsic value? It has only instrumental value owing to being a purely scientific concept and including some benefits as well. When the subject is health, the matter will be valuation implying subjectivity which is the basis of both instrumental and

intrinsic value. Since valuation always indicates an activity of valuing subject, the locus of value and the source of value are different. Even though health is both intrinsically and instrumentally valuable for Callicott, both kinds of values which health has are based on the subjective valuation.

According to Callicott, the roles of subjects on the determinants of both organismic and ecosystemic health provide a middle route between literal and metaphorical senses because only by metaphorical extension, health is regarded as an objective condition of ecosystems, but this condition can be scientifically determined. That's why he proposes a conciliatory understanding of health condition such that experts and laypersons should decide the parameters of ecosystem health in cooperative and complementary rather than competitive and exclusive ways. Callicott declares that "[o]ne could […] dispense with the metaphor and describe ecosystem functions and dysfunctions clinically. But then one could also dispense with the literal concepts of health and disease and describe organismic functions and dysfunctions clinically" (Ibid., 351). Therefore, health is not an absolute but defeasible good that may be replaced by another or greater good.

Although the value of the goodness or badness designated by thick descriptors is subjective, "[t]he value dimension of a thick descriptor functions like a designator of something objective" (Ibid., 357). Thus, ecosystem health "is *functionally* equivalent to an objective value" (Ibid., emphasis added) and activates moral sentiments in moral agents. Likewise, J. L. Nelson (1995) is sympathetic to the objective value of ecosystem since he adopts an idea that the value of an ecosystem should not be based on our interests and preferences. Nelson reconciles the literal use of health with its value such that "[t]o use health and illness language nonmetaphorically – as we do of persons, rather than as we do of carburetors- requires that the system of which such terms are predicated have value" (p. 318). Namely, health is a thick concept that bears an objective goodness; that's why, discipline of clinical ecology is needed for uncovering goodness or values of ecosystems according to Nelson. She argues that "[w]hat is

needed is not simply a more refined system indicators of health status for ecosystem; [instead], an account of nature's good [that lacks] individual and societal preferences (Ibid., 320).

Callicott (1995) ignores whether value of ecosystems is objective or not when he adds some reasons why ecosystems are valuable. According to him, they are also valuable due to prudential, aesthetic, and ethical reasons. The prudential reason why the health of ecosystems is valuable is that sickness of them disturbs socioeconomic systems because they interact with each other. The aesthetic reason is that unhealthy ecosystems seem less attractive than healthy ones, like healthy people. The ethical reason is that it is intrinsically valuable.

In conservation discourse, the meaning of ecosystem health has sometimes been the same as biological integrity due to ambiguous definitions of both concepts. Callicott means by ecosystem health as a normality criterion, by biological integrity as an equilibrated, integrated, evolved community of organisms, and by biodiversity as constituents of biotic community organization. Unlike Leopold, Callicott uses 'integrity' for communities instead of biodiversity and 'health' for ecosystems due to differences between community ecology and ecosystem ecology. Integrity and health are not entirely unrelated; rather, "health is necessary for integrity, [but] it is not sufficient" (Noss, 1995, p. 21, quoted in Callicott et al., 1999, p. 375). He clarifies this relation as follow:

> Some species, that is, seem to operate as keystones. If a keystone species is removed, large changes in community structure and, eventually, ecosystem function ensue. Some keystone species operate as "ecosystem engineers" […] by causing physical changes in biotic or abiotic materials. (Callicott et al., 1999, p. 31)

Both community ecology and ecosystem ecology are complementary because "the maintenance of ecosystem health [...] depends upon the existence of proximate reservoirs of biodiversity" (Ibid., 32). A. G. Tansley, who is the first to use ecosystem concept in his writings, points out this relation considering that

"organisms, when thinking fundamentally, cannot be separated from 'the environment of the biome – the habitat factors in the widest sense … with which they form one physical system" (Tansley, 1935, p. 299). To achieve a holistic environmental ethics, both must work together. However, health is a norm for humanly inhabited and exploited areas while integrity is a norm for areas which humanly uninhabited. In addition to these concepts, Callicott gives a new concept of ecological sustainability to complement inefficiencies of conservation philosophy and defines it "as a conservation concept, therefore, be understood to be the maintenance, in the same place at the same time, of two interactives 'things': culturally selected human economic activities and ecosystem health" (Callicott et al., 1999, p. 368). In Callicott's view, the relation between the ecological sustainability and health is parallel to that of biological preservation and integrity, so these two evolutionary and ecological models of the world are not competing; rather, they are complementary.

There are some questions arising when Callicott unites these two approaches of conservation philosophy. If they are also complementary on normative level and their metaphysical backgrounds are distinct, how are they complementary? How do different ontologies belong to the same system? The answers to these questions given by Callicott remain suspicious. I will not discuss this issue here because it is beyond the scope of this study. Both integrity and ecosystem health as two conservation norms are in the same context. According to Callicott, there is no inconsistency with the synthesis of functionalism and compositionalism by arguing that they "are distinguished only for expository purposes; they, in fact, constitute two ends of a continuum" (Callicott, 1999, p. 24).

Like Callicott, in his essay 'Is there an Ecological Ethic?' Holmes Rolston III proposes homeostasis the crucial law of health by which we may control our actions so as to balance the ecosystem. This natural norm inevitably obligates us, for the sake of the balance of nature, to behave in such a way of developing and utilizing "energy systems which recycle their products back into [n]ature" (Colwell, 1969, p. 50). Developing other values on homeostasis does not mean

that we reduce all moral norms to scientific principles. However, in order not to fall in naturalistic fallacy, it is a precondition of valuation; namely, it is not sufficient but necessary for value. We do not often witness a scientific adjective in front of a moral noun like ecological conscience or evolutionary ethics. He is right to say that these descriptive laws are not moral, but "they become moral only as a moral principle" (Rolston, 1975, p. 96) that provides a purpose for the agent. Homeostasis is value free "unless and until these humans come along and place intrinsic value" (Pojman, 2016, p. 111) on them because descriptive statements of facts does not imply any evaluative statements if no one introduces any evaluative premise.

