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Semiotic Notes on Reuse, Between Reduction and Recycling

Andrea Valle
andrea.valle@unito.it

Abstract: This article develops a semiotic framework for analyzing the waste management triad of reduce, reuse, and recycle, with particular emphasis on reuse as an intermediate position between non-production and material dissolution. Building on Jacques Fontanille's hierarchy of expressive levels and Umberto Eco's characterization of objects as tools of use, the framework defines objects through sign functions relating expressive types (material, perceptual traits) to content types (use traits). Two formal indices are introduced: the Tampering Index (I_t), measuring the degree to which expressive traits are eliminated in reuse, and the Bricolage Index (I_b), quantifying the ratio of pre-existing to total parts in an object's mereological structure. The article demonstrates these indices through worked examples (electric wire reused as rope, bicycle repair) and then extends the analysis to semantic relations (hypernymy/hyponymy), mereological formalization (recursive grammar $O_s \rightarrow kO_s$), repair practices, and temporal dimensions (memory, patina). The framework positions reuse on a continuum between temporary alternative use and recycling, operationalizing Claude Lévi-Strauss's concept of bricolage while revealing how objects maintain a double status as materially persistent yet functionally transformed.

Keywords: semiotics of objects; reuse; bricolage; "tampering"

1. Introduction: Pertinences and Definitions

Reduce, Reuse, Recycle: why develop a semiotic framework for these three R-s?

First, the three R-s remain the dominant operative framework in global waste management discourse. Whatever their historical and political contingency (on which, more below), they constitute a real and widespread semiotic formation: a set of terms, operations, and relations that organizes how many contemporary societies conceptualize the life of objects. Understanding the semiotic operations implied by this discourse is valuable in itself—not as an endorsement of the model, but as an analysis of what it does, what it presupposes, and what it makes thinkable.

Second, and more importantly from a theoretical standpoint, the three R-s offer a concrete occasion for abstraction. Its specific discourse serves as a test case for building a more general semiotic framework applicable to object transformation beyond the waste management context. The analytical concepts developed here—sign function, tampering, bricolage, mereological structure—are not bound to the 3R-s model; they emerge from it but exceed it. The three R-s are the entry point, not the destination.

Third, this theoretical operation produces a critical dividend. A framework precise enough to describe what the three R-s do is also precise enough to show what they cannot do—what transformations and relations fall outside their descriptive reach. The limits of the model thus emerge from the analysis itself, rather than being presupposed from the outside. This seems to me a more productive form of critique than one that simply notes the model's historical situatedness.

The three R-s, while now codified in international waste management frameworks (Hyman 2013), crystallized as a policy discourse in a specific historical and political context—the environmental politics of the United States in the 1970s—and carry ideological implications that have been extensively debated (see, e.g., Rogers 2005). The hierarchy has since been considerably complexified, extended, and contested, with growing attention to degrowth, circular economy models, and the unequal distribution of waste labor across social and geographic contexts. Nevertheless, the three R-s retain analytical value as a minimalistic model of three fundamental operations on objects: non-production, reuse, and material recovery. It is at this basic theoretical level—anthropological and semiotic rather than political or institutional—that the present analysis situates itself.[1] The question of this article, then, is not what the three R-s do politically, but what they describe semiotically: not producing (reduce), using again (reuse), recovering material substance (recycle).

It seems necessary to first define a level of pertinence: I will deal with objects. It is not obvious how one can define semiotically what an object is. Indeed, on one hand, an object can be thought of unitarily as a sign, that is, as something that refers to something else: for example, a blender refers to mixing. This perspective is semiotically unavoidable (cf. *infra*), but not sufficient. In effect, an object empirically presents itself as a heterogeneous aggregate, one might say of a textual type (for example, a "beater" contains parts articulated in reciprocal relations, bears writings on the surface, can provide for multiple modes of use, etc., Mangano and Marrone 2002).[2] Semiotic studies have then emphasized the problem (also fundamentally classical) of the object's boundaries and relations with other objects: a blender must for example be connected to the electrical outlet (a system of services, to put it with McLuhan [1964]), which varies from one country to another, and becomes part of a "society of objects" (Landowski and Marrone 2002), in a network that also includes various forms of subjectivity.[3] It should also be noted that reducing an object to sign or text also seems at first intuition a *diminution* of its material status. Fontanille (2006) has proposed an interesting model to account for the differences in level at which meaning is constituted as a relation between expression and content, in an integrative perspective.[4]

Following Fontanille, one can think of a hierarchy of expressive levels, in what he calls six "levels of immanence." Each level defines its pertinence (i.e., what is criterial for that level's functioning by being immanent to it). And every level is integrated into the higher one and defines a specific form of "experience." Fontanille's scheme can be summarized as follows:

	Level	**Experience**
(a)	Signs and figures	Figurativity
(b)	Text-utterances	Interpretation
(c)	Objects and supports	Corporeality
(d)	Practices and scenes	Practice
(e)	Situations and strategies	Conjuncture
(f)	Forms of life	Ethos and behavior

Given this, I define *in primis* an object in Fontanille's terms as "something" that is linked to the experience of corporeality. An object is a body among bodies. And it is a body for our body that experiences it. Thus, it has traits of materiality that are relevant for perception (visual, auditory, tactile, etc.; see Ingold 2013). In particular, *as* a body, it is endowed with a perceptual closure: an envelope that determines an exterior and an interior (Fontanille

2004), which themselves stand as an interface for our relationship with the object itself (Zinna 2004). I will limit myself to the first four levels (a–d), which we could gather under the acronym STOP (Valle 2026). To consider a particular example: a cuneiform alphabet character is a recognizable sign with a figurativity (a), while a list of goods written in cuneiform characters is an interpretable text (b). The tablet that bears the latter (and in which it is integrated) is a perceivable object (c): its dimension adapts to the body of the scribe who densely inscribes it, interacting with the moldable clay, and can adapt to the body of a future reader. At the higher level of practices (d), the tablet must be produced, written, fired, then it can be stored and moved, in short enter into a communication circuit.

The theoretical stakes of invoking Fontanille here are not merely descriptive convenience. In strictly Greimassian semiotics, everything is processed through the apparatus of the text: the object, the body, and action are all subsumed under *textual* categories, leaving no principled way to distinguish the materiality of an object from its discursive representation, or embodied use or practice from narrative schema. Fontanille's levels thus introduces a fundamental shift: the object is recognized as having a level of pertinence in its own right, distinct from the sign (figurativity) and from the text (interpretability), supported by and supporting its body. This move is what legitimates speaking of *use* as a semiotic category—not as a textual predicate, but as an action to be performed at the bodily level, grounded in material and perceptual engagement. In this sense, the framework is also compatible with an approach to perception and affordance: to speak of what an object affords a body requires precisely a semiotic construct of the body as a level of pertinence, something that is unavailable within a purely textual semiotics.

Moreover, Fontanille's integration between levels becomes analytically productive precisely in cases of reuse. Consider a label detached from a beer bottle and incorporated into a paper collage. At the object level, the label was an occurrence of a sign function: expressive traits (color, typography, graphic design) pointing to content traits (brand identity, product type). In the collage, the label migrates into a new textual level, integrated into a new support—the paper body of the collage. But the tension characteristic of collage as a *practice* is exactly a level integration effect: if the label is fully absorbed as color and texture, the object level is suppressed and only the textual level remains pertinent; if the label qua beer label is kept recognizable and intact, the object level persists through the textual level, the label simultaneously functioning as textual element and as index of the previous object. This tension will be formalized below through what I call the "tampering index" (section 4.1): a fully integrated label corresponds to high tampering, with its original traits eliminated as pertinent; a recognizable label corresponds to low tampering, with original traits persisting and remaining active across levels. A

strictly Greimassian framework would flatten this tension into a single textual surface; Fontanille's integration model captures it precisely.

