

## The Ontology of the Intellectual Commons

ANTONIOS BROUMAS  
University of Westminster, UK

Intellectual commons are the great other of intellectual property-enabled markets. They constitute noncommercial spheres of intellectual production, distribution, and consumption, which are reproduced outside the circulation of intangible commodities and money. They provide the core common infrastructures of intellectual production, such as language, nonaggregated data and information, prior knowledge, and culture. This article formulates a processual ontology of the intellectual commons by examining the substance, elements, tendencies, and manifestations of their being. The first part of the article introduces the various definitions of the concept. The second part focuses on the elements, which constitute the totalities of the intellectual commons. The third part emphasizes their structural tendencies. Finally, the fourth and last part of the article deals with the various manifestations of the intellectual commons in the domains of culture, science, and technology.

*Keywords: intellectual commons, commons-based peer production, ontology, definition*

Today, the epicenter of wealth creation in our societies has rapidly shifted from tangible to intangible assets. Intellectual production is more than ever considered to be the engine of social progress. As a result, the focus of business, policy making, and civil society has accordingly shifted to the regulation of intellectual production, distribution, and consumption. Moreover, rapid technosocial developments have led to the convergence of media and communications in a single network of networks based on packet-switching technologies, making the Internet the archetypal communication medium of our times. It is exactly at this cutting edge of technological progress and wealth creation that people have started to constitute intellectual commons free for access to all, by devising collaborative peer-to-peer modes of production and management of intellectual resources.

New intellectual commons—such as spectrum commons, open hardware, open standards, free software, wikis, open scientific publishing, openly accessible user-generated content, online content licensed under Creative Commons licenses, collaborative media, voluntary crowdsourcing, political mobilization through electronic networks and hacktivism, Internet cultures, and memes—have reinforced cultural and technoscientific commons that constitute the building blocks of our civilization, such as language, collective history, ideas, beliefs, customs, traditions, folk art, games, shared symbols, social systems of care, knowledge in the public domain, and all our past scientific and technological advancements (Merges, 2004). This kaleidoscope of sharing, collective creativity, and collaborative

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Antonios Broumas: [info@lawandtech.eu](mailto:info@lawandtech.eu)

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innovation constitutes our digitized environments not as private enclosures, but as shared public space, a social sphere divergent from the one reproduced by the market and the state.

Along these lines, a grounded ontology of the intellectual commons is essential for our capacity to understand and analyze the phenomenon. This article formulates a processual ontology of the intellectual commons by examining the substance, elements, tendencies, and manifestations of their being. It constructs an ontological perspective of the intellectual commons as social practices of both pooling intangible resources in common and reproducing the communal relations developed around such practices. The first part of the article introduces the various definitions of the concept. The second part focuses on the elements, which constitute the totalities of the intellectual commons. The third part emphasizes their structural tendencies. Finally, the fourth and last part of the article deals with the various manifestations of the intellectual commons in the domains of culture, science, and technology.

### **Definitions**

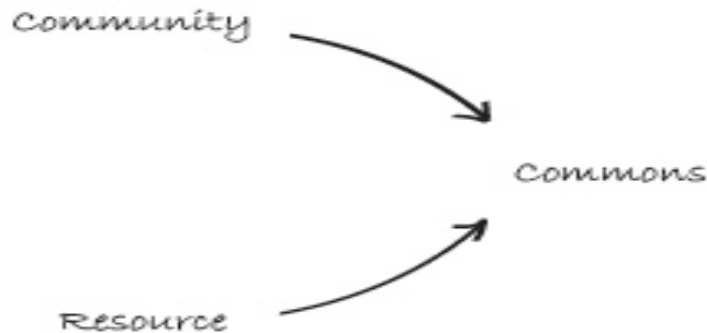
The concept of commons is today most commonly defined in connection to resources of a specific nature. In her seminal work, Ostrom (1990) conceives of the commons as types of resources—or better resource systems—which feature certain attributes that make it costly (but not impossible) to exclude potential beneficiaries from appropriating them. Hess and Ostrom thus broadly describe a commons as a resource shared by a group of people, which is vulnerable to social dilemmas (Hess, 2008; Hess & Ostrom, 2007b). Following the same line of thought in relation to intangible resources, the same authors stress the importance of avoiding the confusion between the nature of the commons as goods and the property regimes related to them (Hess & Ostrom, 2003). According to this approach, information and knowledge are socially managed as common-pool resources due to their inherent properties of nonsubtractability and relative nonexcludability. These two attributes of common-pool resources make them “conducive to the use of communal proprietorship or ownership” (Ostrom & Hess, 2000, p. 332). Yet resource-based approaches run the danger of reifying the commons and downgrading their social dimension.

In contrast, property-based definitions equate the social phenomenon of the commons with collective property in contradistinction with private and public property regimes (Boyle, 2008; Lessig, 2002a; Mueller, 2012). In the intellectual realm, James Boyle labels the commons of the mind as “property’s outside” or “property’s antonym” (Boyle, 2003, p. 66). Along the same lines, Jessica Litman considers that the intellectual commons coincide with the legal concept of the public domain, which she juxtaposes to intellectual property (Litman, 1990). Their equation with collective property restricts the ontological examination of the intellectual commons to rules of ownership and ignores the fact that the latter are actually systems of wider social relations, which also include modes of production and governance.

