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Revisiting the Concept of Common Pool Resources: Beyond Ostrom*

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Since Garret Hardin argued the tragedy of the commons, privatization or state control has been proposed as a solution to cure it. However, Elinor Ostrom opposed such an idea and opened the possibility of sustainable management of common pool resources (CPRs) through local people's autonomous institutions. This study sees that Ostrom's alternative approach fails to explain changes to the degree of excludability and rivalry in different historical contexts by regarding these attributes as physical ones. This study tries to re-conceptualize CPRs by understanding excludability and rivalry as social attributes, rather than as physical attributes. We argue that not excludability itself but the legitimacy of excludability is critical. This study mobilizes sociological imagination to go beyond the current theory of CPRs by paying attention to the social attributes of CPRs.

Keywords: *commons, common pool resources, property rights, excludability, rivalry*

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Introduction

Environmental problems are often compared to "the tragedy of the commons" (Hardin 1968). This perspective has been expanded in the 50 years since Hardin cited shared pastures as an example of the commons. He was alarmed that if access to pasture were unregulated, the pasture would be over-exploited through each individual's intention of maximizing his or her own gains by putting more livestock out to graze; consequently, the shared pasture would go into ruin. According to Hardin, any commons with a limited carrying capacity that is always open to all, in which those who pursue rational economic activities utilize them to maximize their own gains, inevitably becomes devastated. The individuals' freedom to pursue their own egocentric interests leads to the tragedy of the commons. To prevent this situation, Hardin argued, "mutual coercion mutually agreed upon" is required in order to constrain each individual's freedom. Thus, the establishment of private property rights or the intervention and expansion of centralized state power over the commons has been proposed as a way to prevent the tragedy of the commons (Hardin 1968, 1994, 1998; Ostrom 2003).

This argument regarding "the tragedy of the commons" has been cited widely beyond the boundary of natural science including in ecological anthropology, demography, law, politics, ethics, geography, psychology, sociology, and public administration; the frequency of citation has increased (Burger and Gochfeld 1998). On the one hand, studies supporting Hardin's argument have been carried out by presenting cases about overexploitation of resources, destruction of habitats, and extinction of species resulting from population growth. On the other hand, some studies have criticized this approach, sought cases of successful management of a commons, and tried to find social conditions and mechanisms for it. The work of Elinor Ostrom, "Governing the Commons" opened the possibility of sustainable management of common pool resources (CPRs) through local people's autonomous institutions, rather than through privatization or state control.

Is Ostrom's understanding of the commons sufficient and proper? If the design principles Ostrom suggested are maintained, do CPRs remain as they are? What characteristics make CPRs able to be managed sustainably? Is it because of the nature of the resources or due to other causes? If Ostrom's approach is taken, can natural resources be kept healthy as CPRs? While this paper begins with those questions, it seeks to figure out what CPR

management is and explores how discussion about CPRs contributes to the reduction of environmental problems and achievement of sustainable conditions. Section 2 describes the achievements of and limits to Ostrom's approach, while comparing Ostrom's understanding of CPRs with previous scholars. Section 3 re-defines the concept of CPRs based on sociological imagination. Section 4 applies the redefined concept of CPRs, with increased focus on social aspects, to real on-going problems with CPRs. Finally, section 5 summarizes and concludes this study.

Elinor Ostrom's Understanding of CPRs

Ostrom was awarded the Nobel Prize for her study of CPRs because CPRs are at the center of an essential dispute in economics concerning the role of the market. The concept of CPRs was developed from the concept of public goods, which was conceptualized by Paul A. Samuelson in order to criticize market fundamentalism and libertarianism. Therefore, studies on CPRs incorporated critiques of market fundamentalism and libertarianism from the beginning.

1) Discussions related to CPRs before Ostrom's study

Both natural resources, such as land, water, sunshine, and air, and man-made facilities, including reservoirs and waterways, that are utilized together by a great number of people were traditionally called "commons." These commons have been commodified and privatized through the development of capitalism. Now these things are not at most people's disposal. People have to pay the owners for their use, while a small number of people monopolize natural benefits and the phenomenon of rich-get-richer and poor-get-poorer is deepened. Therefore, commons became an interesting and much-debated object of study in both academia and policy. Scholars began searching for an appropriate concept and word to deal with these resources; the concept of "public goods" became the pivotal implication.