CHAPTER 4

DISCUSSION

Until today, a number of approaches have been developed to address the effects of ecosystems or the environment on human health. We have been looking for solutions to environmental problems that cause deterioration of human health with mostly technical concerns and anthropocentric approaches. The aim of the solutions to these environmental problems has been mostly temporary and limited, because they centered only around the maintenance of human life. On the other hand, there are many environmental theorists who attempt to use health concept for the sake of ecosystems. Among them, I will examine and discuss ecosystem health according to Callicott's view and also assess this issue by taking the core problems related with the combination of health and ecosystem into account. My whole purpose is to justify that applying health to ecosystems is plausible.

Callicott rightly thinks that using 'health' in metaphorical sense isn't enough to create ethical theory about ecosystems because ecosystem health does not give us the same motivational power as health of the organisms. Motivational power of the former is less than that of the latter because we usually talk about and care about the health of living beings. As for ecosystems, it is not certain whether they are living things. To find a way to deal with this problem, Leopold makes an analogy between the land and organism. The biotic community leads social limitations on our free actions. These relations imply moral relations with the land that cannot be constructed without love, respect, admiration, and value. To be more explicit, being a member of a community or society means to be subject to

ethical limitations on freedom of action. Namely, the moral relationship requires a social relationship, and the social relationship requires being a member of community. Such relation between ethics and social constraint relies on Leopold's metaphorical extension of moral feelings towards biotic community. Here, there is a problem for Callicott. According to him, we can employ our moral feelings to human individuals and animals. We can even employ them to human communities; patriotism is an example for this. However, extending to the biotic community leads to an unsolvable problem.

Here, to overcome the problem emerging with the extension of moral feelings to biotic community, Callicott's position on ascribing health to ecosystems differs from Leopold's use. Leopold uses health metaphorically as a conservation advantage by making analogy between organisms and ecosystems. In addition, he associates health with diversity and emphasizes active role of diversity for ecological function. However, the situation is not so simple as this for Callicott. It should be asked whether it is sufficient to use health in metaphorical sense for taking moral attitudes towards ecosystem. In other words, how much metaphorical conception of health may activate our moral sentiments?

Like Leopold, Callicott compares the health of ecosystems with the health of organism to justify that 'health' consists of both objective and subjective characters, but he recommends the term 'autopoiesis' "as the capacity of land for self-renewal" to delineate ecosystems better and more scientifically. He also suggests this term to understand Leopold's land health better. I entirely agree with his argument because someone may misunderstand Leopold's analogy between land and organism and may claim that Leopold admits the land as a supraorganismic entity. Such an analogy just gives us metaphorical meaning of health for the land; on the other hand, autopoiesis is a scientific concept that is suitable for ecosystems. So, by means of using autopoiesis, Callicott has been wise to get ecosystem health to have more scientific dimension and avoid of some criticisms on Leopold's analogy.

According to Callicott, autopoiesis is an auxiliary concept to indicate and understand dynamic side of ecosystems. Similar emphasis has been given by Rolston who prefers homeostasis instead of autopoiesis although these terms are different. *Oxford Dictionary* defines homeostasis as "the tendency towards a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes" and autopoiesis as "the self-maintenance of an organized entity through its own internal processes; (in extended use) self-organization, self-regulation". By definition, only by what is inside an autopoietic system can cause changes in that system, because such system consists of all causal relationships, which determine its physical limits. There is no input or output for autopoietic systems because the system is usually defined to include what we conceive about the environment (Turner, 2018). To clarify, the system is only exposed to interactions realized by its structure. The interaction of a system with its environment is also a part of its structure. An autopoietic system interacts with its environment to make it easy to produce itself; thereby, the environment becomes a part of that system (Dekkers, 2014). Homeostasis seems less suitable for signs of ecosystem health which can be explained thus. Life in our planetary ecosystem proceeds with recycling transformations. Since systems have a recycling and energy balance, it is not static, it is dynamic. When the forces that give the balance are constantly converting energy, they are forced to seek the balance again. Homeostasis is; therefore, a success and tendency at a time. This involves both the process of achieving a steady equilibrium and the process of deviation from equilibrium. That's why, autopoiesis is a mechanism and homeostasis is one of its distinctive features.

I find 'autopoiesis' useful for description of ecosystem processes but deriving normativity from 'autopoiesis' is problematic because it is fairly an objective concept. How can such a scientific concept provide us with the ethical principles for ecosystem health? Both science and ethics have separate boundaries; the former includes descriptive laws that describe what is the case and the latter includes prescriptive laws that prescribe what ought to be. So then, does autopoiesis have intrinsic value? In medical sense, the conditions of health can be

determined through scientific investigation and has utility for people. Here, I entirely agree with Callicott's view that we cannot fulfill our other goals without being healthy. This dependence proves that health is instrumentally valuable for achieving our other goals; at the same time, despite that it is not an absolute good, it is intrinsically valuable, because being healthy is never worse than being sick, except under extraordinary circumstances. The locus of value, which is autopoiesis, can be investigated in the realm of science whereas the source of values, which is the moral agent, marks the realm of ethics. According to Callicott, the roles of subjects on both organismic and ecosystemic health drive us to stand between literal and metaphorical senses because "[h]ealth is an objective condition of organisms and, by metaphorical extension, of ecosystems" (Callicott, 1995, p. 354) and these conditions can be scientifically determined. That is, health can be metaphorically attributed to ecosystems even though this metaphorical extension corresponds to objective conditions in them. These conditions of ecosystems are scientifically identified because they are examined in the scope of ecology. However, Callicott does not claim that conditions of ecosystems are health-related, but metaphorically they are. In this point, he confirms the idea that only organisms have objectively health-related conditions. The question of how health provides a ground for values may reveal how science and morality can come together. In my opinion, the laws of health, which are non-moral, inevitably obligate us to analyze the precautionary measures. The task of this effort belongs to the realm of medical science and the results are descriptive; that's why, the natural character of health is value free. On the other hand, we have options to care for our health or to neglect it, but we are encouraged to follow the first one because understanding the importance of an ecosystem as a whole for its own and for the parts of that ecosystem essentially binds a moral purpose to the moral agent because of its whole-part relation to exist and maintain itself.