Alternatively, relational/institutional approaches define the commons as sets of wider instituted social relationships between communities and resources (Dardot & Laval, 2015). As Helfrich and Haas (2009) state, “Commons are not the resources themselves but the set of relationships that are forged among individuals and a resource and individuals with each other” (p. 5). Linebaugh (2008) adds that

Commons are not given, they are produced. Though we often say that commons are all around us—the air we breathe and the languages we use being key examples of shared wealth—it is truly only through cooperation in the production of our life that we can create them. This is because commons are not essentially material things but are social relations, constitutive social practices. (pp. 50–51)

Hence, according to relational/institutional approaches, the commons can be defined as “a social regime for managing shared resources and forging a community of shared values and purpose” (Clippinger & Bollier, 2005, p. 263) or even an “institutional arrangement for governing the access to, use and disposition of resources,” in which “no single person has exclusive control over the use and disposition of any particular resource” (Benkler, 2006, pp. 60–61). In conclusion, relational/institutional approaches pinpoint that commons refer neither to communities nor to resources, but instead to the social relations and structures that develop between the two (see Figure 1).



**Figure 1. Locating the commons.**

At an even higher level of complexity, processual definitions pinpoint the dynamic element of the commons. According to processual approaches, commons are defined as fluid systems of social relationships and sets of social practices for governing the (re)production of, access to, and use of resources. In contrast to resource-based or property-based definitions, the commons are not equated with given resources or to the legal status emanating from their natural attributes, but rather to social relations that are constantly reproduced. Furthermore, in contrast to relational/institutional approaches, the commons do not coincide with, but are rather co-constituted by their institutional elements. According to the processual approach, the commons are a process, a state of becoming, not a state of being. Therefore, Peter Linebaugh (2008) has invented a neologism to reimagine commons as a verb—that is, the process of “commoning” (pp. 50–51). Hence, in contrast to analytical definitions, processual approaches refer to the ontology of the commons not as a common pool resource, but as the very process of pooling common resources (Bollier & Helfrich, 2015).

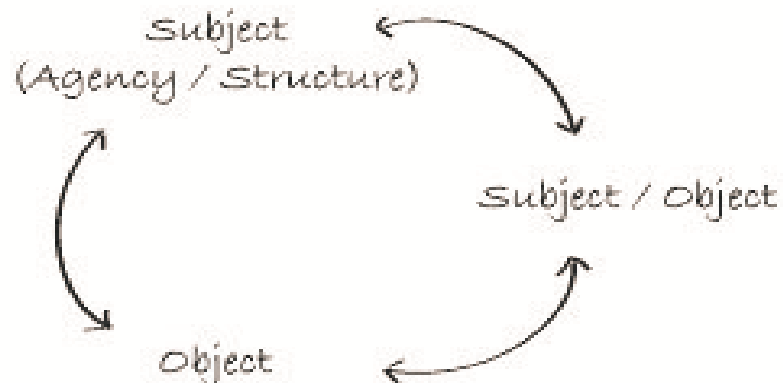
Nonetheless, social practices taking place within the commons are not only restricted to the (re)production of the resource. On the contrary, throughout these practices, the community itself is constantly reproduced, adapting its governance mechanisms and communal relationships in the changing

environment within and outside the commons. According to such an “integrated” approach, the commons should be viewed in its totality as a process that produces forms of life in common, a distinct mode of social coproduction (Agamben, 2000).

### Elements and Characteristics

Intellectual commons are related to terrains of mainly intellectual, as demarcated from those of chiefly manual, human activity. In other words, they refer to social structures related primarily to intellectual work in terms of the production, distribution, and consumption of information, communication, knowledge, and culture, which are subject to dynamic change. Taking into account that the commons in general is not a singular concept, the commons of the mind exhibit multiple layers of (re)production and may involve the *commonification* of both tangible and intangible resources.

Most theorists consider any commons as consisting of three main elements, which more or less refer to the social practice of pooling a resource, the social cooperation of productive activity among peers, and, finally, a community with a collective process governing the (re)production and management of the resource (Bollier & Helfrich, 2015; Caffentzis, 2008; De Angelis, 2009; Hess & Ostrom, 2007b). In dialectical terms, the elements of the intellectual commons can be restated according to the dialectic of subject and object. According to this dialectical scheme, a producing subject interrelates with its external objective environment. The interaction of subject and object takes the form of subject/object, an entity that preserves certain elements of subject and object, eliminates others, and sublates the status of such an entity through the emergence of novel properties that did not exist in its generating entities (Figure 2).