In order to criticize market fundamentalism, which argues that the market allocates resources in the most efficient way, Samuelson (1954, 1955) argued that there are some goods that are necessary for a society but which the market cannot provide sufficiently to meet diverse people's needs. He named such resources public goods. Public goods are resources that are required by all people and others cannot be excluded from their use. That is

to say, those goods lack rivalry and excludability. Some examples of those goods are lighthouses and weather forecasts. These goods can be used freely and, accordingly, producers cannot make profits. Therefore, nobody will provide them other than the state. Samuelson's argument was a shock to mainstream economics and market fundamentalism, and the concepts of excludability and rivalry became essential criteria in classifying resources in the field of economics. This study contributed to Samuelson's receipt of the Nobel Prize in 1970.

Since then, Buchanan (1965) resisted critiques of market fundamentalism, arguing that even resources with no rivalry can be provided by the market more efficiently if excludability is designed and profits are guaranteed to producers. For example, when the state cannot install lighthouses because of a lack of finances, the state can ask navigators to pay charges to lighthouse companies whenever they make a voyage and, consequently, more lighthouses will be built. Buchanan also argued that public goods with no rivalry are more efficiently provided by the market by intentionally creating excludability. Even though he did not intend it, this statement reveals the fact that rivalry and excludability do not always go together. He was awarded the Nobel Prize in economics in 1986, acknowledging the importance of this study.

Ostrom & Ostrom (1977) criticized Samuelson. According to Ostrom & Ostrom (1977), Samuelson made a misjudgment in understanding the relationship between rivalry and excludability to be causal, and in regarding resources with rivalry as also having excludability. As a result, this perspective legitimized market fundamentalism on the ground that resources with no rivalry can become excludable, as Buchanan argued. In addition, Samuelson's perspective legitimized privatization of resources with rivalry and their allocation based on market principles. Consequently, this approach supported market fundamentalism. Thus, Ostrom & Ostrom (1977) strictly divided excludability and rivalry and categorized non-rival and non-excludable resources as public goods and rival but non-excludable resources as CPRs. According to this classification, there are four kinds of resources including private goods and club goods along with CPRs and public goods. Club goods are resources restricted to those who pay fees even though there is no reduction from others' use (See <Table 1>). The two new concepts, CPRs and club goods, were born, and CPRs led to an expansion of the scope of resources with excludability. According to this categorization, CPRs and public goods are commons.

TABLE 1
Categories of Resources

	Excludable	Non-excludable
Subtractable (rival)	Private Goods: foods, clothes, furniture, automobile, etc.	Common Pool Resources: rivers, ponds, underground water, ocean, air, etc.
Non-subtractable (non-rival)	Club Goods: cable TV broadcast, software on sale, intellectual property, etc.	Public Goods: security, internet, weather forecast, open shareware, etc.

Source: Choe 2013a, 2013b, 2016; Choe & Kim 2014; Lee 2006; Ostrom 1990; Ostrom & Ostrom 1977

2) Achievement of and limits to the concept of CPRs defined by Ostrom

Ostrom defined CPRs as non-excludable and subtractable natural resources or artificial facilities used by multiple individual subjects. These resources share two aspects: It is impossible or difficult to exclude potential users from using those resources, and if the amount of one person's use is increasing, the amount of others' use is decreasing. This definition helps solve conflicts concerning privatization of common resources and exclusion from common resource use by theorizing certain kinds of resources whose potential users cannot be excluded or can be excluded only with great difficulty. In particular, neo-liberalists have argued for the privatization of all resources so they can be efficiently managed to avoid "the tragedy of the commons" described by Hardin (1968). Ostrom's studies on various alternatives are meaningful in that neo-liberal arguments have been refuted (Kim 2010; Lee 2006; Yun 2004; 2016).