Unlike extremist approaches that health is only a subjective or objective concept, Callicott comprehends that 'health' is a thick descriptor because it has both subjective and objective characteristics; namely, it is a value-laden concept. For Callicott, conditions of health are objective whereas the value of health is

subjective but universal or intersubjective. Even Jamieson is partially right when he says that health concept is the product of common culture, but he is wrong about the possibility of an objective investigation of health. For him, objectivity itself comes from our culture not from our nature. Perhaps, Jamieson's view can be evaluated and justified according to the value of health, but such an over-subjectivist understanding, as Callicott emphasizes, may lead to relativism. Likewise, Nelson declares if health definition depends on human interests and preferences, it cannot be promoted because health is a thick concept that bears an objective goodness; thus, discipline of clinical ecology is needed for uncovering goodness or values of ecosystems.

The whole point of this is that while the objective conditions of health are determined by science, ethics assists us in establishing consistent and harmonious moral norms with these conditions. Therefore, I certainly agree with Callicott that the value of health is, to some degree, socially constructed because only moral agents play an active role both in establishing and applying the norms related to health even after science has developed a number of objective reference models for the conditions of health. This does not imply any transition from natural laws to moral norms; it only demonstrates that moral norms are developed on scientific basis, that is, moral norms are scientifically informed. That's why, I'm with Rolston on that the health concept is both descriptive and prescriptive; or a thick descriptor as Callicott suggests. However, these explanations still fail to give us the feeling that we have for human health. What is missing is our belief that Leopold (1949) implies by the phrase 'Thinking like a mountain'. As a citizen of biotic community, we may complete the missing part by respecting it. Here, the most important point of Leopold's Land Ethic in which Callicott has found the foundation of new environmental ethic is holism. Moving from Leopold's holism which brings up importance of the whole can provide the same feeling for us, according to Callicott.

Since it is defeasible concept; namely, it can be replaced by another good, it would be more radical to say that the main measure of moral behavior is the

holistic character of the ecosystem. To be more explicit, in case of helplessness and urgency, the means for this goal remain within the short focus of moral agents because they may be worried about their lives when deprived of indispensable life conditions such as air, nutrition, health, or whatever. As a moral agent, man can tolerate the deterioration of the ecosystem in order not to lose his indispensable living conditions. Thus, the reason for the urgent behavior of this agent implies speciesism, which argues that man is superior to other living and non-living beings; otherwise, maintaining well-being of the ecosystems in any circumstances leads to the danger of ecofascism, which is an understanding of the radical environmentalism arguing that interests of human beings and even states can be sacrificed for the glory and well-being of the environmental wholes. The environmental literature is replete with the solutions to avoid these two extreme movements. Which one is defensible is arguable but I may propose their central axis which is Callicott's proposal of ecological sustainability. It permits human exploitation of the environment in sustainable ways because ecological sustainability provides maintenance of both human economic activities and ecosystem health. Accordingly, any unsustainable activity should be forbidden for the sake of environment. To understand the relation between health and sustainability in Callicott's environmental theory, it will be helpful to explicate how *ecological sustainability* is important.

As I mentioned in the fourth chapter, Callicott has adopted a different ecological approach because his position comes from the synthesis of ecosystem ecology with evolutionary ecology, both of which have norms of their own. Considering his long struggle of the avoidance of ecofascism and speciesism, Callicott's attempt to combine these ecologies is *understandable*, even if it may cost many conflicts in theory and application. Callicott introduces the concept of health and integrity in relation to compositionalist and functionalist approaches; he uses health for humanly inhabited and exploited areas whereas integrity for biodiversity reserves. According to him, all environmental norms belong to either compositionalist or functionalist approach. The norms of a functionalist system are determined through ecosystem health while the norms of compositionalist

system are determined through biodiversity. Callicott employs ecological sustainability in order to indicate and propose simultaneous maintenance of both human economic activities and ecosystem health. Health and sustainability are, therefore, related to each other like biological preservation and integrity. So, I suppose that autopoiesis may be the center of ethical activities which must be compatible with this natural norm, and the human element has the most effective role in creating this state. Autopoiesis is more likely to be considered as a parameter of ecosystem health and provides an objective condition. So, it consists of only scientific description but, if this term is assimilated in health, it will have a moral prescription that promotes healthy states, given the options in the parameters of the health. That's what this discussion about.

Holistic definition of health is likely to be valid for the health of the ecosystems because it is a functional whole formed by organisms of different kinds and the inanimate nature around them. However, as McShane claims, the whole-part relation is not enough to be healthy; the whole must have the ability of self-maintenance in case of exposure to the internal and external effects. If an organism or system is adapting to the internal and external influences, to which it is exposed, in order to maintain its existence and to create a new balance within itself, we can apply the concept of health to them. Thus, I agree with the views of Leopold, Callicott, McShane, Rapport, Reiger, and Hutchinson that both organisms and ecosystems are *similar* in terms of their structures and functions.

Undoubtedly, ecological problems that occur in an unhealthy ecosystem can be identified by the parts that make up the ecosystem as in an organism, but to solve it, it is necessary to look at the whole system with a holistic approach. Of course, ecologists cannot see the signs and symptoms of diseases and distresses in ecosystems, as well and easily as the physicians can do so in humans. It may be difficult to determine the symptoms of ecosystem diseases in each case, but a number of major models, which have been suggested by many scholars for this purpose, may be instructive for us when diagnosing a disease. I strongly believe that Costanza and Mageau (1999) proposes very helpful models that determine

health as the absence of illness, as homeostasis, as diversity and complexity, as stability and resilience, as vigor and development ability, as balance between system components. Due to holistic side of health, considering all these models, they can be insufficient to identify healthy conditions. We may need other models as an alternative to determine the symptoms of ecosystem disease.