**Figure 2. The elements of the intellectual commons.**

In this light, the intellectual commons are produced by the interrelation between their subjective and objective elements, as described in Table 1. The subjective element is twofold, consisting, on the one hand, of the collective actors and, on the other hand, of the communal structures of the intellectual commons. The objective element consists of the intangible resources that are used as input for commons-based peer production. The products of the sublation between the objective and subjective elements of the intellectual commons are again twofold. Obviously, practices within the intellectual commons yield more information, communication, knowledge, and culture. Hence, intangible resources are both object of the dialectical process and outcome of the sublation. This characteristic distinguishes the intellectual commons from other types of commons. Yet the dialectical process constantly reproduces and evolves itself, its social bonds being both medium and outcome of the process. Rather than being analyzed as separate from one another, the objective and subjective elements of the commons should be viewed as forming an inseparable and integrated whole (Bollier & Helfrich, 2015).

**Table 1. Characteristics of the Intellectual Commons.**

	Elements		
	Object (resource)	Subject/agency (productive activity)	Subject/structure (community/institution)
<b>Characteristics</b>	Nonexcludability	Nonmonetary incentives	Rules of self-governance
	Nonrivalry	Voluntary participation	Communal ownership rules
	Zero marginal costs of sharing	Self-allocation of productive activity/consensus-based coordination	Access rules
	Cumulative capacity	Self-management	Communal values

As far as their objective element is concerned, intellectual commons are primarily related to the (re)production of intangible resources, in the form of data, information, communication, knowledge, and culture (Benkler, 2006; Frischmann, Madison, & Strandburg, 2014). Practices within the commons in relation to tangible resources are characterized by resource attributes of relative nonexcludability and of rivalrousness (Ostrom & Ostrom, 1977). In particular, the exclusion of individuals from the use of common-pool resources through physical or legal barriers is relatively costly, whereas any resource units subtracted by one individual are deprived from others (Ostrom, 1990). As a corollary, such resources are susceptible to problems of congestion and overuse and can even be open to the risk of destruction—matters that have to be dealt with by commoners through sophisticated and adaptable governance technics, if commons upon them are to last and thrive. In contrast, intangible resources have the status of pure public goods in the strict economic sense (Samuelson, 1954). First of all, intangible goods share the attribute of nonexcludability with common-pool resources, except in the case of the former, such nonexcludability is absolute rather than relative (Hess & Ostrom, 2007b). Furthermore, they are nonrivalrous in the sense that their consumption does not reduce the amount of the good available to others (Benkler, 2006). In addition, information, communication, knowledge, and culture have been

known to bear a cumulative capacity (Foray, 2004; Hess & Ostrom, 2007b). Finally, intangible resources enjoy near zero marginal costs of sharing among peers in the sense that the cost of their reproduction tends to be negligible (Arrow, 1962; Benkler, 2006). The partly intransitive attributes mentioned above—that is, nonexcludability, nonrivalry, zero marginal costs of sharing, and cumulative capacity, which characterize the objective element of the intellectual commons—are not found in types of commons based on tangible resources.

Regarding their subjective agency element, intellectual commons are reproduced according to a commons-based peer mode of intellectual production, distribution, and consumption, which significantly differentiates itself from the dominant mode, based on capital and commodity markets (De Angelis, 2007). In the context of the intellectual commons, the subjective productive force of the social intellect interrelates with communal relations of reproduction. The social intellect can be defined as the collective intellectual worker, producing prior and existing information, communication, knowledge, and culture through cooperative work and an aggregation of the work of many humans. Communal relations between peers are characterized by voluntary participation, the self-allocation of tasks, and autonomous contribution to the productive process (Soderberg & O’Neil, 2014). Participation in the productive process is motivated less by material incentives and more through bonds of community, trust, and reputation (Benkler, 2004; De Angelis, 2007). Coordination is ensured “by the utilization of flexible, overlapping, indeterminate systems of negotiating difference and permitting parallel inconsistencies to co-exist until a settlement behavior or outcome emerges” (Benkler, 2016, pp. 111–112). Eventually, such relations tend to be based on sharing and collaboration between commoners, who join their productive capacities together as equipotent peers in networked forms of organization (Bauwens, 2005). Even though the degree and extent of control may vary, the productive process, available infrastructure, and means of production tend to be controlled by the community of commoners (Fuster Morell, 2014). Taking into account that intellectual production has always had a very close relation with communication and collaboration, today’s information and communication technologies have contributed to the process by compressing time and space and by facilitating peer-to-peer collaboration (Benkler, 2006). As a result, technology has significantly decreased the transaction costs to forge communal relationships and has made it more attractive for creators to establish efficient communities of production.