2. The Object as Tool of Use

In design studies, the description of the meaning of an object is, at least traditionally, addressed in terms of the form/function pair. Form is that set of material traits that are detected in an object precisely with respect to its function, its use. Thus, here "form" describes the plane of expression for "function" as plane of content. If one addresses the question of recycling and reuse, the question of "function" evidently becomes pertinent. Indeed, the main problem that is thematized is precisely what to do with objects, how to make useful what is now otherwise useless. In this perspective, Eco (1976:§0.8.2) has discussed the "production of tools of use" with a gaze both semiotic and anthropological. For example, a stone is a fact in a world of facts, but it can be thrown to attract attention (a means of communication) or to hit someone (a means of offense), or it can be used as a percussor (a tool). In all these cases, the stone becomes a possible occurrence of three different abstract types that are linked to three different functions. The problem of pertinence is therefore crucial (Prieto 1975). The object is therefore a concrete occurrence (e.g., the thrown stone) of an abstract expressive type (e.g., {heavy throwable solid}, which could also be realized through a paving stone or an iron ball) which is associated with an abstract content type (its function: {offense}), which is concretely instantiated (e.g., hitting someone in particular in that place and at that time). The same stone (i.e., expressive occurrence) can be gripped instantiating a heavy manageable object (expressive type), for the function of percussion (content type) at that moment (a concrete occurrence of content).

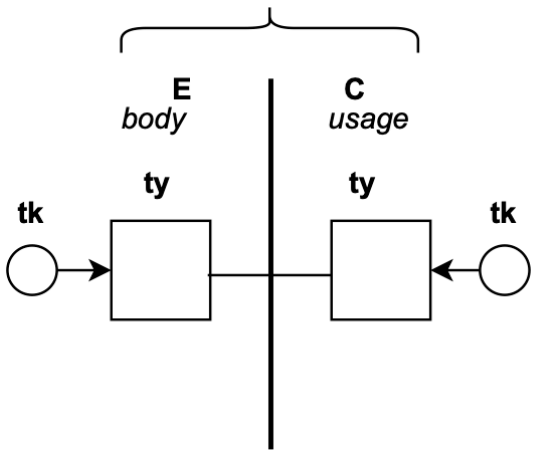


Figure 1. The object as sign function. Expression (E, *body*) and Content (C, *usage*) types (*ty*) are instantiated in concrete token occurrences (*tk*). The vertical bar represents the sign function relating the two planes.

A schematic representation is given in Figure 1, where *tk* (which labels the two circles) stands for occurrence (token) and *ty* (associated with the squares) stands for type. The type/token pair can approximately translate that of form/substance in Hjelmslev 1961.

This schematization has nothing new, since it generally represents the sign function. However, in relation to the "corporeal" characterization of the object introduced earlier, and to the property of "instrumentality" just discussed, one can propose a "substantial" reading of expression and content. I will define as *expression* the side of the sign function that concerns the material dimension. An expressive type is, then, a set of material and perceivable traits that characterize the object as a body. A content type is a set of traits that instead describe its use. In summary, the object, here intended as a tool of use, is a relation between an expressive type and a content type. The expressive type is defined as a set of perceivable material traits. The content type is a set of traits linked to use.

Starting from Floch 1985, studies in semiotics of objects, in particular in the Italian and French tradition, have emphasized how the opposition of form and function does not capture the value-related complexity that characterizes the objects that surround us; that is, the way in which objects themselves circulate in the social production of meaning cannot be reduced to their use (Deni 2002c; Landowski and Marrone 2002; Mangano and Mattozzi 2009). Thus, the object, in its materiality, also incorporates social values, for example linked to aesthetics, to style, and therefore to certain forms of life, which do not solely depend on its function.[5] The famous spider-shaped lemon squeezer *Juicy Salif* by Philip Stark remains a lemon squeezer but cannot be reduced exclusively to the function of squeezing citrus fruits (Deni 2002b:21). On this point, Alvise Mattozzi is particularly critical of Eco's reading, defining it "fatal" for a semiotics of objects (2006b:32). Among other things he is the only one, to my knowledge, who cites Eco's (1976) reading (in his reconstruction, Deni 2015 emphasizes instead the importance of Eco 1968 and 1999, similarly to Deni 2002a, 2002b). This non-reductionist perspective seems to me to emphasize that the object, in reality, is an occurrence of many expressions connected to different uses (*Juicy Salif* is a lemon squeezer, but also has the function of social status marker, etc.). On the other hand, it can empirically be difficult to identify the intended use of a given object (Deni 2002b:38).

Violi has conducted a detailed examination of "artifacts," distinguishing "perceptive properties" and "functional properties" and observing how they contribute differently to the definition of the object-artifact (1997:§7.3.1.3, 277ff.; cf. Deni 2002b:§1.3, 20ff.). In Violi's perspective these properties are on the same side, so to speak, that is, they all contribute to the meaning of the artifact. While acknowledging the previous positions, as a hypothesis, with Eco (1976), I define the object as a tool of use, in which the perceptive properties constitute expression of a content described in terms of use properties. Violi

can, in fact, discuss the case of the modifier “fake”—a fake pistol remains in some way a pistol if one considers all its semantic traits (Violi 1997:229)—but not if the latter are separated between the two planes, as I propose here (the fake pistol does not shoot: therefore, it is not a tool of use with respect to {offense}).

It is worth making explicit that the scope of this framework is limited to what the French semiotic tradition calls *objets d’usage*—objects whose primary semiotic pertinence is functional: tools, utensils, appliances, instruments, containers. Objects whose primary pertinence is of a different order—art objects, sacred objects, heirlooms, fetishes—operate under different semiotic regimes in which the sign function cannot even approximately be reduced to use, and where questions of identity, authenticity, and transformation require different analytical frameworks. The present analysis does not claim to cover these cases. This restriction is not a weakness of the framework but a condition of its precision: a general theory of all objects would be a theory of nothing in particular.

I want to underline that this functional definition is a deliberate methodological choice, not a metaphysical claim about the nature of objects. Objects are semiotically richer than their mere usage: they carry symbolic meanings, affective investments, social histories, and actorial identities that exceed any functional description. A symmetric anthropology, in Latour’s (1994) sense, or an account of objects as social actors crossing multiple actantial roles, would capture dimensions of object life that the present framework brackets. The bracketing is justified by the specific theoretical task at hand: namely, that to analyze reuse, one must first have a stable definition of use as a baseline. Reuse presupposes use. The functional definition is thus not a reduction of object meaning to instrumental reason but a methodological prerequisite for the analysis of transformation. What lies beyond this bracket—the symbolic, the affective, the actorial—remains a legitimate object of inquiry, but for a different article.

3. Hierarchies of Waste in Semiotic Perspective

The previous discussion allows us to semiotically characterize the three R-s. It should be noted how, with Fontanille, the first of the three R-s, reduction, is properly defined at the level of practices (the “P” in STOP), since it individuates objects *ex negativo*. Reduction, and even earlier waste prevention, implies a non-production of objects. The operation is situated at a cognitive (rather than pragmatic) level and does not impact the status of objects as sign functions, but rather their “mode of existence” (as it is called in French semiotics), which remains virtual. In reduction, the operation consists in not constructing tools of use (that are known to exist and to be available for construction).