Let me assess this discussion part briefly. If we remember, the most appropriate definition of the health that I explained and discussed before (see the second chapter) is regarded as a complete recovery that includes the ability of a body to adopt and cope with new threats and maintain integrity and wellbeing. The holistic character of health, which is actually the most fundamental feature of ecosystems, is objectively present and subjectively valuable in itself. Therefore, the disadvantages of choosing the middle route between literal using and metaphorical using are fewer than choosing one. I have just mentioned that if an organism or system is adapting to the internal and external influences, to which it is exposed, in order to maintain its existence and to create a new balance within itself, we may apply the concept of health to them. Accordingly, Callicott's proposal of autopoiesis can be considered as a parameter of health which is a thick descriptor giving us what is needed for ecosystems; therefore, the possibility of establishing an environmental ethics on normative and scientific basis of ecosystem health is worth considering and investigating. We have a chance to get methodological help from science to decide what is good for ecosystems; in other words, we may create our values on the scientific basis which is autopoiesis. That's why, human values should be grounded on autopoiesis that promotes health. Only in this way, ecosystems can be morally considerable.

CHAPTER 5

CONCLUSION

How to ascribe the notion of 'health' to ecosystems leads to emergence of different environmental issues. When we apply it metaphorically, there is not a standard for the objective conditions of being healthy. That's why, metaphorical extension does not motivate us as the objectivity of science. To build a universal ethical theory about what is healthy for ecosystems, it needs to be medicalized because of the value-laden character of the concept. In contrast, when we apply 'health' literally, its normative dimension is always missing. The way of applying the concept to ecosystems depends on how we define it. Therefore, ambiguity in its meaning is the reason for discussions about the scientific and normative points of the concept. Each ascription is just a part which is needed but both may give us the most practical environmental perspective which is both descriptive and prescriptive. In practice, it is a very difficult task to get such a perspective before dealing with some important environmental issues arising from both ascriptions. In my thesis, I have tried to qualify the notion of ecosystem health by taking the origin of the 'health' concept into consideration and discussed how to find solutions to some environmental problems which arise when both health and ecosystem are used together.

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APPENDICES

A. TURKISH SUMMARY / TÜRKÇE ÖZET

I

Ekosistem sağlığı kavramı ekolojik sistemleri koruma ihtiyacı ile ortaya çıkmıştır, ancak anlamındaki belirsizlik çevre felsefesinde birçok tartışmaya yol açmaktadır. Sağlık kavramının canlı organizmalara olduğu gibi ekosistemlere de atfedilmesi, onlara yönelik ahlaki eylemler üzerinde önemli sezgisel etkilere yol açsa da, sağlığın tanımı konusunda genel bir anlaşma yoktur. Bu nedenle, ekosistemler için sağlığın ne anlama geldiğini belirlemeden önce neyin sağlıklı olduğuna karar vermek çok zordur. Birinci bölüm, tezimin temel konusuna genel bir giriş sunmaktadır. Genel giriş sonrasında, sağlık kavramına yönelik daha önce yapılan tanımları da değerlendirerek bu kavram için en uygun açıklamayı bulma çabası sergilenmektedir.

Bazı çevre düşünürleri ve politikacılar, kavramı gerçek anlamında kullanırken, diğerleri bunu metaforik olarak kullanmıştır. Kavramın anlamındaki belirsizlik bu tür anlaşmazlıklara sebep olmaktadır. Sağlık kavramı doğru bir şekilde tanımlanmadıkça, bu kavramın medikal alanlar dışında, özellikle de ekosistemler için kullanılıp kullanılamayacağı problemi aşılamamaktadır. Bu yüzden, sağlığın en doğru tanımının araştırılması sağlıklı olma koşullarını belirlemede atılacak ilk adımdır. Ancak daha sonra, bu kavramın ekosistemler gibi başka varlıklara ya da sistemlere uygulanıp uygulanmayacağı konusu açıklığa kavuşur.

Bu bölümün devamında, sağlığın anlamının araştırılması ve ona yönelik en uygun tanımı bulma çabası söz konusudur. Sağlık kavramının kökenine bakacak olursak, bu kavramın İngilizce karşılığı olan 'health' Eski İngilizce'de *bütün* anlamına gelen 'hælth' kavramından türetilmiştir. Bu kavram, aynı zamanda Eski İngilizce'de de aynı anlamda olan 'hal' kavramından türemiştir. Daha sonra ise Orta İngilizce'de *sağlık* anlamına gelen 'hail' şeklini almıştır. İşte bu kelime tam olarak da sağlık anlamındaki *health*, bütün anlamındaki *wholeness* kavramları arasındaki çağrışımları yansıtmaktadır. Bu tür linguistik çağrışımlar, Dünya Sağlık Örgütü'nün "sağlık" tanımını anlaşılabilir kılmaktadır. Dünya Sağlık Örgütü sağlık tanımlamalarını birçok defa revize etmiş olup, en son kabul ettiği tanım şu şekildedir; sağlık yaşamın amacı değil, günlük yaşam için bir kaynaktır. Aynı zamanda, fiziksel kapasitelerin yanı sıra sosyal ve kişisel kaynakları da vurgulayan olumlu bir kavramdır. Tanıma bakacak olursak¸tıbbi anlamda, diğer birçok araştırmacı için, fiziksel, sosyal ve duygusal zorluklarla baş etmek, Dünya Sağlık Örgütü'nün gözden geçirilmiş tanımında vurgulanan tam veya bütün iyileşmeyi (complete recovery) desteklemektedir. Bu nedenle, birçok başka yönü de göz önünde bulundurarak bir nesnenin veya sistemin yeni tehditlere uyum sağlama ve bunlarla başa çıkma, bütünlük ve refahı sağlama kapasitesi olarak sağlık tanımını önermişlerdir. Onlara göre, ancak bu tanım sağlık koşullarını operasyonel ve ölçülebilir yaptığı için bu kavramı en iyi açıklamaktadır. Bu tanım, daha sonraları bilim ve tıp çevrelerince de genel kabul görmüştür. Onlara göre, bu tanıma uygun her varlık veya sistem için sağlıktan söz etmek mümkündür. Örneğin, bir canlının sağlığından nasıl söz edebiliyorsak ekonominin sağlığından da söz edebiliriz. Şöyle ki, ekonomik bir sistemde dalgalanmalar görünebilmesine rağmen, sistem bu dalgalanmaları absorbe edebilecek ve yeni bir dengeye ulaşarak varlığını sürdürebilecek potansiyele sahiptir. Dolayısıyla, kendi varlığını sürdürebilecek şekilde birtakım dışsal etkilere karşı uyum sağlayabilme veya onlarla baş edebilme kapasitesine sahip olması sağlık kavramının ekonomiler için de kullanımını makul kılmaktadır. Ancak, benzer durum arabalar için söz konusu değildir. Örneğin, bir arabanın kendi mekanik sisteminde gerçekleşen herhangi bir aksaklık bu mekanik sistemin çalışmasına engel olur. Arabadaki mekanik sistemin bu tür aksaklıklara uyum

sağlayabilme ve onlarla baş ederek kendi sisteminin varlığını sürdürebilme potansiyeli bulunmamaktadır. Bu potansiyel veya beceri eksikliği, araba sağlığından söz etmemizi mümkün kılmamaktadır.