In relation to their subjective structural element, the intellectual commons arise whenever a community acquires constituent power by engaging in the (re)production and management of an intangible resource, with special regard for equitable access and use (Bollier, 2008). In this sense, there can be no commons without a self-governing community. Rules of self-governance include both rules for the management of the productive process and rules of political decision making. On the one hand, self-management rules determine the general characteristics of the mode of production, distribution, and consumption of the resource, the choices over the design of the resource and the planning of the productive process, the criteria for the allocation of tasks and the division of labor. On the other hand, political decision making determines the collective mission or goal of the process, the membership and the boundaries of the community, the constitutional choices over the mode of self-governance, the participation of individual commoners in the decision-making process, the interaction between commoners, the adjudication of disputes, and the imposition of sanctions for rule violation. In addition, the intellectual commons are regulated by ownership and access rules. Ownership rules determine the

property status of both the means of production and the resources produced. Access rules regulate the appropriation and use of resource units (Ostrom, 1990). Access can be open to all or managed and limited to certain individuals or usages (Mueller, 2012). Property rights are bundles of access, contribution, extraction, removal, management/participation, exclusion, and alienation rights, thus conferring different types of control over resources vis-à-vis persons and entities other than their right-holder (Hess & Ostrom, 2007a). Ownership of communally managed and communally produced resources bestows the rights to regulate access and use. Access rules generally aim to sustain and guarantee the communal mode of resource management and to avert exhaustion through commodification. They constitute the constructed boundaries between the realm of the intellectual commons and the sphere of commodity markets. Hence, ownership and access in the intellectual commons are inextricably linked. Furthermore, the intellectual commons are established as communities of shared values, oriented toward communal stabilization and reproduction through time (Clippinger & Bollier, 2005). Values, such as reciprocity, trust, and mutuality among peers, are not confined to one-to-one relations. Rather, they develop and are set in circulation both within and among commoners' communities. Communal values are very important for the well-being of the intellectual commons, since their circulation and accumulation contribute to the construction of group identities and the consolidation of reciprocal patterns of pooling resources in common. Yet communal values within the spheres of the intellectual commons also function in contradistinction and as alternatives to circuits of dominant monetary values. There is an underlying confrontation between alternative and dominant value systems, which is connected with patterns of pooling resources in common and processes of commodification (De Angelis, 2007). Intellectual commons communities reveal a wide diversity of institutional practices, which evolve through time in correspondence to the vulnerabilities to enclosure or underproduction of the relevant resource and the social dilemmas faced by the community during the course of sustaining each specific commons (Hess, 2008).

As any other type of social institution, intellectual commons control and, at the same time, empower the activity of their participants. Nevertheless, they significantly differ from state or market regulation of people and resources, since they constitute social systems, in which institutions are immanent in, rather than separate from, the reproduction of the community.

### **Tendencies**

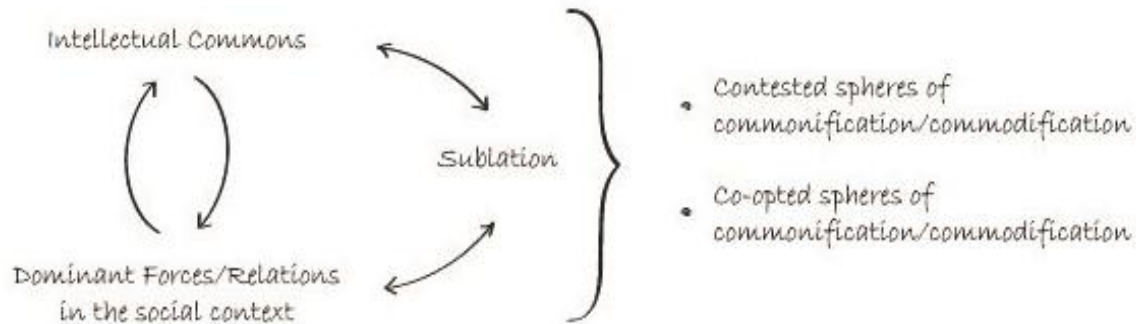
According to Vincent Mosco (2009), commodification is "the process of transforming things valued for their use into marketable produces that are valued for what they can bring in exchange" (p. 2). Today, the commodification of intellectual produces is confronted by the contending force of the expansion of the intellectual commons. Fifteen years after the then Microsoft CEO Steve Ballmer compared Linux with cancer, contaminating all other software with the General Public License (Greene, 2001), free and open source software projects have grown exponentially and have become the technological base for large parts of the software development industry (Knorr, 2015), proportionally displacing closed intellectual property business regimes of software development. Intellectual commons develop in the form of virtuous circles and ecosystems. Sharing is a practice at the core of the intellectual commons. The more they are shared, the more information, communication, knowledge, and culture enhance their social utility (Bollier, 2008; Frischmann, 2012; Hardt, 2010; Rose, 1986). Hence, sharing literally fuels innovation. It is through the practices within the intellectual commons that this sharing potential of intangible resources for social

utility is taken advantage in full. When productive communities possess institutions that guarantee that the output of their production remains within the virtuous circle of commons-based peer production, then practices of pooling resources in common acquire network effects. This gives rise to an expansion of both the quantity/quality of intellectual production and the size of productive communities, which has been characterized as the "cornucopia of the commons" (Bollier, 2007, p. 34). This phenomenon of expanding the pooling of resources in common can be termed *commonification*. Contrary to the opposite transformations of commodification, commonification transforms social relations, which generate marketable commodities valued for what they can bring in exchange, into social relations, which generate resources produced by multiple creators in communal collaboration, openly accessible to communities or the wider society and valued for their use.