Nevertheless, Ostrom's definition includes several problems. First of all, by regarding excludability and subtractability as physical or technical attributes, the concept of CPRs defined by Ostrom has a number of limitations. Excludability and subtractability are attributes constructed by society, not a physical or technical attribute. Ostrom overlooked this aspect. As subtractability is a physical attribute, historical changes in subtractability cannot happen. However, air socially has been regarded as a resource with

non-subtractability for a long time because the amount of air is so great. Air recently was changed into a subtractable resource because of population growth and environmental pollution and became an excludable resource through emission trading schemes. Another example is water. The physical attribute of water is the same. However, water is a subtractable resource where water is scarce, while it is not a subtractable one where water is plentiful. In addition, changes in public opinion have changed the nature of some resources, like underground water in Hawaii and Jeju, from private goods into common goods by losing excludability. It is difficult to capture and explain historical change without technical change and spatial differences when we apply Ostrom's concept.

The second limitation of Ostrom's definition is closely associated with the first one. That is the legitimation effect, preventing people's access to most resources that are privatized already, including private goods and club goods. Currently, most resources hold the attribute of excludability because of technical development that reduces the price of exclusion. For example, currently most resources become private goods or club goods that are used exclusively, as shown Figure 1. If this exclusive use results from the physical or technical attribute of a resource, it is inevitable. If it does not, there is a way not only to prevent privatization of commons and but also to bring privatized commons (CPRs and public goods) back in order to protect the most vulnerable and the natural world. Therefore, it can be said that Ostrom's definition of CPRs is useful for protecting commons but it does not contribute to bring them back. In reality, excludability is not a physical or technical attribute of resources, but a socio-ethical attribute shaped by common sense like the "Golden Rule".

Sociological Imagination about CPRs

1) Social attributes of CPRs

Cohen (1993) pointed out the importance of correcting misunderstandings about the relationship between resources and human beings when he discussed property rights. He argued for recognition that property rights are not a relationship between owners and things but one between people related to things. That is to say, the essence of private property rights is the right to prohibit and exclude others' use of the thing. The relationship between human beings and resources, regardless of whether they are natural or man-

made, is determined by relationships among human-beings, not the physical attributes of things. The physical attributes of things influence the classification of resources. However, it is human relationships that determine the relationship between resources and human beings and provides criteria for classifying resources. Software with the same physical attributes could be a public good or club good depending on the kind of social relations and cultural contexts it is embedded in. Water with the same physical attributes can be a private good or a CPR in different social and/or historical contexts.

Therefore, CPRs should be defined not by physical aspects of things or the economic perspectives of capitalists, but by the ethical and social perspective of citizens. The reason that CPRs become CPRs is not because of their own inexcludability or the high costs of excluding others. Instead, it is because those who are excluded from the use of the resources would have difficulty in surviving or it is not ethically legitimate to exclude potential resource users. If it is generally thought to be unjust to exclude potential users from using certain resources, those resources become CPRs. For example, on Jeju Island anybody is allowed to pick wild brackens in the public and private mountains and fields, if not cultivated. This is not because there is no ownership of the land or a lack of technologies such as CCTV or institutions to prevent picking a wild bracken. Rather, it is because of human values that allow the freedom to pick uncultivated brackens for everybody. Land owners do not and cannot prevent picking activities because of socially shared values. They can legally prevent free picking, but nobody has done so.

Considering these aspects, the terms of excludability and subtractability are not good to describe social attributes. Hereafter, thus, we use the terms of rivalry and legitimacy of exclusion instead. Therefore, we redefine CPRs as natural resources and man-made facilities which are used in a competitive situation but it is not socially allowable to exclude potential users. There are two reasons it may not be socially permitted to monopolize CPRs and prevent potential users from using them. First, it is because potential users cannot survive if they do not use them without restriction. Second, it is because it is not fair to exclude someone who wants to use CPRs due to the costs of maintenance and conservation of CPRs because the CPRs were not produced by certain individuals and/or groups.

There are many cases that show evidence for the first argument. Empirical studies of CPRs of the past and the current day undertaken in many countries, including the United Kingdom, Japan, and Indonesia, have shown that resources necessary for livelihood are not excludable in spite of ownership (Inoue 2014; Linebaugh 2007; Polanyi 2009). Resources directly

necessary for survival, such as drinking water and air as well as water necessary for the livelihood of farmers, have not been used exclusively or under a monopoly in different cases. Private ownership and exclusive use of underground water has been prohibited since 2000 in South Korea, where more and more resources became commodities and potential users were excluded under the mad wind of neoliberalism. This resulted from the social pressure based on common sense respecting human survival and the Golden Rule (Choe 2013b).