II

Bu çalışmanın ikinci bölümündeki temel soru şudur: 'Sağlık' kelimesinin ekosistemler için anlamı sadece yukarıda belirtilen özelliklere sahip olan bütünü için kullanabiliyor mu? Bu soruyu cevaplamak için; ilk olarak, "işlev" teriminin parça-bütün ilişkisine bağlı olarak açıklanması gerekir. Çünkü, bütünün varlığının sürdürülmesinde parçaların bütüne katkısının önemi büyüktür. Bu katkı, parçaların bütün için işlevini oluşturur. Ancak, parça-bütün ilişkisinin açıklanmasından sonra bütün için sağlık durumunun mümkün olup olmadığı belirlenebilir. Zira, yukarıdaki tanım, sağlığın işlevsel parçalardan oluşan her bütün için geçerli olmadığına da işaret eder. Bir şeyin sağlıklı olması için, o şeyin değişen koşullara adapte olarak kendisi için ideal durumunu devam ettirebilme becerisine sahip olması gerekir. Bu bölümde, ekosistemler ve sağlık için ortak bir zemin oluşturmak amacıyla iki işlevselci modeli tanıtmaya, daha sonra da bu modellere cevap olarak topluluk ekolojisi ve ekosistem ekolojisi olan iki ekolojik yaklaşımı sunmaya çalıştım.

İşlevle ilgili var olan geniş felsefi literatüre rağmen, sadece ikisi filozoflar ve bilim adamları arasında en iyi bilinen ve kabul edilenleridir. İlki, genellikle karmaşık bir sistemdeki bir özelliğin, bütünün davranışı üzerindeki etkileri açısından işlevini açıklamaya yardımcı olan *nedensel rol* modeli olarak adlandırılır. Diğeri ise, biyolojik bir özelliğin fonksiyonunu doğal tarihi içerisinde analiz eden *etiyolojik* model olarak adlandırılmaktadır. Robert Cummins'in sunduğu nedensel rol modeli bilim, tıp, ekonomi ve hatta biyoloji gibi hemen hemen her alanda kullanılabilirken, Larry Wright'ın sunduğu etiyolojik model ise evrimsel açıklamaların söz konusu olabildiği sadece biyoloji alanında kullanılır. Bu iki yaklaşım da ekoloji biliminin alt dalları olan topluluk ekolojisi ve ekosistem ekolojisinde vücut bulur. Topluluk ekolojisi bir çevreyi oluşturan

bireysel parçaların ve bu parçaların çevreyle ilişkisini incelediği için bu ekolojide işlevler etiyolojik modele göre açıklanır. Çünkü, bireysel varlıklar için evrimsel tarih söz konusudur. Öte yandan, ekosistem ekolojisi ekosistemleri oluşturan canlıların, onları çevreleyen cansız doğayla arasındaki etkileşimleri incelediği için bu ekolojide işlevler nedensel modele göre açıklanır. Aslında, ekosistem ekolojisi bir yönden topluluk ekolojisini de kapsar, çünkü popülasyonlar da ekosistem ekolojisinin bir parçası olup ekosistemler üzerinde etkiye sahiptir. Dolayısıyla, her iki ekolojide var olan interaktif ilişkiler birbirleri için hem neden hem de sonuç pozisyonunu alabilir. Bu düşünceyle, Paul E. Griffiths ve Arno Wouters gibi düşünürler her iki yaklaşımı da bütünleştirmeye çalışmışlardır. Onlara göre, iki yaklaşım da kendi analizlerinde birbirlerine ihtiyaç duyarlar. Ancak, bu çalışmanın odağı gereği ekosistemleri dikkate aldığımızda, evrimsel süreçler onlar için söz konusu olamadığından etiyolojik açıklamalar yer almayacaktır. Bu yüzden, bir önceki bölümde değinilen sağlığın tanımı göz önüne alındığında, bir sistemin dışsal etkilere adapte olarak ya da onlarla baş ederek kendi varlığını sürdürmesine katkıda bulunmasının etiyolojik modelle açıklanması mümkün olmasa da, tek bir işlevsel açıklamayla sınırlamak da çok faydalı olmayacaktır.

III

Üçüncü bölümde, sağlık kavramının ekosistemlere literal, metaforik veya her iki anlamda uygulanıp uygulanmayacağını, önde gelen birtakım çevre teorisyenlerinin görüşlerini dikkate alarak açıklamaya çalıştım. Literal anlamda kullanımı ile ilgili olarak ilk önce Peter Calow'un sibernetik yaklaşımına değindim. Calow'un bu yaklaşımı organizmalar ile ekosistemler arasında kurduğu analojiden ileri gelmektedir. Bu analojide, ekosistemler ile organizmalar arasında metaforik bir benzetme olmasından ziyade, ekosistemlerin sağlıklı olma durumlarından literal anlamda bahsedilebileceği ancak; organizmaların tersine, ekosistemlerin pasif kontrol sistemleri olması sebebiyle kendileri için sağlığı ihtiva eden duruma ulaşmalarının sadece ekosistem mühendisleri olarak da adlandırılan dominant birtakım türler tarafından sağlanabileceğini vurgular. Ona göre, ekosistemler evrimsel perspektifle açıklanamayan biyolojik makinelerdir.

