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## ***Homesteading the Noosphere: The Ethics of Owning Biological Information***

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### **Abstract**

*The idea of homesteading can be extended to the realm of biological entities, to the ownership of information wherein organisms perform artifactual functions as a result of human development. Can the information of biological entities be ethically “homesteaded”: should humans (or businesses) have ownership rights over this information from the basis of mere development and possession, as in Locke’s theory of private property? I offer three non-consequentialist arguments against such homesteading: the information makeup of biological entities is not commonly owned, and thus is not available for homesteading; the value of the individual biological entity extends to the information whereby it is constituted, and includes inalienable rights of an entity over itself and its information; and use of life as an information artifact makes an organism an unending means to an end rather than an end itself. I conclude that the information space of biological entities is not open for homesteading, not liable to private ownership, and should not be available for perpetual exploitation.*

**Keywords:** *Bioethics, information ownership, private property, non-consequentialist, biological information*

### **Introduction**

Property rights seem to imply that if I own a whole thing, I also own its parts, granted that those parts can be owned. If a whole is constituted by its parts, it would be constituted by all and each of its parts for at least as long as these are parts of the whole. For example, if I own my whole house, I own the exterior siding; if I own my whole car, I own the tires; if I own a whole book, I own all the words. But I do not own the informational content of the words in the book: the publisher owns this. I do not own the tire tread technology: the tire company exercises intellectual property rights. I do not own the formula for the composite exterior siding: a business owns this information, a part of the whole thing that I own—this part is not owned by me. Each of these wholes is an inorganic human artifact—what if we change the focus to living organisms? If I own the yard in front of my house, I also seem to have property rights over a blade of grass in the yard; if I own the

blade of grass, I must also own the biological information in that blade of grass. But that blade of grass is perhaps part of a genetically modified organism: the grass seed company that created this information owns it, and thus owns that kind of grass, even if the whole plant can be said to be a part of my property. I subsequently cannot legally sell the grass seed when the organism tries to reproduce itself, even though it is my grass.

The previous examples focus on information that is said to be owned privately and exclusively outside of material property rights (I own the material, someone else owns the information; for instance, I own the building, and someone else owns the rights to the blueprints). But is the last example of the same kind as those preceding it, with the exception that this latter information happens to be part of what makes up a biological entity? Do intellectual property rights hold for the information makeup of living things? One current trend in the West is to say: “Yes, you can own this information”; biotech, a \$43 billion a year industry, is by-and-large built on exclusive patent rights to just this kind of biological information (Roberts, 2018, 1108).<sup>1</sup> Can the information of biological entities be “homesteaded”, that is, do humans (or businesses) have ownership rights over biological information on the basis of mere development and possession, following Locke’s theory of private property? This is a global problem with political and social ramifications (Powledge, 2001; Roberts, 2018), and how we answer it may affect not only the future of food, but the future of life on this planet (Shrader-Frechette, 2005). While most arguments in information ethics tend to be consequentialist in outlook (Fallis, 2004; Spinello, 2004; Macilwain, 2013; Roberts, 2018), judging or justifying information policies based on their effects, real or possible, I offer three non-consequentialist arguments against the homesteading of biological information: first, the information makeup of biological entities is not commonly owned, and thus is not available for homesteading. Second, the value of an individual biological entity extends to the information whereby it is constituted. Third, use of life as an information artifact makes an organism a means to an end rather than an end itself.

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<sup>1</sup> The U.S. Constitution (1.8.8) gives Congress power to “promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries”; such patenting for exclusive rights to inventions and creations has been extended to organisms and their information over the years.