A terminological clarification is in order here. In post-Greimassian semiotics, the distinction between virtualization and potentialization, as two of the four “modes of

existence," is technically relevant. Virtualization designates the simple absence of an object type from the field of relevance: the object exists in the cultural encyclopedia, but no specific project or design has been elaborated for it. Potentialization, by contrast, designates a state of suspended availability: the object has been conceived, projected, culturally elaborated as a concrete possibility, but not yet realized.[6] Reduction, semiotically, covers both operations depending on the level at which it intervenes. When one refrains from instantiating an already available cultural type, the object remains virtual. When one refrains from realizing a specific project—a design, a blueprint, a prototype already elaborated—the object is kept potentialized: an absence made present (cf. Paolucci 2010:380ff.), a reserve held in suspension. Reduction is thus semiotically more complex than the 3R-s model suggests, operating differently depending on the mode of existence of the object in question. What is common to both cases, and what makes reduction a positive practice rather than mere absence, is the active cognitive operation of comparison between what could be realized and the decision not to realize it.

Continuing in the series of R-s: recycling, as Massimo Leone has noted,[7] is an operation that eliminates the adequacy of the expressive occurrence to its type. The cloud at the bottom in Figure 2 represents what for Hjelmslev 1961 is matter ("purport"), that is, the material continuum that can be adequate to form[8] (here described as "type") to constitute its substance (here, "occurrence").

Given this presupposition, recycling is a practice that removes from the concrete object those traits that characterize it as an occurrence of a type. Thus, wartime recycling provides that bells can be melted to obtain cannons. Removed from the bell tower, the bell is melted to give rise to production *ex novo*: the only trait of the expressive type that remains is that of materiality, bronze, which remains necessary, but not sufficient, to make adequate a new expressive type, that of the cannon. By severing the link between occurrence and expressive type (hence the "X" in Figure 2), evidently the entire sign function collapses: no more bell-ringing that signals the calendrical rhythm (hours and liturgy). If one proceeds beyond recycling, toward the (responsible or not) disposal of waste, one sees how this process can continue leading to the loss even of this common trait, for example through incineration, which certainly does not destroy matter from a physical point of view, but makes that trait itself unavailable (see *infra* for discussion).

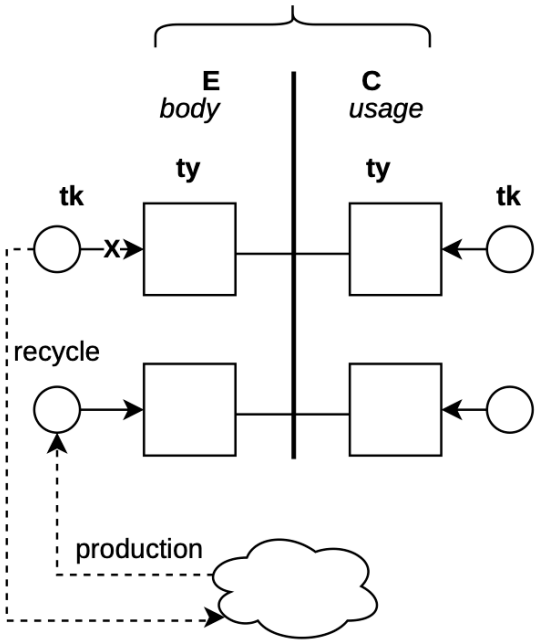


Figure 2. Recycling: the expressive occurrence is severed from its type ("X") and dissolved back into matter (as represented by the cartoon cloud in the figure), which becomes available for new production. The sign function collapses entirely.

Reuse is thus effectively situated in an intermediate position between two situations in which the object is absent (Figure 3): in reduction, the object *a priori* is not produced; in recycling, *a posteriori* the object is obliterated in its being an object.

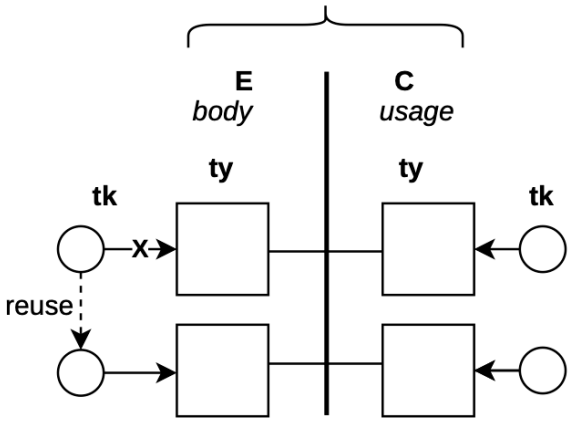


Figure 3. Reuse: the previous sign function ("X") is severed while the material occurrence transforms (dashed arrow) to instantiate a new expressive type connected to different usage. The object has double status: no longer the original object, yet the latter is still present.

In the middle, in reuse, the object has a double status: it is no longer the original object, but at the same time that object is still there. Reuse, by definition, produces a new object in which the occurrence of the pre-existing object is adequate for (is an occurrence of) a new expressive type connected to a different use (type/token [occurrence] of content). On

one hand, the link with the previous sign function is severed (the "X" in Figure 3): for example, an electric wire is used to close a fence and not (anymore) to conduct energy. The concrete wire now makes adequate the expressive type of rope whose function (content) is {to bind}. On the other hand, the same wire, continuing to make adequate the type of electrical conductor, modifies the mode of existence of the previous use (for example, in the wire: {to conduct electricity}) from actual to virtual: it is possible but not realized (on modes of existence, see above).

4. Methodological Note: On Metrics and Heuristics

The indices proposed in what follows (I_t and I_b) occupy a methodological middle ground between heuristic devices and operational metrics. They are heuristic devices insofar as they guide analysis and conceptualization of reuse phenomena. However, they become operational metrics when applied to objects for which we have established a semantic description in terms of discrete traits. That is, given a specified description of an object as a structured set of properties (what in computational contexts would be called an “ontological description”), these indices provide calculable measures of transformation. The challenge, of course, lies in the adequacy of such descriptions—a problem not unique to this framework but fundamental to any formal semiotic analysis (see the definitive discussion by Eco [1984] on what he called the Dictionary versus what he called the Encyclopedia). In what follows, I treat these indices as potential metrics while acknowledging that their application requires prior analytical work on trait identification. The indices presuppose rather than prescribe methods of semantic description. Following minimalistic trait-based approaches to meaning (e.g., Hurford 2007), the examples below demonstrate proof-of-concept applications. Trait identification methodology lies outside this article's scope.

4.1 *Tampering Index*

The reuse of an object can provide for a process of adaptation of the expressive occurrence: parts can be removed from it, but the object can also be modified in its material structure (e.g., by drilling, detaching, bending). One can therefore think of tampering with the pre-existing object, which impacts some of its expressive traits: for example, the previously mentioned electric wire may have been removed from an appliance. If one considers the appliance as a reused object (in only one of its parts, the power cable), one can say that it has undergone tampering. The term “tampering” is deliberately chosen despite (or perhaps because of) its informal and negative connotations. Following Lévi-Strauss’s appropriation of “bricolage” —originally a colloquial French term for makeshift work—“tampering” (from the Italian, *manomissione*) captures the essential character of reuse as a forcing or “hacking” of the object’s original configuration. Reuse is not neutral adaptation but rather an intervention that necessarily violates design intentionality. This aspect can be described through a Tampering Index It.