In informational capitalism, exchange value is not the sole form of social value in circulation, and intellectual property-enabled commodity markets are not the only value systems monopolizing the production, distribution, and consumption of information, communication, knowledge, and culture. The intellectual reservoir of the public domain, the intangible resources pooled in common, and the patterns of sharing and collaboration within and among intellectual commons communities interconnected through peer-to-peer networked structures mutually compose and reproduce openly accessible intellectual ecosystems of culture, science, and technology. Hence, in contrast to the circulation of exchange values within intellectual property-enabled commodity markets, use and other social values circulate within and among the intellectual commons, forming alternative spheres of value circulation/accumulation. Examples of such spheres include the open source software community, alternative public spheres formed by bloggers and alternative media, Internet cultures in social media, and online meeting points like 4chan.

Even though they are fundamentally characterized by their orientation toward self-governance and open access to their productive output, in societies dominated by capital, the commons of the mind unfold themselves neither as wholly open nor as entirely self-governed. Instead, openness and self-governance are tendencies, which emerge from the essential properties encountered in the social relations of the intellectual commons. As in any other productive process, intellectual commons are determined only to a certain extent by the properties of the resources involved, being after that point greatly dependent on the sociohistorical context in which they evolve (Kaul & Mendoza, 2003). In particular, the degree of openness and self-governance in each community of commoners is determined by the specific outcomes of the dialectics between the intellectual commons and dominant forces/relations in their social context. In this view, institutions within the intellectual commons are the result of the interaction between the intellectual commons and the objective conditions of their environment. Such a perspective also leaves ground for counterinfluencing agency/structure dialectics between the resulting institutions within the intellectual commons, their generative elements, and their social context.





**Figure 3. The dialectics of the intellectual commons.**

Hence, as shown in Figure 3, in capitalism, structures of pooling resources in common are inherently contested and contradictory terrains of social activity, which are constantly reproduced in a nonlinear manner on the basis of the dialectics mentioned above but also counterinfluence their environment. Outcomes of the interrelation between the intellectual commons and dominant forces/relations in the social context can be classified in two distinct spheres of reproduction: contested spheres of commonification/commodification and co-opted spheres of commonification/commodification.

The dialectics within the reproduction of the intellectual commons exhibit certain tendencies and countertendencies (see Table 2), which emanate from their essential characteristics and the essential characteristics of the wider social context. In particular, due to the attribute of nonexcludability, intellectual commons are less vulnerable to “crowding effects” and “overuse” problems and relatively immune to risks of depletion (Lessig, 2002b, p. 21). Therefore, practices of pooling resources in common in relation to intangible resources have the potential to be structured as open access commons on their demand side—that is, “involving no limits on who is authorized to use a resource” (Ostrom & Hess, 2000, pp. 335–336). Examples of open access intellectual commons include our common cultural heritage and the public domain. Yet intellectual commons are also subject to opposing forces in the social context, manifested in legal institutions and technological infrastructures of enclosure, which tend to socially construct information, communication, knowledge, and culture as artificially scarce; to monetize access; and, eventually, to commodify them (Hess & Ostrom, 2007b). Accordingly, the characteristics of nonrivalry and zero marginal costs of sharing observed in relation to intangible resources tend to encourage patterns of sharing among creators, which may result in the pooling of common resources, on the condition that forces of commonification are also set in motion. Conversely, institutions and technologies in the social context enable the fixation of intellectual works in the form of commodities and, thus, make them susceptible to market allocation and private accumulation (Cohen, 2007). Sharing is a fundamental characteristic that distinguishes commons from commodity markets or other systems of private resource accumulation (Madison, Frischmann, & Strandburg, 2010). Therefore, the degree of sharing tolerated by the sublation of the opposing tendencies mentioned above gives evidence about the degree of their relative independence or co-optation by market logic.

**Table 2. Tendencies and Countertendencies Within the Intellectual Commons.**

Characteristics of pooling resources in common (commons-based peer production)	Tendencies (forces of commonification)	Interrelation (subject/object dialectics)	Countertendencies (forces of commodification)	Characteristics of commodification (capitalist mode of production)
Nonexcludability	Open access	Commonification ↔ commodification	Monetized access	Enclosure
Nonrivalry/zero marginal costs of sharing	Sharing	Pooling of common resources ↔ private accumulation of resources	Market allocation	Fixity
Cumulative capacity, nonmonetary incentives, voluntary participation	Collaboration	Commons-oriented relations of production ↔ market competition and oligopolies	Antagonism	Monetary incentives
Self-allocation of productive activity and consensus-based coordination	Self- and collective actualization	Self-management of the productive process ↔ hierarchical management of the productive process	Alienation	Command
Communal value system	Circular reciprocity	Work in collaboration or waged labor	Labor as commodity or exploitation	Market value system
Communal ownership	Self-governance	Consensus-based decision making ↔ hierarchical decision making	Domination	Private/state ownership