### **Homesteading the Noosphere**

In the present argument I discuss the ethics of “homesteading the noosphere”, a phrase coined by information technologist Eric Raymond (2000) in an essay of the same name in which he provides an account of the ethics of information development in open source contexts, defining the noosphere as the “territory of ideas, the space of all possible thoughts” (9). Raymond (2000) suggests—based on Locke’s (1952) theory of property—three ways of acquiring ownership of information entities: homesteading (common ownership plus work equals private ownership), transfer of title, and loss or abandonment of title and possession through a kind of pseudo-homesteading. Homesteading is made the act whereby common ownership of the total information space (referred to here as the noosphere) is transformed into private ownership of the part of the information space developed by those who perform the knowledge work—free intellectual space is claimed for personal ownership through the act of development.<sup>2</sup> The term “homesteading”, with reference to biological information, may be appropriate given key similarities between land and biological information (Roberts, 2018). Biological information, for example, is unique to an entity, as land is unique,<sup>3</sup> and both may be inherited, giving each potential familial and hereditary links with the past and future (Roberts, 2018, 1169-1170). The idea of homesteading may thus extend to the realm of biological entities, to the ownership of information that helps organisms perform artifactual functions as a result of human development, such as through breeding practices or advanced genetic manipulation.<sup>4</sup> Plants, animals, and human biological materials are made to take on traits and characteristics considered beneficial (to engineers) as a result of knowledge work, and this is said to result in the private ownership of the new biological information. But can the information of biological entities be homesteaded: do humans (or businesses) have ownership rights over this information from the basis of mere development and possession?

Information is an intangible; Adam Moore has argued that the ownership of information counts as intangible property rights (2000, 98-99; 1998; 1997). Moore clarifies his position by stating that “intangible

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<sup>2</sup> For a more complete and nuanced account of the steps in this process, see Moore (2000).

<sup>3</sup> Even identical twins do not share identical genetic profiles (Roberts, 2018, 1169).

<sup>4</sup> The present paper does not address the ethicality of genetic engineering directly, but only the ownership of biological information. For treatments of the ethics of genetic engineering, see West (2006), Lucassen (1996), Hettinger (1995), Polambi (2013), Shrader-Frechette (2005), and Ormandy, Dale, and Griffen (2011).

property rights surround control of physical tokens, and this control protects rights to types or abstract ideas” (2000, 99), that is, it protects rights over the ideas behind those individual tokens. Ownership of these abstract ideas, or “intellectual objects”, in the words of Hettinger (1989, 35), is often justified by entitlement to the fruits of one’s labor. As Hettinger points out, however, the right to own and use intellectual objects based on one’s own labor is distinct from the right to prevent others from also possessing and using the intellectual object or creating tokens of it for their own use: the right to possess and personally use one’s own property is distinct from the right to exclude others from benefiting from it (40). Additionally, Hettinger (1995) argues that while labor may extend the rights of a person to ownership of a token (personal use and possession of a specific thing), it does not extend the rights of a person to ownership of a kind (exclusion of others from possessing or using that kind or other tokens of that kind) (280). Ownership of an apple by laboring for it does not extend to owning not only all apples but the kind “apple” as a result of that same labor.

It seems that Locke’s formula for homesteading does not cover or justify the exclusive ownership of biological entities as a kind through labor, nor of their biological information. Hettinger concludes that “it is *prima facie* irrational for a society to grant monopoly rights to something that all could use at once” (1995, 279).

Locke, in his *Second Treatise of Government*, argues that after common property becomes private property through labor, there must be no substantive loss to the common property, and no loss to others as a result of the acquisition, or in Locke’s own words, there must remain what is “enough, and as good, left in common for others” (Ch. 5, section 27).<sup>5</sup> This seems to entail a limit to homesteading: homesteading must not detract from the rights of others or the common property of all. If intellectual objects are obtained as private property through homesteading, this process must not exclude others from the good of the commons, nor should it harm the commons itself. If the commons is the space of all possible thoughts, as in the noosphere, and privatizing a portion of the commons detracts from the total of all possible thoughts or excludes others from enjoying it, Locke’s theory regarding privatization through labor is no longer applicable as a justification for such privately owned intellectual objects, that is, these

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<sup>5</sup> For Locke, this responsibility of the owner is not an indefinite state of affairs, but is concluded at the privatization of the common property: there must be enough and as good left over at the moment after the property becomes private.

intellectual objects may no longer be acquired through such homesteading. Locke's theory of property, then, is misapplied to the cases of homesteading biological information: such ownership detracts from the biological information available (some of the possible ideas are no longer available because they are owned), or it excludes others from enjoying it (biological information ownership claims are usually exclusive). It is not the noosphere, the territory of all thoughts, that can be homesteaded with biological information, if we are to follow Locke's limits, but instead the actual biological information tokens, so long as such privatization does no harm to either the commons of biological information, or every other human's enjoyment of that commons. Physical tokens that instantiate intellectual objects might be ownable, but intellectual objects themselves might or might not be able to be owned through homesteading because ownership of intellectual objects might substantively detract from the commons of the noosphere or other's enjoyment of it, and thus break Locke's limits for homesteading.