Dolayısıyla, canlı organizmalardaki gibi teleolojik bir amaç da taşımazlar. Calow'a göre, sistemin birbirleriyle etkileşime giren dinamik parçaları birbirleriyle uyum içerisinde çalışarak o sistemin varlığını sürdürürler. Dolayısıyla, sağlık kavramının uyarlanmasında ekosistemler gerekli üç kritere de sahiptir. Bu kriterler organizasyon, esneklik (resilience), ve üretkenlik (productivity)tir. Ekosistemler yaşam formlarının çeşitliliğine ve bu yaşam formlarının etkileşimlerine sahip olduğu için bir organizasyon ihtiva eder. Aynı zamanda, ekosistemler dışarıdan gelen herhangi bir olumsuz etki sonrasında bozulmayıp eski haline dönebildiği için esneklerdir. Ekosistemler canlı bileşenlerinin sürdürülebilmesini sağlaması nedeniyle de üretkenlerdir. Calow'a göre bu üç kriter ekosistemlere sağlığı atfedebilmemizi mümkün kılmaktadır.

Calow'un sibernetik yaklaşımının ardından, Bruce Morito'nun ekosistem sağlığıyla ilgili görüşlerine değinmeye çalıştım. Daha doğrusu, kendisi 'ekosistem sağlığı' yerine 'ekosistem otonomisi'nden söz eder. Ona göre, her bireysel organizma ya da bütün çevresinden bağımsız bir şekilde kendini gerçekleştirir ve varlığını sürdürür. Onun bu anlayışının temeli Laura Westra'nın *özgürlük argümanında* (freedom argument) yatar. Morito'ya göre, otonomi terimi bizler için ekosistemlere karşı daha güçlü ve etkili bir sorumluluk yükleyicidir. Tıpkı canlı organizmalardaki gibi ekosistemlerin de yapısal ve işlevsel bütünlüğünü sürdürmeye çalıştığına ve bunun için de bütünlük (integrity) kriterinin sağlanması gerektiğine işaret eder. Bu kriter, temel değerden ziyade değerin temeli olarak kabul edilirse gerçek-değer (fact/value) problemini aşmamızı ve böylece normatif yönü elde edebileceğimizi mümkün kılar. Morito, ekolojik değerler konusunda postmodern yapısal bir teori öne sürmektedir. Bütünlük (integrity) kavramının sağlık kavramından daha fazla evrensel değer olma özelliğini taşıdığını ileri sürer. Çünkü, ona göre ekosistem sağlığı ekonomik ve sosyal değerleri de ihtiva ettiği için bir tür "değer çokluğu"na işaret eder. Oysa, bu durum bütünlük (integrity) kavramı için söz konusu değildir. Robert Lackey ise bilimi bu tür değer temelli kavramlardan soyutlamamız gerektiğini, eğer soyutlamazsak sözde normatif bilim olarak da zikredilen bilim maskesi altındaki değer temelli varsayımlar olmaktan öteye geçemeyeceğini vurgulamaktadır. Ona göre bilim, bir sistemin iyi veya kötü

olduğuna dair herhangi bir yargı üretemez. Aksine, bilim neyin doğru ya da yanlış olduğuna dair yargılar üretir. Bu yüzden, sağlık kavramı ekosistemlere literal anlamıyla uygulanmamalıdır. Böyle bir teşebbüs vuku bulduğunda, çevre ve ekosistemlerle ilgili kural koyucular ekosistem sağlığının anlamı konusundaki belirsizliğe ve tutarsızlığa yol açabilecek değer temelli yargılar ortaya atacaktır.

Sağlıkla ilgili ekosistemlere yönelik olarak geliştirilen metaforik yaklaşımlar arasında ise ön plana çıkan Leopold'un *the Land Ethic* eserinde açıkladığı görüşleridir. Ona göre, organizmalar ve ekosistemler yapıları ve fonksiyonları gereği benzerdir; ancak aynı değildir. Bu yüzden, sağlığın ekosistemlere metaforik olarak uygulanabileceğini savunur. Ekosistem sağlığı yerine yeryüzü sağlığı (the land health) terimini kullanan Leopold, sağlığı bütünlük (integrity) ile aynı anlamda kullanır ve biyoçeşitliliği (biodiversity) de temel kriteri olarak belirler. Leopold, düşünce tarihinin ilk dönemlerinde insanlar tarafından bozulmamış ya da el değmemiş yer olarak da anlaşılan wilderness alanlarını yeryüzü sağlığı (the land health) için bir referans model olarak sunar. Ona göre, wilderness alanlarını sağlıklı koşulları belirleyebilmek için çalışacağımız bir yeryüzü laboratuvarı olarak kullanabiliriz. Oysa Callicott, Leopold'un referans model olarak ileri sürdüğü bu wilderness alanlarının günümüzde kalmadığını savunmaktadır. 1930'lardan sonra ise daha holistik bir görüş benimseyen Leopold, ahlaki sezgilerimizi biyotik topluluklara kadar genişletir ve sunmuş olduğu maksim ile eylemlerimizi kontrol altına alarak biyotik hakkı korumamızın mümkün olduğunu savunur. Bu ilkeye göre, eğer davranışımız biyotik toplulukların bütünlüğünü (integrity), istikrarını (stability) ve güzelliğini (beauty) koruma eğilimindeyse bu davranış doğru bir ahlaki eylemdir.

Kaputska ve Landis ise, organizmalar ile ekosistemlerin aynı yapıda bile olmadığını öne sürerek sağlığın metaforik olarak bile atfedilemeyeceğini savunur. Çünkü, onlara göre ekosistemler üzerinde canlı organizmalardaki gibi doğal seleksiyon işlemez. Bu yüzden de, canlı organizmalardaki hiçbir karakteristiğin ekosistemlere atfedilemeyeceğini iddia ederler. Onlara göre, "Ekosistem sağlıklı mı?" sorusuyla "Araban sağlıklı mı?" sorusu aynı formdadır. Bu yüzden, sağlık

teriminin metaforik kullanımı, onun bilimsel gerçekliğe değil de insan değerleri ve yargıları üzerinde temellendirilmesi tehlikesine yol açar. Oysaki bilim, insan değerlerine, yargılarına ve inançlarına değil, sadece gerçekliğe odaklanır. Dolayısıyla, bir bilim olan ekoloji de çevre yönetiminde (environmental management) yer alan ahlaki, ekonomik ve sosyal değerlere odaklanmaz. Bu değerlerden bağımsız bir şekilde objektif bilgi elde edebilmek için bilimin gücünü metodolojik olarak kullanır. Sağlık kavramı da bilimsel bir kavram olduğu için metaforik anlamda kullanılması sakıncalıdır. Çünkü, ekoloji biliminin ahlaki anlamda rehber görevi taşıması söz konusu değildir.