The dialectics, which give birth to the sphere of the intellectual commons, are framed by additional characteristics and tendencies, the social determination of which is even more extensive than the partly intransitive attributes of intangible resources. In this context, several researchers have pinpointed that individuals are motivated to engage in intellectual commons communities by diverse and heterogeneous incentives, which are primarily nonmonetary, such as communal reciprocity and skills building (Ghosh, Glott, Krieger, & Robles, 2002), social status gains and reputation among peers and beyond the community (Lakhani & Von Hippel, 2002), and the use value of produced resources and the hedonic pleasure of creativity (Lerner & Tirole, 2002). The important role of nonmonetary incentives within intellectual commons communities certainly does not imply that commoners are free from extrinsic monetary pressures arising from the immersion of such communities in the dominant value flows of commodity markets. Hence, other researchers have recorded that the exploitation of reputation within the intellectual commons as a means to leverage employment opportunities also plays a motivational role among commoners (Von Krogh, Haefliger, Spaeth, & Wallin, 2012). Nonmonetary incentives and the participation of commoners on a voluntary basis combined with the partly intransitive characteristic of the cumulative capacity of intangible resources weave relations within the productive process, which generate collaborative tendencies among peers. Contrariwise, the dominance of monetary incentives in the wider social context reproduces antagonistic relations. The countervailing tendencies mentioned above impact both the patterns of pooling resources within intellectual commons communities and the relations among them, pushing toward either commons-oriented peer relations of production or market competition, accumulation of market power and oligopolies.

Furthermore, the characteristics of self-allocating tasks and consensus-based coordination in the productive practices of pooling resources in common promote the self- and collective actualization of commoners. On the contrary, hierarchical command of labor in the productive processes, which dominate the social context, generates alienation of creative individual workers. The synthesis between the two juxtaposing spheres shifts the productive practices of the intellectual commons either toward self-management or toward hierarchical management. Intellectual commons should also be examined as alternative communal value systems reproduced at the margins of dominant market value systems. Whereas markets circulate social power in the form of monetary values and labor in the form of commodity through decentralized bilateral transactions, intellectual commons communities are based on circuits of circular reciprocity among peers. Interrelations between the two value systems generate relations of production within the intellectual commons, which may widely range between the two extremes of collaborative work among peers and exploited waged labor. Finally, the communal or private/state ownership of the infrastructure and means of pooling resources is critical for the degree of self-governance and domination encountered in each intellectual commons community and eventually determines its mechanisms of political decision making—that is, whether such mechanisms shall be consensus-based or hierarchical. In conclusion, intellectual commons generally share the characteristics mentioned in the previous section. Nonetheless, the extent and quality of those characteristics in each case of commons is ultimately determined by the dialectics between forces and relations of commonification/commodification. Hence, the more an intellectual commons community dynamically transforms its practices and orients itself from the sphere of commonification toward the contested sphere of commonification/commodification to the co-opted sphere of commonification/commodification, the less extensive and qualitative its characteristics of open access, self-management, and self-governance will be and vice versa.

In corollary, the intellectual commons have the potential to be noncommodifiable, yet are not insulated from phenomena of commodification. The establishment of either intellectual commons contesting commodification on the basis of sharing and collaboration or intellectual commons being co-opted by commodity circulation and subject to value capture by capital are ultimately socially constructed outcomes. These outcomes are determined by the dialectics constituting the spheres of the intellectual commons vis-à-vis the value system of commodity markets. They are related to tendencies and countertendencies, which may be realized or remain unrealized. The intellectual commons embody the potential to unleash in full the creative and innovative powers of the social intellect, yet their future remains open, subject to struggles for social change within their spheres and in the wider social context.

### Manifestations

Intellectual commons ascribe to practices of social reproduction in relation to primarily intellectual human activity. Intellectual work manifests itself in the reproduction of data, knowledge, and communication. Correspondingly, intellectual commons are related to the reproduction of information, communication, knowledge, and culture. The commons of the mind cannot be separated from practices of pooling resources in common in other spheres of human activity, but rather operate in combination and, thus, have the potential to commonify social reproduction in its totality. The same circuits of the commons may manifest themselves in productive activities involving information, communication, knowledge, culture, manufacturing, sociality, and so on.<sup>2</sup> In addition, they do not refer to a supposed "immaterial" realm, but rather to the movement of matter through cognitive, communicative, and cooperative practices and to the reproduction of social relations (Williams, 1989).<sup>3</sup>

Information refers to collections of data meaningfully assembled "according to the rules (syntax) that govern the chosen system, code or language being used" (Floridi, 2010, p. 20). It is a combination of data and intellectual work, which embodies human interpretation. Therefore, to be accessible and comprehensible, any assemblage and transformation of data into information must comply with a socially constructed and shared system of semantics. Furthermore, the process of assembling information by the pooling together of data is in itself based on patterns of sharing and collaboration. Since the accumulation of factual data and its collaborative assimilation into information constitute the foundation for knowledge production, robust commons of information are a precondition for all modes of intellectual production, distribution, and consumption. The information commons includes the vast realm of nonaggregated data

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<sup>2</sup> For example, open hardware commons have the potential to manifest themselves in the commonification of all their terrains of social reproduction, such as in relation to designs, communications media, manufacturing spaces, material infrastructure, and products—or at least in some of them. Hence, fablab networks mainly commonify hardware designs—that is, they are mainly manifested as knowledge commons. Yet practices of pooling resources in common in hardware design have the potential to colonize the production of material goods through artisanal networks and, thus, acquire a deeper layer of commonification within social reproduction.