### **There is No Common Ownership of Biological Information**

For biological information to be privately owned through homesteading, the information must be commonly owned. Common ownership requires common access or the ability for common use, but biological information is not accessible by all (we address here the information of a biological entity, not the biological entity itself), nor is it available for common use or appropriation, even if the material itself is. In an analysis of the possibility of the common ownership of biological information, we must be clear about the nature of common ownership, we must have some notion of information—and biological information in particular—and we must recognize problems related to the process of homesteading in this natural information space.

The nature of common ownership includes subtractability and non-excludability (Hess & Ostrom, 2006, 9). Commonly owned resources may or may not be subtractable (that is, there may or may not be limited resources or rivals for those resources), but they are necessarily non-excludable. First, let us address subtractability: One person's knowledge or use of a bit of naturally occurring biological information is not subtractive from the whole information space available, that is, such knowledge or use does not "use up" the resource so that others are barred from knowing or using the information. Because of this, naturally occurring biological

information resources are non-rivalrous:<sup>6</sup> there is no natural competition for limited biological information. But these information resources are excludable, that is, some people may be excluded from accessing or using the resources by their very nature, and this reintroduces the problem of rivalry and subtractability. We might ask: what naturally excludes people from biological information? The information is hard to come by and requires advanced and expensive technologies, skills and knowledge, and the information itself is complex and therefore difficult to understand or to synthesize. Because of this exclusivity and the costs involved in access and use of the information, people become rivals for access and use (as long as there are perceived benefits). While the resources do not dwindle with use (as in traditional subtractability), the value of having the resource (the already known information) dwindles with greater access and use and makes the limited amount of previously unknown biological information more valuable. New (unknown) naturally occurring biological information grows in value as it becomes more limited.

In our analysis of exclusion, it would be well also to address definitions of terms related to information. Following Machlup (1983, 641), we take data to be “raw bits” (atomic facts) of what is given in the world, information is “organized data in context”, and knowledge is the “assimilation of the information and understanding of how to use it” (Hess & Ostrom, 2006, 8). Information in biological entities exists as data, becomes information for humans through scientific inquiry and analysis, and becomes knowledge for humans when it is understood and assimilated with other knowledge. Unfortunately, most humans have no access to the raw information in biological organisms; if they had access, most humans would not understand it because they lack the prerequisite scientific education and training; if they understood the information, most humans would not have the wherewithal to make use of it. In sum, most humans have insufficient access to biological data, insufficient understanding of biological information, and insufficient abilities to use or assimilate the biological knowledge. A remedy to this problem would be to provide free public access to all natural biological data, training and education regarding biological information, and adequate resources by which to access and use the information. Without this remedy, the barriers to access, understanding,

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<sup>6</sup> Non-rivalry is a general characteristic of intangible works of all varieties (Moore, 2000, 99; Roberts, 2018, 1168).

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and use of biological information make this information exclusive: biological information is not commonly owned.

Although raw biological information is not common property, it is not to be considered private any more than the moon (which is also not common property). Rather, it seems to be a resource enjoyed by few, and owned by none, rather than being owned by all. Common ownership requires common access or the ability for common use, both of which are not satisfied with biological information. If private ownership requires common ownership as its basis (as in homesteading), there can be no rightful private ownership except with previous common ownership. Note that this does not bar common ownership of biological information in the future, but it does bar private ownership through homesteading until and unless there is first common ownership, which would include open access, understanding and use. Practically speaking, this would mean that before homesteading could occur with specific biological information, that same information would be required to be openly accessible, understood and used.