Such an index characterizes the way in which the passage between the two occurrences represented by the dashed arrow in Figure 3 takes place. It can be defined precisely once we have established the set of traits characterizing the expressive type of the starting object. Let T be this set of traits, with cardinality |T|. Let $T_{eliminated}$ be the subset of traits removed or modified in the reuse process. Then:

$$I_t = |T_{eliminated}| / |T|$$

The challenge is not the calculation itself, but rather the prior semiotic work of identifying and delimiting the pertinent traits. This requires: (1) determining what counts as a trait at the appropriate level of granularity, (2) establishing which traits are definitional for the object type, and (3) recognizing when a trait has been sufficiently modified to count as "eliminated". These are analytical decisions that must be made explicit in any application of the framework.

4.2 *Application: Electric Wire as Rope*

To demonstrate the operational character of It, consider again the electric wire reused to tie a fence. The calculation requires establishing trait sets for both expressive types. Through lexicographic analysis, material analysis, and functional decomposition, one can identify eight traits constitutive of an electric wire as expressive type: threadlike or elongated form, flexibility, tensile strength, electrical conductivity, insulation, standardized connectors and terminations, gauge and thickness appropriate to amperage, and material composition (copper core, plastic or rubber sheath). For rope used in binding, the pertinent traits reduce to six: threadlike form, flexibility, tensile strength, knotability, sufficient length, and material durability under tension. This is not an exhaustive ontological description but rather a working set sufficient for analytical purposes; different granularities remain possible.

The intersection $T_{wire} \cap T_{rope}$ = {threadlike form, flexibility, tensile strength} is non-empty, confirming the possibility of reuse of the electric wire for a rope, though not vice versa (as discussed below in "Semantic Relations"). When the wire is reused as rope, four traits are eliminated or rendered non-pertinent: electrical conductivity (not destroyed but irrelevant), insulation (present but no longer functional), standardized connectors (likely physically removed), and gauge/amperage relation (irrelevant to binding function). Material composition persists but its electrical properties become irrelevant. Thus, $I_t = 4/8 = 0.5$.

This mid-range value confirms the intuition that this constitutes genuine reuse, distinct from both temporary alternative use (which would yield $I_t \approx 0$, as all traits remain available for return to electrical service) and recycling (which approaches $I_t = 1$). The metric reveals

that reuse involves selective preservation: the material occurrence persists (hence not recycling), but only those traits shared by the hypernym “cord” transfer functionally (see *infra*). The specificity of “electric wire” is partially effaced ($I_t > 0$) but not obliterated ($I_t < 1$).

4.3 *Extreme Cases and the Reuse-Recycling Continuum*

Such a hypothesis allows for at least reasoning on extreme cases. If $I_t = 0$, then no trait has been eliminated, and the pre-existing object can be welcomed as expressive occurrence in the new object. In this case, the new occurrence is still *in toto* also a virtual occurrence of the previous expressive type, even if some of its traits may not be pertinent for the new type. For example, I can take back the electric wire (which here we assume as an autonomous object, beyond its possible recovery from an appliance) with which I tied the fence and solder it into a circuit. The wire has not lost the trait of conductivity, which, however, was not pertinent in its use as rope, and therefore it can return to being an occurrence of a conductor. This situation typically occurs in temporary reuse. A book can be used as a riser for a computer. In this case, a new object is produced (an occurrence of riser object for the support function) but the process is reversible precisely because, in fact, the material object makes adequate two different expressive types (and therefore two different uses). The printed characters that compose the book are an expressive trait evidently not pertinent for the riser but remain available for a return toward the previous sign function. As Violi (1997:228) notes, a table, a pile of books, and even a Saint Bernard dog can be legitimately treated as a {support for sitting}.

At the opposite end, a complete tampering of the object would imply that its expression was completely obliterated. In these terms, one could then think of recycling as a reuse with $I_t = 1$, in which all traits are tampered with. But perhaps not even all: of the expressive type at least one trait of materiality remains (the bronze of bells discussed above is still pertinent for cannons). Therefore, $I_t = 1-\varepsilon$, that is almost, but not quite yet, 1.

This requires clarification. Is materiality a semantic trait of the expressive type? The answer is affirmative. Materiality traits ({bronze}, {copper}, {iron}) function as semantic properties that enable certain affordances. The bell and the cannon share the semantic trait {bronze} precisely because this material property is pertinent to both: bronze’s acoustic properties for the bell, its ballistic properties for the cannon. Crucially, this shared material trait allows functional traits like {produces resonant sound} or {withstands explosive force}. In recycling, then, what persists is not raw, unsemiotized matter, but matter already semiotically organized at its most abstract level—a minimal but non-zero semantic specification. This is why recycling reaches $I_t = 1-\varepsilon$ rather than $I_t = 1$: a thin layer of semantic organization (materiality) persists even as all functional specificity is

eliminated. Complete disposal (incineration) would reach $I_t = 1$ by eliminating even this minimal semantic trait, returning material to an unformed continuum.

In this sense, reuse and recycling are arranged, rather than on two separate trajectories, along a continuum. In the same continuist line of reasoning, one would have $I_t = 1$ with the (responsible or not) disposal of residues, that is, the exhaustive loss of all traits characterizing the expressive type.

Figure 4 represents this continuist perspective. The tampering index can be thought of as a sort of regulator of the junction that bifurcates between reuse and recycling: if $I_t = 0$ then all the traits of the expressive occurrence are conveyed completely toward the new occurrence; if $I_t = 1$ (or 1-ε) they veer entirely (or almost) toward matter.

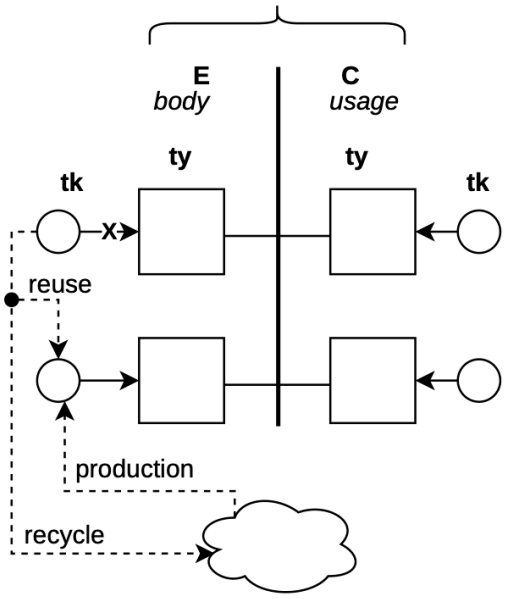


Figure 4. The continuum between reuse and recycling. The tampering index It functions as a regulator of the bifurcation: if $I_t \approx 0$, traits are preserved (reuse path); if $I_t \approx 1$, the occurrence dissolves toward matter (recycling path). Production regenerates objects from matter.

5. Semantic Relations and Mereology

5.1 *Hyper/hyponymy*

Reuse provides that a certain token of a type can be assumed as token of another type. If one thinks of the type in the simplest way, as a set of semantic properties, then two sets of properties present themselves, the pre-existing one and the new one. Therefore, as noted above, the possibility of reuse occurs when the intersection of the two sets is not empty. An electric wire can be used to tie the fence in place of a rope because the two

types have some properties in common, for example, flexibility and tensile strength. This fundamental relation can be expressed in terms of hyper/hyponymy (cf. Violi 1997:38; also Deni 2002b:20).