There is also much evidence for the second argument. The most representative one is the continuous debate jeopardizing the legitimacy of private ownership on land in the advanced capitalist societies where land was privatized first in human history. Even Locke (2012), who legitimized capitalistic private ownership, stated that private land ownership can be legitimized only when land is not rival. Currently, land has the attribute of rivalry. Consequently, private land ownership can be the object of critique (Choe 2012). There is little logic either in Nozick's argument that justifies land ownership on the basis of procedural legitimacy or in some economists' arguments that justify private land ownership on the basis of efficiency in land use (Choe 2012). Even liberalist Henry George argued that all human-beings have equal rights to land (Kim, 2011). The reason that many liberalists who support the importance of ownership cannot justify private land ownership is that land owners make no contribution to land production. It cannot be socially and morally justified to use ownership to exclude new users who reclaim wild land and use it while maintaining its fertility. The legitimacy of exclusion is based on common sense of fairness and the Golden Rule.

Therefore, we define legitimacy of exclusion and rivalry as attributes of CPRs. Legitimacy of exclusion happens only under the condition that a certain individual and group contributes to creation of the resource. A resource that does not meet this condition does not become an object of monopolistic and exclusive use of certain individuals and/or groups. This implies that anybody who takes the burden of developing and maintaining a resource has a right to use it. Even if certain individuals and/or groups contribute to the creation and maintenance of the resource, illegitimacy of exclusion still occurs when nobody can survive without the use of the resource. For example, those who develop oases are obliged to provide water to travelers who have nothing to pay for it. However, those who develop and maintain oases have preference in their use.

This new definition of CPRs maintains resistance against neo-liberalism,

which destroys nature by commodifying everything, and justifies the movements returning privatized nature, which should not be privatized, to all human beings. In particular, this has significant meaning in protecting nature, which has rivalry as an attribute but no legitimate basis for exclusion. Again, it is possible to provide a basis for more global citizens to participate in sustainable development by managing nature as CPRs, so that individuals, small number of groups, or the government cannot monopolize it, allowing all human beings to jointly enjoy the benefits created. In light of the reality in which nature has been destroyed by a conspiracy of rich capitalists and the poor, responsibility for protecting nature can be drawn from distributing stakes to the poor.

2) The new definition of CPRs

CPRs are defined as resources, the amount of which actors can use is decreasing if another actor's use is increasing but from which it is not socially allowed to exclude potential users (Choe 2013). Legitimacy of exclusion as a social attribute is not fixed: it is flexible depending on social conditions. Table 2 shows dimensions different from Table 1 because the legitimacy of exclusion can be different according to social values and relations. For instance, the air existed as a public good when there was a small global population and no air pollution but it became a CPR under emission tax schemes that allocated rights to pollute or monetized the clean air in face of serious air pollution and climate change. The population growth and industrialization leading to air pollution increased rivalry of the air and change it from a public good to a CPR. Furthermore, the air becomes a private good under the emission trading scheme in which the air is commodified and capitalized. This situation reveals that the status of a resource in society is determined by social relationships around resources and social rules on resources, not by the physical attributes of resources.

Food, clothes and houses have subtractability and excludability as physical attributes. These resources were and still are private goods in many countries. However, they increasingly have become CPRs since many states adopted social welfare policies according to their people's common sense of fairness and respect of human beings. In addition, the software that has the same physical and technical attributes can be either a club good or public good. Individual users can use it for free, but corporate users must pay for it. Why? It is because individual users use it for their lives but corporate users use it for profit. This also demonstrates that exclusion results from the

TABLE 2
Reclassification of Resources on the Basis of Social Attributes

	Rivalry				
Legitimacy of exclusion	Private Goods: furniture, automobile, cellular phones, luxury goods, etc.	foods, clothes ↓ →	land, house ↑ ↔	Common Pool Resources: underground water, irrigation facilities, etc.	Non-legitimacy of exclusion
	internet networks ↑			national parks ↑, air ↑, security ↑, national defense ↑	
	Club Goods: cable TV broadcast, software for business, etc.	Personal software →		Public Goods: open software, knowledge, internet, etc.	
	Non-rivalry				

Note.—Arrows express direction of historical changes.

common sense of fairness, that is, the Golden Rule. Exclusion is feasible when it is legitimate and ethical.