But let us suppose that at some time in the future such open access, understanding and use, either in part or in whole, is enjoyed by the public: would this constitute common ownership of biological information? Common ownership can only occur if ownership is possible. Is it possible to own natural information states? Natural information states are forms of naturally occurring organization, and not merely the bits or data of which they are composed. To own such a state, a person would own a natural kind, that is, a kind of organization of information that occurs naturally.

Let us take the example of a forest: many people, as groups or as individuals, are said to own forests and the trees that grow in them. In this case, notice that it is the particular forest (or the land) or the biological entities in it that are commonly or privately owned or that are public goods, rather than the kinds of things they are, for instance, a forest, flower or tree. While a forest may be ownable, forest is not, nor is flower or tree. As natural kinds, or forms, or information states, they can neither be commonly nor privately owned. This is, in part, because natural information states cannot be owned. If this is true, then natural biological information cannot be owned, even commonly. If private ownership requires common ownership plus homesteading, then naturally occurring biological information cannot be privately owned.<sup>7</sup>

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<sup>7</sup> This may seem at first to be a misdirected defense—who would think that humans could own and exercise exclusive rights over naturally occurring biological information? In the



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If natural information states cannot be owned, can artificial biological information states (biological information developed or synthesized by humans) be owned? Using our previously defined terms, can the noosphere of biological information be homesteaded, that is, can the space of all possible biological information states (non-actual or un-dreamt of) be developed from a commons for personal or corporate ownership? Of what would this commons—this noosphere—be composed: actual biological information or as-yet-unthought-of ideas, or both? If composed of actual biological information (naturally occurring), this cannot be owned even commonly, as was concluded earlier, and therefore cannot be part of the noosphere that is open to homesteading. If, as Eric Raymond argues, this noosphere is “the space of all possible thoughts” (2000, 9), the “commonly owned” property may not be actual; but we cannot own what is only possible unless we can exercise ownership over it. For instance, we can sell something we might own in the future before it exists (for instance, we might sell a house for which we have not yet completed the purchase process, or we might sell a right to inheritance we have not yet come into for a bowl of stew), but we may only do this if we have the right to sell it. If the noosphere was commonly owned, the public would be able to exercise ownership over it; they would be able to access it, use it, understand it, etc. But the public is not able to exercise ownership over it, so that it seems false that the noosphere (that is, every possible idea we have not yet had) is commonly owned. If the noosphere is not common property, it cannot be homesteaded, and thus cannot be privatized in that way.

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United States, until the Supreme Court decision in 2013 *American Molecular Pathology v. Myriad Genetics* which overturned 30 years of patenting practice and precedents (Palombi, 2013), it was the case that “genes and other DNA can be patented, whether natural, recombinant, or synthetic.... One can also patent specific *uses* of any biological agent, whether the agent is novel or preexisting” (Hettinger, 1995, 277). The recent Supreme Court decision ruled that isolated natural biological materials are not patentable.

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### **The Value of a Living Thing Extends to Its Biological Information**

Another approach to this issue focuses on value: the value of the individual biological entity extends to the information whereby it is constituted. A biological entity has natural rights not only to its own material states, but also to its internal informational states; these rights are inalienable, as they are intrinsic to its value.<sup>8</sup> The ownership of living things is fundamentally different than the ownership of non-living, in that living things continue to exercise natural rights over their own material and informational states separate and distinct from the rights of their external owners. The information of a biological entity cannot be homesteaded because the entity (and perhaps its kind) already exercises natural rights over this content,<sup>9</sup> and external ownership does not extend to ownership of this information. A seed can be owned, but not its information.