Benzer şekilde, Dale Jamieson sağlığın metaforik olarak ekosistemlere kadar genişletilmesinin insanlardaki aynı motivasyonu sağlayamayacağını ileri sürer. Ona göre, sağlık kavramının kendisi bizim değerlerimize ve yargılarımıza bağlı olduğu için kültüreldir. Jamieson, daha da ileriye giderek objektifliğin kendisinin de doğamızdan değil, kültürden ileri geldiğini iddia eder. Ancak onun bu iddiası, ahlaki öznenin sağlam normatif değerlere sahip olabilmesini güçleştirir. Bu yüzden, Callicott onun bu görüşünü *bayağı görecelilik* (vulgar relativism) olarak nitelendirmiştir. Callicott'a göre Jamieson'un bu görüşü doğru olsaydı, antik Yunan döneminde köleliğin gerçekten ve objektif olarak iyi olması gerekirdi. Jamieson ayrıca sağlığın ekosistemlere uygulanmasının yol açacağı iki riskten de söz eder. Birincisi, bu uygulama bizim doğayla aramızdaki ilişkiyi medikalleştirerek değer meselesini *ekodoktorlara* bırakması tehlikesine işaret eder. İkincisi ise, ortaya çıkan bilimsel görüntünün değer meselesine zaten yer açamaması durumudur. Bu yüzden, ekosistem sağlığı bilim tarafından tek başına ne anlaşılır ne de kavranır. Ona göre, bu ve diğer çevresel meselelerin çözümü tüm insanlığın kalbinin problemidir.

Sağlık teriminin hem metaforik hem de literal anlamda kullanılmasını savunan düşünürler arasında ise, Katie McShane, D. J. Rapport, H. A. Regier, T. C. Hutchinson ve Baird Callicott yer alır. McShane'e göre her parça-bütün ilişkisine sahip sistemlerde sağlıktan söz edemeyiz. İster canlı organizmalar için olsun, isterse ekosistemler için olsun, sadece sağlıkla ilgili parçalar ve sağlıkla ilgili

foksiyonlar, ki bunlar o sistemin ya da organizmanın varlığını sürdürmesine yardımcı olur, o sisteme sağlığı atfedebilme imkanı tanır. Ona göre, evrimsel mekanizma sağlıkla ilgili yapılar ve fonksiyonları belirlemek için zorunlu değildir, çünkü nedensel mekanizmalar da sisteme katkı yapması açısından sağlıkla ilişkilendirilebilir. Sağlık kavramı McShane'e göre doğası gereği normatiftir ve ona sahip olan için iyi bir şeydir; bu yüzden de değerlidir. Bir varlık ya da sistemin, kendi varlığının sürdürülmesine katkıda bulunan yapıları ve fonksiyonları o varlık ya da sistemin sağlıkla ilgili yapı ve fonksiyonlarıdır. Dolayısıyla, sağlığı ihtiva eden bu yapı ve işlevler ait oldukları varlık veya sistem için sağlık teriminin atfedilmesinde zorunlu koşullardır.

D. J. Rapport, H. A. Regier ve T. C. Hutchinson ise organizmalar ile ekosistemlerin birbirleriyle paralel mekanizma ve özelliklerine sahip olmasına rağmen koşullarının farklı olduğunu kabul ederler. Onlara göre, bizler ancak organizmalar için söz konusu olabilen 'hastalık' kavramıyla ekosistemlerdeki 'fonksiyon bozukluğu' ya da 'yıkım' gibi birtakım durumları açıklayabiliriz. Çünkü, organizmalar ile ekosistemlerin ortak özelliği onların sibernetik olmalarıdır. Bu durum, dışarıdan gelebilecek her tür etkiyi kontrol altında tutabilme potansiyeline işaret etmektedir. Örneğin, termodinamik yaklaşım açısından besin dönüşümünde gerçekleşen herhangi bir aksaklık veya dramatik bir değişim, ekosistemlerdeki birtakım fonksiyonların yerine getirilmesini engelleyebilir. Onlar için, bu tür bozukluklar ya da hastalık benzeri durumlar bilim tarafından teşhis edilebilir ancak; sağlık için belirlenecek standart durum organizmalardaki gibi kolayca belirlenemeyecek olup yine insanların yargılarına bağlı olacaktır.

Benzer yaklaşıma Callicott'un görüşlerinde de rastlamak mümkündür. Ona göre, sağlık kalın bir kavramdır (thick descriptor), bu yüzden onun bir tarafı nesnel olup bilimsel bir metotla araştırılıp incelenebilir. Diğer yönü ise öznel olup onun değer yönüne işaret eder. Callicott'a göre ekoloji bize ekosistemlerin nesnel koşullarını tanımlayabilir, ancak bu koşulların hangilerinin sağlıkla ilgili olduğu bizim yargılarımıza bağlıdır. O yüzden, ekosistem sağlığı literal anlamda nesnel

koşullara tekabül eder ancak; bu koşulların bir kısmının sağlıkla ilgili olduğunu metaforik olarak ileri sürebiliriz. Callicott Leopold'un aksine bütünlük (integrity) normunu topluluklar (communities) için sağlık normunu da ekosistemler için kullanır. Bu sınıflandırması esasen topluluk ekolojisi ile ekosistem ekolojisi ayrımına dayanır. Hatırlarsak, ekosistemler için ekosistem ekolojisinin bir şekilde topluluk ekolojisini de içerdiğini açıklamıştık. Callicott da benzer şekilde, bütünlük ve sağlık normlarının birbiriyle ilişkili olduğunu öne sürer. Ona göre, her ikisi birbirini tamamlayıcı (complementary) nitelikte olup sağlık bütünlük (integrity) için zorunlu fakat yeterli değildir.