As Violi discusses in depth, the construction of hierarchies of semantic properties is far from obvious: my intent in these notes is only to suggest some working hypotheses. I will then assume the local possibility of hyper/hyponymic relations, which do not necessarily have to constitute a linear hierarchy. *Electric wire* and *rope* are hyponyms of *cord*, which is their hypernym. A quick inspection of various lexical resources provides us with these definitions:

> *Cord*: a long slender flexible material usually consisting of several strands (as of thread or yarn) woven or twisted together. (Merriam-Webster, sense 1a)[9]
>
> *Rope*: a large stout cord of strands of fibers or wire twisted or braided together. (Merriam-Webster)[10]
>
> *Wire* (electric): a line of wire for conducting electric current — compare cord, sense 3b: a small flexible insulated electrical cable having a plug at one or both ends used to connect a lamp or other appliance with a receptacle. (Merriam-Webster, “wire” sense 5a, cross-referencing “cord” sense 3b)[11]

If one thinks of semantic structure in terms of a local hierarchy of properties, then reuse provides for a passage of the pre-existing token from a lower level toward a higher level (hypernymy) and a redescent downward level (hyponymy; see Figure 5). In other words, in reuse there must be at least one common semantic trait between the two occurrences involved.

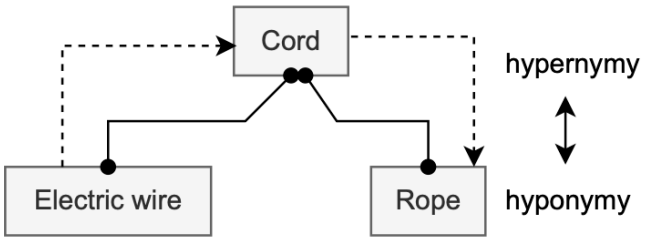


Figure 5. Hypernymic-hyponymic relations in reuse. The electric wire (lower left) and rope (lower right) both converge through hypernymy on the shared superordinate term “cord”, then diverge through hyponymy. The dashed arrows show the trajectory of reuse through the semantic hierarchy.

5.2 *Formal Grammar of Object Composition*

Bordron (1991) has acutely addressed the question of the "mereology" of objects, that is, of the relation between a whole and its parts. His complex theoretical proposal is crucial for a discussion of reuse, for example, in relation to the examination of some specific forms of "totality."[12] In particular, objects are "architectures": sets of elements that share a variable number of parts. In what follows, in relation to our theme, I limit myself to a simpler taxonomic perspective.

Let us assume a certain object O, here intended unitarily as a tool of use, that is, described by expression and content. This object can be in two states: new (*n*) or pre-existing (*p*). State *n* is that of the newly constituted object, for whose constitution the parts were produced specifically. State *p* is that of an object that exists previously and autonomously with respect to the new object *n*. The object O_p is characterized by its own sign function E/C autonomous from On. With a formalism inspired by generative grammars (in particular, so-called L-systems; Prusinkiewicz and Lindenmayer 1990), one can define an object in a generic state *s* (O_s) as follows:

> $O_s \rightarrow kO_s$
>
> where $s \in \{n, p\}$ and $k \in N^*$ (the natural numbers 1, 2, 3, ...).

This simple rewriting rule indicates that a certain object O, whatever its state *s* (*n* or *p*), can be defined (rewritten) as a set formed by *k*-number objects. It is possible to describe an operator + that indicates the combination of parts: *k* then represents the number of + operators.

Therefore, if, for example, $k = 2$, then kOs can be expanded into O_s+O_s. This operation allows recursive reapplication of the rewriting rule for a number $i \in N^*$ of times. If in the above example (where $k = 2$) $i = 2$, then there will be two applications:

> $i=1(O_s+O_s)+(O_s+O_s)$
>
> $i = 2\ ((O_s+O_s)+(O_s+O_s))+((O_s+O_s)+(O_s+O_s))$

This recursive structure becomes clearer when visualized as a tree (Figure 6), where each node represents an object and each branch represents the decomposition into *k* components.

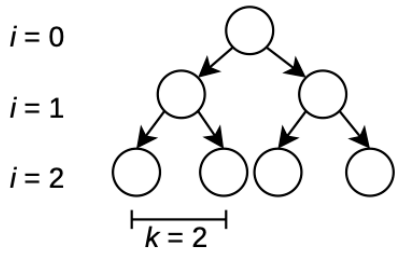


Figure 6. Tree representation of object decomposition with *k* = 2 and *i* = 2. Each node represents an object O_s, with recursive branching showing how objects are composed of k component objects at each level *i*.

To avoid misunderstandings, since it is not obvious that semantic properties are organized in a tree, it is also not at all obvious that the mereology of an object can be linearly described by a tree (cf. Violi 1997:86, which refers to Eco 1984). It is a radical simplification that seems to me initially useful in the perspective discussed here.

The description above simply indicates that an object can be thought of as a hierarchy of component objects.[13] To be empirically descriptive, the formalism should provide that *k* is not a constant, but instead a variable k_r as a function not only of each level identified by *i*, but of each ramification. That is, trivially, each component object, at each level *i*, can be composed of a variable number of parts, including a value = 0 (thus, $k_r \in N$), in the case where it is not decomposable. In this case, the object is a terminal element, a leaf of the tree so to speak. One could say that *k* is a vector of vectors, in which the value 0 defines a pruning of the tree. But here we simplify.

The state *s* of object O can assume two values, new (*n*) or pre-existing (*p*). We assume that the rewriting system that generates the tree always starts from a first statement O_n because the objective is the description of a new object with respect to which we represent its composition in terms of new or pre-existing objects. The system will thus have the form:

> $i_0 = O_n$
>
> $i_n = O_s \rightarrow kO_s$

At this point, interesting formal configurations are offered to identify empirical cases.

If $k = 1$ and $i = 1$ we have a new object composed of a single object. An example of non-decomposable, unitary object is found in the use of things, like the case of the stone. The lithic industries that characterize the Paleolithic provide for the use of stones, at variable processing rate, as percussors, engravers, or scrapers (Renfrew 2007; see Ingold 2013 for discussion). The case can be described as:

> $O_n \rightarrow O_n$

In general, the processing of materials offers an analogous situation. In the case of stone, processing provides that the trait of materiality persists through flaking,[14] but the same formalism can describe an anthropological classic like ceramic cultures, for example in the production of vases, which provides for a process of transformation of matter (what Bastide 2012 has studied in terms of "treatment of matter"; see Ingold 2013). Beyond this aspect, the vase also lends itself to exemplifying a different situation:

> $O_n \rightarrow O_p$

In this case, a new object is composed of a (single) pre-existing object. A new container is composed of (but also "from," that is, "starting from") an old container. An example is the reuse of the Danish butter cookies box as a sewing material container.[15] Note that the reuse of a certain container is extremely widespread and typically exploits the hypernymic passage described previously: from specific container (e.g., for cookies) to (more) generic, to then become specific again (e.g., for sewing material).[16] As is known, this particular reuse has historically stereotyped: a container can easily be reused to contain heterogeneous objects, but in the case of Danish cookies we have a socially crystallized sign function.

As said, one could have avoided the formalism and more simply constructed a mereological tree, a modeling that, moreover, has already been discussed as insufficient in the literature to characterize the constitution of an object. The previous formalism however has its definitional interest because one can hypothesize that *every object whose tree*

includes among its nodes an object O_p is a reuse. Or also, in a dynamic perspective: *every object in whose tree an object O_n is rewritten as O_p is a reuse*.

6. Bricolage

6.1 *Bricolage Index*

In Lévi-Strauss's celebrated examination, the *bricoleur* is described in opposition to the engineer. Unlike the bricoleur, the engineer subordinates his work to "the availability of raw materials and tools conceived and procured for the purpose of the project" (1966:17). Raw material and tool are then the two emblems of production, as described in Figures 2 and 4. The bricoleur instead makes do with "whatever is at hand," that is to say, with a set of tools and materials which is always finite and is also "heterogeneous because what it contains bears no relation to the current project, or indeed to any particular project, but is the contingent result of all the occasions there have been to renew or enrich the stock or to maintain it with the remains of previous constructions or destructions" (ibid.).