What is it that makes a specific living organism valuable? The extrinsic value of living things is typically in view when assessing the development, use and ownership of biological information, that is, we look at what organisms and their information can do for us (West, 2006). But it is the intrinsic value of the information that makes it extrinsically valuable: living organisms carry out specific functions which are beneficial to themselves by means of biological information, and these functions are well-ordered unities, complex workings of the life of the thing. Part of the intrinsic value of the biological information is that it goes into making up the disposition by which the entity acts and performs changes in the world through time, that is, by living. If life is valuable, that by which life is carried forth in the world is valuable (at least for that entity), and this is a value not only intrinsic to the entity (it is part of what makes the entity itself valuable)

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<sup>8</sup> A significant number of people believe they own their personal biological information, including our past President Barack Obama (Roberts, 2018, 1150). Legally, five states (Alaska, Colorado, Florida, Georgia, and Louisiana) recognize personal ownership over one's own genetic information (Roberts, 2018, 1128). "Casting DNA as the source of our individuality supports the proposition that genetic information might rightfully—perhaps exclusively—belong to the person from whom it came" (1150), that is, perhaps one reason for the general intuition that we own our own biological information is that this information is a part of our very selves.

<sup>9</sup> The biocentrism argued for here finds precedents in Indian *ahimsa* (non-violence to all life forms) found in Hinduism, Buddhism, and Jainism; Albert Schweitzer's arguments surrounding reverence for all life; Hettinger's (1995) arguments concerning the natural ownership rights of all living things over their bodies and their futures, as well as the rights to non-harm (280-282); and the arguments from recent environmental ethics (Ortiz, 2004; Rollin, 2003; Verhoog, 1992) and progressive property (Roberts, 2018).

but is a value also intrinsic to the information (the information itself is a well-ordered organic unity that is complex).

How is this value related to the natural rights of an entity? Whether an entity's biological information is beneficial, neutral, or harmful to other entities (through knowledge and use or through natural functioning), the information is of value to the entity itself for the entity itself. Because the value of the information makes up part of the value of the entity as a part of its natural physical whole, it can properly (and naturally) be said that the biological entity exercises rights over its information as exercising rights over itself (because its information is part of itself, part of what makes it itself, and is not merely part of the things it owns).<sup>10</sup> The entity does not come by its biological information artificially but naturally—it exercises natural rights because the information is natural to itself.<sup>11</sup> This is unlike the case of a book and its words: the book may or may not exercise rights over the words of which it is composed; this is closer to the case of a person and their own thoughts: one's thoughts are part of what makes a person that person, as with the book and its words, but additionally the person has some sense of responsibility for the thoughts, some agency, some causality, some inalienable rights over these thoughts.<sup>12</sup> But even closer is the case of a person and their own genetics: the person has a natural right to this genetic information, not because this information is hers or his but because it is her or him, part of who the person is, not merely property. As a small subset of biological entities and their information, humans exercise natural rights over their own genetics (though not necessarily ownership rights), not because they caused this information or even because they know about it, but because it is part of who they are as a specific human; it is part of how they participate in human being. These rights are not mere ownership rights, but are personal rights, and more fundamentally, they are rights of an entity to itself. These rights are not specific to humans: every living thing has a right to itself and a right to its biological information as part of how the thing participates in its specific kind of being by living. However, as Jessica

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<sup>10</sup> See McLochlin (2001) and Roberts (2018, 1150-1153) for a further discussion of this point.

<sup>11</sup> Moore (2000, 107) suggests that "ownership of a token does not entail ownership of a type" in reference to owning one's own genetic information.

<sup>12</sup> Lysander Spooner comments: "Nothing is, by its own essence and nature, more perfectly susceptible of exclusive appropriation, than a thought. It originates in the mind of a single individual. It can leave his mind only in obedience to his will. It dies with him, if he so elect" (1855; qtd. in Moore, 2000, 115).

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Roberts argues, even though biological information raises identity concerns, “one need not adopt the position that genetic information is determinative of identity to adopt the position that it is relevant to identity” (2018, 1158).<sup>13</sup> Ownership of such information may be tantamount to commodification of an entity’s body or self, as being a commodification of part of the body or self (1154).