Application of the Concept of CPRs Considering Social Attributes to Reality

Changes in the social relations surrounding resources also change the relationship between resources and human-beings. This causes the misuse and overuse of natural resources, leading to various social problems, Ostrom opposed proposals for privatization of CPRs or governmental intervention to avoid the tragedy of the commons. Instead, she suggested an alternative solution based on in-depth empirical studies, which was the establishment and operation of autonomous institutions within communities. She determined eight design principles for autonomous management of CPRs (Ostrom 1990):

1. Define clear group boundaries.
2. Match rules governing use of common goods to local needs and conditions.

3. Ensure that those affected by the rules can participate in modifying the rules.
4. Make sure the rule-making rights of community members are respected by outside authorities.
5. Develop a system, carried out by community members, for monitoring members' behavior.
6. Use graduated sanctions for rule violators.
7. Provide accessible, low-cost means for dispute resolution.
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.

However, if we approach the problems around CPRs by focusing on physical attributes of resources, like Ostrom does, problems resulting from or affecting social changes might be neglected. Therefore, proper solutions to problems around CPRs cannot be developed. Causes of these problems can be found just in the relationship between natural resources and local communities.

Ostrom showed through case studies that communities could fail in CPR management or be vulnerable to risks when they do not secure more than three of the design principles. Ostrom implied recognition of the importance of social relations around natural resources through her concern about "design principles." It is important to build institutions that reflect the design principles suggested by Ostrom. However, it is also important to know why existing institutions have been demolished in communities that used CPRs with no problem in the past and how changed social context has influenced community institutions. Communities do not construct their own institutions in a social and historical vacuum. Rather, they change themselves, influenced by their social and historical context. That is to say, it is necessary to have a concern with social structures beyond a community's boundary and to have social debate and consensus about a clear definition of the concept of CPRs. As a result, society can come to know which resources have to be categorized as public goods, CPRs, and private commodities. This approach to classification requires social debate and consensus.

Several cases of CPRs in South Korea reveal the necessity of a new approach beyond Ostrom's. On Jeju Island, South Korea, village pastures have existed as a CPR that have been used and managed by villagers since the 1930s. Since most village pastures are located in the central mountain areas, Gotjawal, where underground water is contained within the special ecosystem of Halla Mountain, has been maintained soundly. However, village

pastures are not a critical resource for villagers' livelihood anymore, and they have faced development pressure resulting from increasing construction of tour and recreation complexes, development, and rising land prices. Thus, many village pastures have been sold and privatized. There were 123 village pastures in the 1940s, but only 53 are left. As a result, the ecological health of Gotjawal's village pastures has been jeopardized. The amount of water use has rapidly increased because of the increasing number of hotels and recreation complexes, and groundwater has been contaminated because of the increasing use of pesticide and chemical fertilizers for agriculture and golf course management. There was no change in the physical attributes of village pastures and design principles for village pasture management, but there was change in villagers' expectations about village pastures and the socio-economic context around them. The value and meaning of village pastures have changed because of changes in the social and economic conditions relating to village pastures as CPRs. Therefore, it is very difficult to ask villagers to maintain village pastures as CPRs for Gotjawal conservation rather than selling them, resulting in privatization. Conservation is a social necessity, not the villagers'. Villagers would be economically sacrificed and this approach cannot be accepted by them.

There were lots of village forests in South Korea, and many of them still exist. Village forests are intentionally created and protected to benefit villages. Village forests were usually located in front of the village and contribute to harmonizing villagers and maintaining order through villagers' participation and cooperation. Village forests were an important component of the village landscape, providing a common space for rest and psychological stability. Ecologically, village forests are habitats for wildlife, conserving biodiversity. They also contribute to controlling the village microclimate. In traditional Korean society, most villages had village forests, but many of them were lost and some are now close to the moment of destruction,