In the terms introduced above, one can propose that an object O_n composed entirely of O_n parts is "engineered," while one composed entirely of O_p parts is "bricolaged." With a proposal methodologically akin to that of the tampering index I_t, one can thus hypothesize a Bricolage Index, I_b. Also in this case, it is possible to propose a metric. Given that one can arrive at a description of the object's structure (and we know it is not a trivial task), then the bricolage index I_bb is the ratio between number of pre-existing parts and number of total parts:

> $$I_b = |\text{parts}_{\text{preexisting}}| \,/\, |\text{parts}_{\text{total}}|$$

It follows that a totally engineered object has $I_b = 0$, because it is entirely constituted of parts produced for the purpose of obtaining the object in question. A totally bricolaged object has $I_b = 1$, because assembled exclusively from pre-existing objects.

6.2 *Application: Construction of Homemade Musical Instruments*

Building musical instruments from reclaimed materials has a long tradition (Hopkin 1996, 2019). To demonstrate I_b's operation in construction, consider the building of an electromechanical percussion instrument of the kind described in Valle 2013, 2015 and Valle and Lanza 2017, analyzed at the component level: resonator body, actuator (motor), mounting hardware, power supply, control circuit, and mechanical coupling elements ($|\text{parts}_{\text{total}}| = 6$).

Pure engineering—purchasing all components new from electronics suppliers and hardware stores—yields $I_b = 0$, as all parts are produced specifically for this project. Pure bricolage—assembling the instrument entirely from salvaged components (a recovered metal box as resonator, a disassembled electric razor for the motor, screws from dismantled appliances, a repurposed phone charger, circuit elements from defunct electronics, cf. Valle 2015)—yields $I_b = 1$, exemplifying Lévi-Strauss's "heteroclite" stock of pre-existing materials. Mixed construction demonstrates intermediate values: if the control circuit uses new microcontroller and components while resonator, motor, and hardware are salvaged, then $I_b = 3/6 = 0.5$.

This construction-from-scratch example illustrates the engineer/bricoleur continuum at its extreme pole, where I_b quantifies the degree to which an object emerges from "whatever is at hand" versus purpose-acquired materials.

6.3 *Repair*

A case of particular relevance is that of repair (Jackson 2014; Strebel, Bovet, and Sormani 2019). A new object is composed of a variable number of O_n objects, because the constitution of the latter is functional to the root object. The broken object however is no longer the same object. In fact, trivially, the latter does not work: the broken object thus loses its status as tool of use because the sign function is interrupted. It has two roads ahead: either it is discarded (and perhaps recycled), or it is reconstituted into a new object. This claim requires a clarification. What the broken object loses is the status of a functional *occurrence*: this specific instance can no longer instantiate the sign function. What persists, however, is the cultural *type*: the object remains recognizable as a guitar, a hammer, a blender—its type is held in cultural memory, virtualized rather than lost, available to guide repair or replacement. The broken object thus occupies a liminal semiotic position: its occurrence has lost sign function status, while its type persists as a cultural reference point—sedimented and solicitable—in the virtual reservoir. It is precisely this persistence of the type that makes repair possible and meaningful. The repaired object is in the perspective proposed here a new object, because from a situation of non-usability one moves toward that of (new) usability. In fact, a possible strategy, which is typically exploited in terms of industrial consumption logic, consists precisely in favoring the discarding of the broken object and its replacement with a new one. Repair is from this point of view the creation of a new object O_n, constituted by at least one pre-existing object O_p, whose expressive occurrence makes adequate the starting type. It is counterintuitive at first sight to maintain that the repaired object is new, and that the replaced component is pre-existing. This touches on the ancient philosophical problem of the Ship of Theseus: if all parts of a ship are gradually replaced, is it still the same ship? The paradox reveals a tension between mereological identity (based on component

continuity) and functional identity (based on use continuity). In the framework proposed here, the pertinence is deliberately functional: an object is defined as a tool of use, and a non-functioning object fails to instantiate the sign function that defines it. From this perspective, repair effects a discontinuity in object-status even while maintaining apparent material continuity. We can distinguish two modes of repair: on the one hand, there is identity-preserving repair, where minimal intervention maintains both mereological and functional continuity, allowing us to speak colloquially of “the same object”; on the other hand, there is identity-transforming repair, where extensive replacement or modification produces what is in our approach a new object, even if social convention grants it continuity with its predecessor.

As we earlier noted, the value of an object is relative to its (re)use. This fact becomes particularly crucial from a social point of view. Hence a repaired object can have different value. A car repaired with an official spare part does not lose value, but a historicized object, for the simple fact of being repaired, can lose value. Thus, in the lutherie of vintage Fender electric basses, each replacement, for example of frets, prejudices the value of the instrument for certain persons (e.g., collectors). The dysfunctional object (because the frets are worn) can then have superior value to the functional one. One could, however, note that here a new use intervenes, that of collecting or curating vintage objects, which is not entirely compatible with that of musical instrument. We have again an occurrence in which two objects collapse as a relation between different types.

The formalism proposed here (the O_n/O_p notation and bricolage index) allows us to map this continuum precisely. But if one assumes that “new” indicates the fact that now there is a usable object, while in the condition of breakage the object was not there (anymore), one understands the sense of the attribute. Similarly, the component that takes the place of the broken one is pre-existing (even if it could be new from a merchandising point of view) because autonomous from the broken object. In other words, it is already there.

The recursive logic proposed in terms of the rewriting rule also allows describing two situations of repair. If one considers the replaced component object (O_p) per se, that is, as object O_n, this can itself be new or pre-existing. A car part can be replaced with a new spare part or with a recovery from the junkyard, the lost cap of a bottle can be purchased at the supermarket or recovered from a previous bottle.

6.4 *The Complex Case of Bicycle Repair*

Unlike I_t, which measures trait elimination within a single object occurrence, I_b quantifies compositional heterogeneity across the mereological structure. Repair, however, presents a theoretically complex case because it involves the tension between mereological identity

(component continuity) and functional identity (use continuity) discussed earlier in relation to the Ship of Theseus paradox.

Before proceeding, it is worth distinguishing two forms of bricolage that the framework encompasses, which differ not only operationally but also aspectually. *Constructive bricolage* is prospective: it operates under a perfective aspect, oriented toward a new object to be achieved from heterogeneous pre-existing parts. The reference point is the future sign function; the telos is creation. This is bricolage in Lévi-Strauss's original sense —the bricoleur assembling something unprecedented from a heteroclite stock. *Restorative bricolage*, by contrast, is retrospective: it operates under an imperfective aspect, oriented toward a past state to be recovered. The reference point is the original sign function; the telos is return. The bricoleur here restores the mereological integrity of an object using non-original parts because original parts are unavailable. These two forms share the same basic operation—assembling from pre-existing heterogeneous elements—but their temporal orientation and interpretive baseline differ. This aspectual distinction maps onto the mereological versus functional identity tension noted above: restorative bricolage operates under the sign of mereological continuity (restoring the same object), while constructive bricolage operates under the sign of functional novelty (creating a new object). The typology thus makes explicit a tension already implicit in the framework. This aspectual difference has consequences for how Ib should be interpreted. For constructive bricolage, $I_b = |T_{pre\text{-}existing}| / |T_{total}|$ measures the proportion of heterogeneous sources in the new object—a high value signals strong bricolage. For restorative bricolage, a complementary reading is more intuitive: $I_{b\text{-}r} = |T_{changed}| / |T_{total}|$ measures the degree of intervention on the persisting object relative to its original state—a high value signals strong transformation away from the original. The two readings of the index are arithmetically complementary: $I_{b\text{-}r} = 1 - I_b$. The baroque result that simple repair yields high bricolage is thus not a flaw in the index but a consequence of applying a constructive metric to a restorative operation—a signal that the aspectual context must be specified before the index is interpreted.