This argument, by itself, does not conclude that the rights of a biological entity over its material and informational self may not in turn be under the rights of some other entity or group of entities, or responsible in some way to them or to its own kind, or part of a larger organic whole, but it does include the idea of inalienability: there are rights that cannot be taken away from a biological entity, and these include the rights to itself and to the information of which the thing is composed (Roberts, 2018, 1168). The private ownership of a living thing’s biological information through homesteading would trespass against this right of the living thing over itself, sacrificing the rights of the entity to the rights of the owner, imposing an agency other than that of the entity to make the entity something it was not, without regard to these previous rights. This would be akin to owning the votes of a democratic country, or owning the constitutional rights of citizens, or owning the galloping of a horse, or owning the blossoming of a flower. While humans may have rights that counteract or are over the rights of other entities (for instance, the right to cut my grass), and material ownership rights over these same entities (for instance, I may be said to own my grass), humans do not have direct and absolute ownership of the rights of an entity over that entity’s own being or functioning (we do not own the grass’s right to grow or to be green—these are inalienable to the grass because they are part of what makes it itself).

It may be wondered whether humans overstep these rights every time we kill or eat a living organism. In those cases, the organism has a natural right to live and grow, and our killing and eating impinges on that right, but does not take it away—we do not own the life of the organism that we eat, and we do not alienate it from its right to live, or from its right to its own information. We take its life, not its right to life (which is inalienable). This right to itself is not a property right, which is the focus of this paper, but is instead a right to be what it is, informationally speaking (and

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<sup>13</sup> While Roberts’ focus here is specifically about genetic information, the argument seems to fit the case of all biological information, which is part of what makes biological entities themselves (that is, there are identity concerns, even though biological information might not be wholly “determinative” of an entity’s identity as itself).

otherwise). But is killing and eating not still wrong? There might be several justifications for killing or eating living organisms even in view of such inalienable rights. One approach is that there might be a value ordering such that one entity's life (or information) is justifiably taken to support the life of another even if its rights are inalienable. One might wonder what these values are, and how we might order them or might come to know the proper order. It might be that rational animals are of a different order of value, complexity, and being (as the intuitions of some show) such that use of non-rational animals or vegetative life in this way is permissible or even good if it promotes the unity and complexity of the entire biosphere, if it promotes the well-being of rational animals, and if it promotes the well-being of the entity or kind of entity so used (and this could be justification for lower order beings eating and killing other biological entities as well). Wheat might be an example of an entity whose well-being as a kind might possibly be promoted through eating, if this were also accompanied by care of the kind out of interest for its welfare even if also motivated by self-interest. Apples are another example, as it seems that part of the purpose of fruiting is for the fruit to be eaten in order to propagate the seed. Overpopulated wildlife or cattle might be additional examples; human decomposition might be another. An alternative (or additional) justification for killing and eating is that the purpose of some entities might actually be to serve the life of others by being what they are and living and dying (and perhaps even being eaten) as they are—the purpose of the being might include its being in relation to other entities and their lives. This would include rational animals as part of the cycle of life, as we might be purposed to eventually provide food and life to other creatures (such as worms or bacteria). A third justification might be that there is a creator who commands, allows, or creates biological entities to kill or eat other organisms. This reason would be in keeping with the common beliefs of most humans throughout history, including adherents to many world religions. In this case, the rights and value of entities, kinds, and information would trace back to the design of the creator(s), and the purpose of the entities, kinds, and their information would come about as the result of the actions of this same being

While the human right to require consent and compensation for use of one's own biological information is generally acknowledged even outside of ownership (Roberts, 2018, 1147), plants and animals cannot so consent or choose compensation, nor may they freely enter into contractual agreements—to commodify a plant or animal's biological information would be to do so without regard for its right to itself and its information,

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and would constitute exploitation, as I discuss in the next section. How could we “own” biological information without overlooking this silent value, this quiet right?

### **Ownership of the Means of Biological Entities is Perpetual Exploitation**

A third approach to the problem of homesteading biological information focuses on exploitation: use of life as an information artifact makes an organism a means to an end rather than an end itself. The heart of this argument is that lives are not mere tools; biological entities are not technologies. The engineered functions of a living thing should always serve to benefit the thing itself, and not harm it or limit its proper biological functioning. Ownership of biological information tends to place greater value on the intents and goals of the engineer or owner and replaces benefits to the entity with benefits to the owner, sometimes to the detriment of the entity. For instance, organisms have been genetically modified to disallow reproduction based on the supposed ownership rights of engineers. This design choice made on the basis of private ownership is to the detriment of the entity itself: the entity has been deprived of the right of being a viable species, of carrying on the natural functions for which it exists.<sup>14</sup> Even when this does not occur, to own the information of an organism that passes on their new information would be to own rights to that kind in perpetuity: it is not like owning an apple, but rather more like creating an apple from a pear, and then owning all apples now and for the coming decades, to the point of owning “apple”. Such ownership would amount to perpetual exploitation of a kind, even if ownership of the patent only lasts for twenty years—the kind itself is a result of exploitation, and all future instances bear the mark of this exploitation in the very information of which they are composed. Ownership of the means by which a biological entity is itself—