Why have those village forests with significant ecological functions become extinct? Is it because of changes in the physical attributes of village forests? No, it is not. The physical attributes of village forests are still the same. However, the social necessity for the village forest and the social relationships around them has changed. In the past, village forests functioned as a common pool resource. As energy technologies were not well developed at that time, controlling the microclimate was very important for reducing energy demand for heating and cooling. In traditional society, there was not much change in community membership and emotional harmony was very important for cooperative village works. There were social needs for village

forests and, therefore, they were created and managed as common pool resources. Currently, however, those functions of village forests are not important or necessary for villagers anymore. Cooling and heating needs can be satisfied with energy input. Conservation of biodiversity and provision of a beautiful landscape are still important, but these functions are meaningful for South Korean society as a whole, not for the village itself. Therefore, it is not proper to ask villagers to keep and manage village forests as CPRs with their own efforts. The function of village forests, which was originally limited to villagers, needs to be extended to all of society beyond the boundary of the village. In fact, people started to recognize village forests as a part of ecosystem, which supports sustainable lives in Jeju. They also started to regard natural resources as ones with illegitimacy of exclusion. Therefore, more people partake in movements to enact laws and regulations to limit privatization of CPRs and to change privatized CPRs into the National Trust.

We are concerned about natural resources as CPRs and the sustainable management of CPRs because they are connected to conservation of sound natural resources and, consequently, sustainable life for human beings. When natural resources such as CPRs are the basis of local villagers' livelihood, and local villagers manage and protect the CPRs through rules and institutions to protect them for sustainable use, both villagers' livelihood and natural resources can be maintained. However, when CPRs are not the basis of villagers' livelihood anymore and they are traded as commodities with monetary values within the capitalist order, CPRs cannot function as they did before. In this context, CPRs become private properties, driving pollution and destruction of natural resources. Therefore, it is important to maintain the social relationships that made CPRs what they were. In addition, it is also important to have a social consensus that CPRs should not be monopolized nor commodified. The new definition of CPRs based on the common sense of fairness and the Golden Rule help that social consensus.

The design principles formulated by Ostrom are important for maintaining CPRs as CPRs. However, as long as the villagers and local communities using CPRs are not living in a vacuum in a capitalist society, there is little possibility they will not sell CPRs as commodities. Commodified resources are turned into inputs to production processes for more profits, leading to the destruction of nature. If there are some villagers whose livelihood is based on those CPRs, trade and loss of CPRs may jeopardize the sustainability of their life. Therefore, in order to maintain CPRs as CPRs, it is necessary to have social consensus and support beyond relying on the will and capacity of villagers.

Conclusion

Current environmental pollution and destruction have various causes. One of these is the privatization and overdevelopment of natural resources that have been commonly used and managed by local villagers. Hardin argued in his famous article, "The Tragedy of the Commons," that environmental problems have been caused by limitless use of natural resources as commons based on individuals' selfish rationality. Since then, however, many studies, including Ostrom's, found that many communities have used CPRs sustainably by limiting access to the common natural resources that are the basis of villagers' livelihood and by developing rules and institutions.

Nevertheless, even according to Ostrom's theory of CPRs, it is understood that the attributes of CPRs cause excludability and rivalry. Thus, this alternative approach fails to explain changes in the degree of excludability and rivalry in different historical contexts. Degrees of excludability and rivalry can be distinguished not by their physical attributes but by the social contexts and social relationship around CPRs. Even the physical attributes of CPRs can be changed depending on socio-economic conditions. Resources with no rivalry in the past can become rival when the environment has been polluted and destroyed or the population has increased. Some resources which were difficult to exclude from access and use can have excludability through adoption of new institutions. After all, the relationship between resources and society is influenced by the relationship among human beings within a society and the institutions society has created.

In sum, when we redefine CPRs with legitimacy of exclusion and rivalry, we can have a more appropriate approach for the maintenance and management of CPRs. More precisely, not excludability itself but the legitimacy of excludability is critical. Empirical cases showing successful sustainable management of CPRs through the creation and management of autonomous community institutions are counterevidence to pursuing privatization or state control as a solution to the tragedy of the commons. However, Ostrom's new approach to CPRs pays most attention to internal capacity or internal conditions called design principles and less attention to the impacts of external socio-economic changes on each community and the social structure and social value changes that condition a community's capacity. Therefore, that view restricts socio-ethical approaches. This study mobilizes sociological imagination to go beyond the current theory of CPRs by paying attention to the social attributes of CPRs.

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