Consider a bicycle analyzed at the level of major components: frame, front wheel, rear wheel, chain, pedals, handlebars, seat, and brake system ($|parts_{total}| = 8$). The repaired (hence, in this framework, new) bicycle is made up of 1 new part and 7 pre-existing ones. We have a new bicycle assembled almost entirely with pre-existing parts. That the bricolage index decreases as more new replacement parts are substituted may seem paradoxical. However, the index correctly predicts that in this Ship of Theseus bicycle, if I replace all pre-existing parts with new ones, then I obtain a completely engineered and non-bricolaged bicycle ($I_b = 0$). If we calculate I_b treating the repaired bicycle as a “new” object O_n (following our functional definition that a non-working bicycle is not a bicycle),

then simple repair—a broken chain replaced with new while all other parts persist—yields $I_b = 7/8 = 0.875$, indicating substantial bricolage. The new bicycle is largely a pre-existing one. Multiple repairs with mixed sourcing shift the ratio: if chain and seat are replaced with new parts while the rear wheel comes from an abandoned bicycle, then $I_b = 6/8 = 0.75$.

However, this calculation depends on adopting the functional identity perspective: the repaired bicycle is in our approach a new object because it now instantiates the sign function {bicycle}/{transportation} that the broken bicycle failed to instantiate. From a mereological identity perspective, one might argue that most components remain O_p relative to some earlier functional state, yielding different I_b values. This ambiguity reveals how repair occupies a liminal position, where our two criteria for object identity—mereological and functional—pull in different directions. The choice of which identity criterion to privilege must be made explicit and depends on analytical purpose: as an example, for consumption studies emphasizing component sourcing, mereological identity may be pertinent.[17]

Reuse can also be seen in an ecological perspective, not only in relation to the social dimension, but more generally to the biosemiotic one. It is established that many animals possess complex technical abilities which are not necessarily biologically determined (Vallortigara 2000). Thus, crows demonstrate extraordinary problem-solving abilities (Heinrich 1999), going so far as to bend an accessible wire in the surroundings to produce hooks useful for fishing larvae (Hunt 1996). Is it a reuse or an engineering construction *ex novo*? If one assumes a perspective for which the pertinent trait is that of corporeality, then we are dealing in this case with a bricolage starting from bodies existing in the environment that are then partially modified: a case with $I_b = 1$, a variable I_t and where $O_n \rightarrow O_p$. One could observe that the wire is not an object in functional terms. However, in reuse the pre-existing use is not relevant at a definitional level: it can simply be forgotten (even if it need not be), without this threatening the status of the operation as reuse. As discussed earlier, the electrical conductivity of the wire is irrelevant for its use as rope.

In this sense, bricolage turns out to have interesting extensions beyond human technical doing, opening into a wider biosemiotics of reuse. In other words, reuse comes first. Indeed, this aspect has been recognized by François Jacob (1977) in a celebrated article in which he considers Lévi-Straussian bricolage as a fundamental procedure in evolutionary processes ("evolution as tinkering"). This same idea underlies the term "exaptation" proposed by Gould and Vrba to indicate "characters, evolved for other usages (or for no function at all), and later 'co-opted' for their current role" (Gould and Vrba 1982:6).

7. Creativity and Abduction

What has been described so far pertains mainly the plane of expression. However, reuse is at first sight an operation that one would say is creative. In effect, it is the potential use that governs the process. In other words, the potential use (as content type) requires defining a sign function that is characterized by a certain expressive type. The task is then, teleologically, to make a body of the world an expressive occurrence for a certain use. This process is properly in Peirce's terms an *abduction*, because from the object one moves toward a certain use, for which that same object turns out to be adequate: under these conditions, the object can be reused, perhaps with appropriate tamperings. In other words, reuse involves seeing the object as a potential expressive occurrence, but this is possible only if one hypothesizes a sign function (a relation between types) from the existing body which points toward its use. Such a use isn't necessarily dictated (deduction) from the object nor is it a generalization (induction) over a set of objects or uses. Rather, adapting to use (perhaps with a certain tampering) is a creative, abductive process (Bonfantini 1987): it is creative precisely because it sees something that is there only in part, and as a potentiality, in the concrete object. As Munari (1971) notes, reuse provides for constant readaptation, or, one might say, exaptation, an application of the "TMO method" ("tecnica mentre opero", 'technique while operating').

The engineering creation of a new object ("production" in Figures 2 and 4), made of new component objects, is also guided by an abductive inferential process, but of a different type: this involves moving from matter toward an occurrence that makes adequate a new expressive type linked to a content type. On the one hand, one could observe that this "treatment of matter" in the production of the object is entirely analogous to what happens in recycling, but in the opposite direction: in production, one proceeds toward the occurrence starting from matter; in recycling, instead, there is a movement from occurrence toward matter. On the other hand, recycling also has a creative dimension: recycling makes matter newly available to its formation. Thus, for example, cardboard becomes paper again, and precisely for the creation of a potential paper artifact. If in recycling a creativity of matter manifests itself, in reuse one assists instead at a creativity of (formed) substances through the conversion, perhaps with partial tampering (a treatment of some aspects of matter), of one substance into another.

If engineering concentrates on the constitution of bodies, bricolage operates an abduction between existing bodies. Engineering (production) and recycling operate creatively with a back and forth from matter, while bricolage, which is always reuse, moves abductively between substances.

8. Memories

Note that, definitionally, one cannot avoid a temporal marker in the description of the three R-s, given the iterative prefix that characterizes all three terms. Time manifests itself semiotically in bodies in the form of memory, that is, of inscribed traces. This temporal dimension introduces what might be called a semiotic biography of the object: not agency or personality attributed from without, but the accumulation of inscribed traces that constitute the object's history as readable in its material occurrence.

It is possible to think of the three R-s in relation to enunciative praxis and the operations on modes of existence that it provides (Fontanille 1998). Dondero summarizes this praxis and its operations as follows:

> In a nutshell: The process of virtualization covers every discourse that has been concretely sedimented and that is solicitable. Actualization concerns the process of passing from the reservoir to action through the recalling of acquired competences and skills, while realization is the action of putting something into discourse (*mise en discours*). Finally, potentialization is the reverse process which follows realization, that is, a process of putting significations on standby so that they may subsequently be virtualized (or not: they may disappear, only being a single-use phrase or a single-use strategy in a work of art). (2025:113)

In reduction, for example, the object is not there and yet could have been, under other circumstances. It thus remains in a virtual mode of existence, without being actualized (or realized). But reduction precisely implies a practice of comparison between these two modes. It is characterized as a "positive" practice, and not only as absence, precisely because it is realized in a comparison between the social memory of virtual objects and their non-instantiation.

In recycling, by contrast, assuming that a trait of materiality persists, the memory of the object is reduced to its zero degree, to matter virtualized for new productions. Illegible per se, it can however be made socially accessible in declarative form, as when the new object makes explicit that it is made of recycled material (for example in the labels of clothing made of recycled fabrics). Time is constructed in this case at a textual level to set up a memory indicating a previous virtualization of matter.