<sup>3</sup> For instance, spectrum commons may combine practices of pooling resources in common in relation to natural (radio spectrum), social (means of communication), and intellectual (wireless communication technologies) resources, all of which are reflected in matter and the movement of matter.

and information, which has been collected, processed, accumulated, and stored across history by humanity as a result of sharing and collaboration among many individuals. It also includes aggregated data and information about nature, human history, and contemporary society, which has not been enclosed either directly or indirectly by virtue of patent, copyright, and database laws or by technological means and, therefore, lies in the public domain.<sup>4</sup> Reliance of intellectual production on sharing and collaboration is acknowledged by our systems of intellectual property law, which, therefore, purposefully include limitations to exclusivity and common use provisions of information resources. Such an equilibrium between enclosure and the commons embedded in law has led certain scholars to maintain that the system of intellectual property rights is “a mixed system of private property and commons” (Cunningham, 2014, p. 65).

Knowledge is the assimilation of information into shared structures of common understanding (Machlup, 1983). It is a social product generated on the basis of objects of a transitive dimension (i.e., prior knowledge produced by society) and objects of an intransitive dimension (i.e., structures or mechanisms of nature that exist and act quite independently of humans; Bhaskar, 2008). By the term social reference is given to the fact that the production of knowledge is essentially a process of cooperation among several individuals (Marx & Engels, 1844/1998), which is structured in dynamic subprocesses of cognition, communication, and cooperation (Fuchs & Hofkirchner, 2005). The accumulated knowledge of humankind constitutes the intellectual basis of social life. The building blocks of human knowledge are produced and managed as commons, according to socially constructed rules, which prohibit any kind of exclusionary conduct.<sup>5</sup> Hence, discoveries about physical phenomena and laws of

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<sup>4</sup> As a general rule, data and information do not per se fall under the scope of copyright or patentable subject matter or, instead, do not per se fulfill other criteria of copyright protection or patentability. Nonetheless, the commodification of information flows and the subsequent investment of time, money, and effort for the compilation of databases have pushed for the introduction of statutory private monopolies over information, the most prominent of which is the 1996 European Union directive on the legal protection of databases. By virtue of the latter, an exclusive sui generis right for producers of nonoriginal databases has been established throughout the European Economic Area, which, instead of protecting units of data per se, grants its holders the right to exclude others from the extraction and/or reutilization of the whole or of a substantial part of the contents of the databases under protection.

<sup>5</sup> According to the Articles 1 and 2 of the 1886 Berne Convention for the Protection of Literary and Artistic Works, copyright applies only to expressions of ideas that have been fixed in a tangible medium and not to ideas themselves. Articles 9 and 2 of the 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) further clarifies the scope of copyright: “Copyright protection shall extend to expressions and not to ideas, procedures, methods of operation or mathematical concepts as such.” Along the same lines, U.S. copyright law explicitly excludes ideas from its protective scope by providing that: “In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work” (17 U.S.C., Sec. 102(b), 1982). In relation to patentability, Articles 27 and 1 of the TRIPS agreement includes in the scope of patentable subject matter only inventions, whether products or processes of technology, which “are new, involve an inventive step and are capable of industrial application.” In a more detailed manner, Articles 52 and 2 of the 1973

nature, abstract ideas, principles and theories, mathematical symbols, methods and formulas are managed as open access commons pooled together by the cooperative activity of the scientific community, past and present. All in all, the core of scientific knowledge is generally managed as a commons, advanced through sharing and collaboration among peers in community.<sup>6</sup> The knowledge commons also consists of technological inventions that fall short of patentability because they do not fulfill the criteria of novelty, nonobviousness/involvement of an inventive step, social utility/susceptibility of industrial application. Broadly speaking, this includes the accumulated technological advancements of the greatest part of human history—namely, inventions (1) that were conceived before the existence of patent laws; (2) that have been communicated to the public, but have not been filed for patent protection by their inventors; (3) that had their patent rights expire; or (4) that have been invalidated by litigation. Furthermore, technologies in use, whether protected by private monopolies or not, lead to further innovation and invention through practices of maintenance, repair, and modification shared among the communities of their users (Edgerton, 1999; Von Hippel, 2005). In addition, the knowledge commons includes all types of “traditional knowledge.” The latter refers among others to the know-how, practices, skills, and innovations developed within and among communities through patterns of sharing and collaboration in a wide variety of contexts, such as governance, agriculture, science, technology, architecture, arts and crafts, ecology, medicine, and biodiversity (World Intellectual Property Organization, 2012). Finally, the development of packet-based electronic communication systems and advanced information technologies in the form of the Internet and the World Wide Web have greatly facilitated the sharing of knowledge between peers along with commons-based peer modes of production based on collaboration.