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<sup>14</sup> As another instance of purposeful harm, Harvard received U.S. Patent No. 4,736,866 for “any transgenic nonhuman mammal all of whose germ cells and somatic cells contain a recombinant activated oncogene sequence introduced into said mammal, or an ancestor of said mammal, at an embryonic stage”; Harvard supposedly owns *any nonhuman mammals* genetically modified in embryonic stage to increase the probability of getting cancer as well as all of the descendants of such an animal that are similarly at high risk because of this modification (<https://patents.google.com/patent/US4736866A/en>).

that is, ownership of its functions through its information—is perpetual exploitation of the entity or kind through technologizing its own self or its kind.<sup>15</sup>

What if we isolate the material that contains the new biological information from its natural state, or synthetically create this new isolated material in a lab—can we own it then, without this counting as exploitation? This isolated biological information would still be information, which includes (in the very concept) organization as a kind. This would mean ownership of a natural or artificial kind that is biological in nature, an information state that is addressed above in earlier arguments.

### **Conclusions on Homesteading Biological Information**

Jessica Roberts argues that “theory informs the most foundational question of property law: who should own what” (2018, 1108). It is not merely laws that are needed to protect the rights of entities, it is morality and a foundation for that morality, it is discussion and thought about natural rights, it is recognition and respect for the value of every living thing, it is careful stewardship of resources that are much more than resources, that are alive, and that therefore exercise inalienable rights over their own information. Locke’s theory of property seems ill-fitted to the area of biological information: homesteading is a concept not appropriate to biological information. My argument here is that the information space of biological entities is not open for homesteading because it is never commonly owned and so is not liable to private ownership; biological entities have intrinsic value that extends to their biological information, and such information is relevant to their identities, and this provide bases for

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<sup>15</sup> One might ask whether breeding is similarly exploitative. If the breeding is to such an extent that it harms the biological entity, such as through causing it pain, diseases, or sterility, it may in fact be just as exploitative, especially if these characteristics of the entity are not reversible in the kind, are unnatural, and/or result from goals of the breeder opposed to the well-being of the entity. Such instrumentalizing of life is not unique to modern technologies.

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inalienable rights of the entity to itself; and biological entities deserve respect as ends in themselves, and should not be available for perpetual exploitation.<sup>16</sup>

In sum, we do not own biological information; indeed, we cannot own it. And because it cannot be owned, it cannot be commonly owned. Because it cannot be commonly owned, it cannot be homesteaded. Because it cannot be homesteaded, it cannot be owned by me, or you, or any other thing. We cannot own the being of an organism, or the organization or functions of that being, that is, the biological information, and we ought to stop acting as if we do.

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<sup>16</sup> The approach I have outlined here responds only to explicitly Lockean property bases, and not to neoclassical approaches or progressive property, in both of which private property has different grounds than homesteading. In the economic neoclassical approach of Demsetz (1967), for instance, “property rights arise when it becomes economic for those affected by externalities to internalize benefits and costs” (347). People are rational decision-makers who seek to maximize utility through cost-benefit analysis (Roberts, 2018, 1112). Private property only exists because it engenders more welfare than otherwise, welfare being the sum of all material wealth in a society (1113). Such neoclassical property theory does not ground private property rights on homesteading, and thus is not directly open to my critiques on Locke’s system applied to biological information. However, among the two, neoclassical and progressive property, the latter seems more fitting to actual circumstances of biological information ownership (Roberts, 2018), though even here, the second and third arguments offered above may continue to resist such concepts of ownership based on intrinsic value and perpetual exploitation of a kind.



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