Leopold'un organizma ve yeryüzü (the land) arasında yaptığı analojinin bilimsel eksikliğini giderebilmek amacıyla, Callicott sağlığın nesnel tarafını *autopoiesis* kavramıyla açmak ister. Bu kavram, kendi kendini yaratma ve kendi kendini yapma anlamlarına geldiği için organizmalarla ekosistemler arasında ortak bir kriter işlevi görür. Aynı zamanda da, ekosistem durumlarını açıklayabilecek en iyi kavramdır. Callicott'a göre, sağlık kavramı belirli bir durumu ve düzeni sürdüren statik bir özellik ihtiva ederken, autopoiesis ekosistemlerde devamlılık gösteren dinamik bir değişimi ihtiva eder. Autopoiesis sağlığın nesnel tarafını araştırabileceğimiz bilimsel koşulları verir. Bu koşullar, aynı zamanda doğal norm niteliğinde olduğu için sağlıkla ilgili olarak değerlerimizi bu doğal norm üzerine de temellendirebiliriz. Bu yüzden, sağlık terimi kalın bir kavram (thick concept) olup hem nesnel hem de öznel yönü vardır. Dolayısıyla, kavramın çift yönlü oluşu Callicott için, onun ekosistemlere uyarlanmasının literal boyutunun yanında, metaforik olarak da söz konusu olduğunu vurgular.

IV

Tezin dördüncü bölümünde ise, sağlık ile ekosistem kavramlarının kombinasyonundan kaynaklanan birtakım problemleri, sağlığın normatif ve bilimsel yönünü tartışarak ele almaya çalıştım. Bu tartışma bölümündeki amaç ve niyetim, ekosistemlere sağlık teriminin uygulanmasının makul olabileceğini

gerekçelendirmektir. Callicott'un yaklaşımı bu amaca ve niyete en uygun savunmayı sunmaktadır.

Biyolojik canlılar dışında, Callicott sağlıkla ilgili yaklaşımlarımızın bir dereceye kadar sosyal ve kültürel yaşantımızın etkilerini taşıdığını kabul ederek somut bir gerekçe sunmuştur. Şöyle ki, dünya üzerinde obezliği zenginlik belirtisi olarak kabul eden kültürler varken, bunu birtakım bilimsel sonuçlara dayandırarak hastalık belirtisi olduğunu savunanlar da vardır. Ancak yine de, sağlığın bu derece objektiflikten uzak, evrensel bir değer olma özelliği taşımayan birtakım temellere oturtulması Morito'nun işaret ettiği gibi bir tür değer çokluğu problemini yaratmakta ve sağlığın hak ettiği yeri alamamasına yol açmaktadır. Sağlık kavramına ilişkin bu rölatif durumun, ekosistemler gibi canlı olmayan ama dinamik olan sistemler için daha net bir şekilde geçerlilik taşıdığını göz önünde bulundurmak gerekir. Çünkü, ekosistemlerin var olup olmadığı, var iseler canlı olup olmama durumları, onlar için evrimsel süreçlerin söz konusu olmaması ve gözlemlenebilecek somut sınırlarının olmaması kısmen rölatif yönü de bulunan sağlık kavramını ekosistemlere uyarlamamızı gittikçe zorlaştırmaktadır. Öte yandan, Callicott ekoloji biliminin esas inceleme konusu olarak ekosistem koşullarını bilimsel anlamda açıklayabilmesine dikkatleri yönelterek, onlar için sağlığın literal anlamda kullanılması umudunu vaat etmektedir. Ancak, yine de bu konuda katı ve net bir duruş sergilemeyip sağlık terimini ekosistemler için metaforik olarak kullanabileceğimiz konusunda bizi uyarmaktadır. Çünkü, sağlığın kalın bir kavram (thick descriptor) olduğunu vurgulayarak, ekosistem sağlığını hem nesnel koşullarda inceleyebilmek hem de çevre etiğine hizmet etmesi açısından değer yüklü bir kavram olduğuna işaret etmek amacıyla orta bir yolu tercih etmiştir.

V

Bu çalışmada, sağlık kavramının kökenini dikkate alarak ekosistem sağlığı terimini karakterize etmeye ve her iki terimin bir arada kullanılmasından kaynaklanan bazı çevresel sorunlara nasıl çözüm getirilebileceğini tartışmaya

çalıştım. Bu amaçla, ekosistem sağlığı ile ilgili önde gelen çevre felsefecilerinin etik teorilerini analitik bir araştırma ile değerlendirdiğim tartışma bölümünün kısa bir sonucunu içerir. Özetleyecek olursak; daha önce açıkladığım ve tartıştığım sağlığın en uygun tanımı (bkz. ikinci bölüm), bir organizmanın ya da sistemin yeni tehditlere adapte olma veya bunlarla başa çıkma ve iyi oluş durumunu sürdürme becerisini içeren tam bir iyileşme olarak kabul edilir. Sağlık bu holistik karaktere, ki ekosistemlerin en temel özelliğidir, objektif olarak sahiptir ve bu karakter subjektif olarak da değerlidir. Bu yüzden, literal ve metaforik kullanım arasında orta bir yol benimseme sadece birini benimsemekten daha fazla avantaja sahiptir. Tezin ilk bölümünde, bir organizmanın veya systemin kendi varlığını sürdürebilmesi için iç ve dış etkilere karşı uyum sağlayabiliyorsa, sağlık terimini atfedebileceğimizi açıklamıştım. Buna göre, Callicott'un autopoiesis kavramı sağlığın bir parametresi olarak düşünülebilir, çünkü ekosistemler için neyin iyi olduğuna karar verebilmek için bilimden metodolojik olarak faydalanabiliriz. Diğer bir deyişle, değerlerimizi bilimsel bir temele sahip olan autopoiesise dayandırarak oluşturabiliriz. Ancak bu şekilde ekosistemler de ahlakın bir konusu olarak düşünülebilir.

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