Communication refers to a socialized process of symbolic interaction between human subjects through which meaning is exchanged. Therefore, being more than the transmission of data, communication is in essence the social production of meaning that constitutes social relationships (Mosco, 2009). Furthermore, exercising free speech through communication between citizens essentially involves drawing from the vast pool of intellectual resources held in common. Hence, the wider the scope of the intellectual commons, the more the fundamental freedom of speech is empowered (Netanel, 2008). Cultures are unities of symbolic systems reproduced by means of interpersonal human communication (CuChe, 2010). Culture includes the fundamental elements of socialization, which are necessary for life in common—that is, the *a priori* of human society. It is essentially a socialized process based on sharing and collaboration and a collective project in constant flux. To begin with, any culture is reproduced upon a common language, which is also in itself a system of symbols. Furthermore, a cultural system includes the

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European Patent Convention excludes from the scope of patentable subject matter (a) discoveries, scientific theories, and mathematical methods; (b) aesthetic creations; (c) schemes, rules, and methods for performing mental acts, playing games, or doing business, and programs for computers; and (d) presentations of information.

<sup>6</sup> Due to the fact that patentability criteria apply only to technological applications of scientific knowledge, scientific advancements cannot in themselves be patented, except in their embodiment as useful/industrial applications. It is, after all, to this end that the publication of the knowledge underlying an invention as freely accessible is a prerequisite for the granting of private monopoly rights over technological applications in most patent systems.

reproduction and evolution of shared ethical, moral, religious, and other value systems, which determine anything from body techniques and patterns of behavior to ways of life and orderly social function within social groups (Elias, 1969; Mauss, 1973; Sahlins, 2013; Williams, 1983). Culture also exhibits common traditions, habits and customs, religious or secular belief systems, and interacting worldviews and shared conceptions about social life in general. In addition, culture consists of common aesthetic systems and styles, artistic and cultural techniques, practices, skills, and innovations along with artistic and cultural expressions of folklore, such as folk art, arts and crafts, architectural forms, dance, performances, ceremonies, handicrafts, games, myths, memes, folktales, signs, and symbols. Last but not least, when we talk about culture, we refer not only to its contemporary form but also to cultural heritage and collective historical narratives handed down from one generation to the next (Burke, 2008). In conclusion, cultures are commons, reproduced and evolving through practices of collective sharing and collaboration between peers and social groups within and among cultural communities. They constitute the cultural bases that render human creativity and social life possible. Yet the cultural commons also includes the public domain. The public domain is a legal artifact in flux, each time carving the line between private property and the intellectual commons (Goldstein, 2003). Intellectual works in the public domain—that is, not protected by copyright or unbundled from exclusionary private rights—include works created before the existence of copyright, those of insufficient originality for copyright protection, works the copyright of which has expired or is otherwise inapplicable due to invalidation by litigation along with government works, works dedicated by their authors to the public domain, and works that are licensed by their authors under conditions that are orientated toward open access. In addition, the cultural commons includes the fair use limitations engraved in copyright law (Samuelson, 2006). De facto cultural commons, which develop beyond the boundaries of law, have also been facilitated by contemporary information and communication technologies through the unauthorized sharing or mixing of copyright-protected works in digitized environments.

### Conclusion

Intellectual commons are the great other of intellectual property-enabled commodity markets. They constitute noncommercial spheres of intellectual production, distribution, and consumption, which are reproduced outside the circulation of intangible commodities and money (Caffentzis, 2013). Yet intellectual commons are not just an alternative to the dominant capitalist mode of intellectual production. On the contrary, they provide the core common infrastructures of intellectual production, such as language, nonaggregated data and information, prior knowledge and culture (Mitchell, 2005). In addition, they constantly reproduce a vast amount of information, communication, knowledge, and cultural artifacts as common-pool resources. It is the compilation of these intellectual infrastructures and resources with the productive force of the social intellect, subjected to the rule of capital, which constitute the foundation of the capitalist mode of intellectual production. As De Angelis (2007) pinpoints, “every mode of doing needs commons” (p. 243). Capitalist modes of producing intellectual goods are inescapably dependent on the commons. Nonetheless, such dependence is not mutual. Forces of commonification can materialize their potential to unleash socialized creativity and inventiveness without the restraints of capital.

The engagement with theoretical ventures over the intellectual commons needs to be attentive to the fact that wider radical transformations required for the expansion of commons-based peer intellectual

production, distribution, and consumption cannot be pushed forward purely by theorizing. Instead, they presuppose tectonic shifts in co-relations of power between incumbent economic forces and the emerging commoners movements. Therefore, our transition to commons-based societies may only come as a result of social and political action. Because the commons cannot be separated in their tangible/intangible expressions, in this project no division of labor between its intellectual and sociopolitical aspects is possible. Participants can only be commoners of the mind as much as of the soul and body.

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