In reuse, the expressive occurrence of the previous sign function proposes itself instead in presence and in variable degree as memory of past use. In this regard, reuse has been

effectively characterized in terms of “refabrication” (Seriff 1996), that is, of a new production in which the object has a double, historical status, as a function of a memory of variable depth.

Drawing on Schrödinger, Hidalgo (2015) has emphasized how the solid physical state is a prerequisite for the constitution of a memory. It is only with solidity that, literally, a state of matter (such as that deposited in the object) can persist. Not by chance, reuse in fact concerns solid objects, which are semiotically characterized by a trait of durativity. Solidity allows the object to be a support for the inscription of traces, that is, for memory. The other physical states of matter can eventually be recycled: wine gone bad can become vinegar—a transformation that may preserve traces of the wine's general type (a red wine yields a different vinegar than a white), but not of its individual history as a used, handled occurrence. The question of time emerges strongly in the complex and fundamental context of food. Food is, however variably, always temporary. Moreover, even if one wanted to characterize it in terms of objects, food is impermanent by definition because it must be consumed, that is, destroyed as object. For food, therefore, the horizon of reuse seems not especially relevant: since it must be consumed—that is, destroyed as object—the applicable category shifts toward recycling, or, prior to that, reduction.[18]

It should be noted that the argument for solidity as a prerequisite for memory inscription does not deny that non-solid objects undergo processes that leave traces of their history—wine is a case in point, carrying in its taste and structure the memory of soil, climate, and fermentation. What solidity provides is specifically *readable* inscription: a stable substrate that makes traces accessible to a user without transformation of the object itself. The memory of wine is real but accessible only through consumption—that is, through destruction. It cannot be read as patina or wear on a surface while leaving the object intact. This marks the outer limit of the framework’s pertinence rather than being an arbitrary restriction: the framework is most productive where inscription is durable and readable, and less so where memory is embedded in states that require transformation to be accessed.[19]

Two instructive edge cases are worth acknowledging here. Wine consecrated as the Blood of Christ undergoes a transformation of sign function without any physical transformation: a sacral institutional act operates at the level of practices and strategies, overriding the object level entirely and instituting a new, contextually bound sign function. For the semiotician at least, the physical occurrence is irrelevant—the institution is what counts. This is reuse at the highest Fontanille level, where cultural and ritual context can institute a new sign function for a non-solid, impermanent object. Whisky reused as a disinfectant in an emergency context is a different case: here, a trait already pertinent to the original sign function—alcohol content, relevant to {taste} or {get drunk}—carries a further property, its

antiseptic effect, that was present but not pertinent to that original use, and becomes pertinent under new contextual conditions. Both cases are compatible with the framework —the sign function changes, a new object of use is constituted—but they operate under specific contextual constraints (sacral, emergency) that are not the norm for *objets d'usage* in the everyday sense. They mark the fuzzy border of a framework whose solid core remains the object as tool of use, in its durable form.[20]

In temporary reuse, time intervenes as a framework of limited existence of the new object. This reduced temporal framework holds in momentary co-presence two objects, that is, two expressions and two contents, as in a reversible lenticular print. Once the new use is finished, that is, once the occurrence of content is realized, one returns to the pre-existing object. The pre-existing object is potentialized into a new virtual object that is immediately realized and actualized (the book as support for a computer), to then repeat the same circular movement and resume the starting state (that of support for reading). When instead an object designed for temporary use (as is typical in industrial production contexts: e.g., a bottle of liqueur) becomes permanent (e.g., as a vase for flowers) one has a sort of freezing *ad libitum* of time as memory (or memorization) of the new potentialized state. Instead of transiting toward the destruction of the occurrence (or eventually recycling), the pre-existing "disposable" object stops in an occurrence of the new one.

In general, reuse abductively releases the potential of the pre-existing object, spending it in the creation of a new sign function. Following Groupe μ (2015), this can be understood in thermodynamic terms: the pre-existing object carries potential meaning as potential energy—stored, available, not yet spent. Reuse releases that potential into the creation of the new object occurrence. A discussion on the memory effects made possible by reuse would open an entire research program. I therefore conclude with some working hypotheses:

> 1. In reuse, time declares itself as memory of the history of that occurrence, as "patina"; not necessarily connected to use, it takes the form of an "emblem" of history (Fontanille 2002a). For example, Freitag bags made from truck tarps declare a previous history.
>
> 2. In reuse, however, memory also presents itself as the history of past uses of the sign function of the object in that particular occurrence, to which can be added new uses relative to refunctionalization. Here, enunciative praxis translates into a double "imprint," into an accumulation of all uses that leave traces on the object (Fontanille 2002a). The object then presents itself, not just as a "text" (the result of a unitary work of an etymologically "weaving" subject) but rather as a "territory" (a surface of multiple and heterogeneous inscriptions; Valle 2017). To remain with the example of Freitag bags, some, when new, nonetheless present signs of pre-existing

use linked to road transport and to loading/unloading operations. To these traces are added those of the new use as bag.

3. The reused object however also holds in presence the cultural (encyclopedic) history of the previous object. This duplicity can produce “surreal” effects, because it in fact accumulates heterogeneous semantic traits between the two functions, as in tires used as planters (for this and other examples, see Cerny and Seriff 1996). This aspect, since it refers to the encyclopedic component, can take the form of a social stabilization that moves from the level of occurrence to that of type (as in the case of the Danish cookie box).

4. Finally, the encyclopedic macrohistory (“semantic memory”) can be complemented by individual microhistory. This happens when the occurrence of an object bears effects linked to personal, “episodic memory” (cf. Schachter 1996). A certain object that is idiosyncratically linked to the user takes on a new functional life, without losing the previous existential value, or even precisely by emphasizing it. On a personal note, among the electromechanical musical instruments that I have built (see Valle 2013, 2015; Valle and Lanza 2017), I have used as resonator a metal box containing buttons: set in agitation through an electric razor controlled by a computer, the box functions as a sistrum, thanks to the percussion of the buttons against the tin. The box belonged to my aunt who recovered it in order to contain buttons, which were also recovered in the instrument, now serving as percussors. There is evidently in reuse the possibility of a component that I have not discussed but that can be crucial: the passionate one, linked to affection for the object.

Conclusions

These notes have proposed a semiotic approach to the three R-s, with particular emphasis on reuse as an intermediate position between the non-production of objects (reduction) and their dissolution into matter (recycling). Building on Fontanille’s hierarchy of expressive levels and Eco’s treatment of objects as tools of use, the framework characterizes objects through the sign function, which relates expressive types (material, perceptual traits) to content types (use traits).

The article introduces two formal indices. The Tampering Index (I_t) measures the degree to which expressive traits are eliminated or rendered non-pertinent in the passage from pre-existing to reused object, positioning reuse on a continuum between temporary alternative use ($I_t \approx 0$) and recycling ($I_t \approx 1-\varepsilon$). The Bricolage Index ($I_b$) quantifies the ratio of pre-existing to total parts in an object’s mereological structure, distinguishing engineered production ($I_b = 0$) from Lévi-Straussian bricolage ($I_b = 1$), with repair occupying intermediate positions.

Through particular examples—the electric wire reused as rope, the repaired bicycle—the framework demonstrates how these indices operationalize these theoretical distinctions. The analysis extends to semantic relations (hypernymy/hyponymy, enabling reuse through shared traits), mereological formalization (the recursive grammar $O_s \rightarrow kO_s$), and temporal dimensions (memory, patina, and the passionate attachment to reused objects).

While this framework has been developed within semiotic theory, the formal character of the indices I_t and I_b suggests potential applications beyond semiotics proper—from sustainability metrics in design-for-disassembly to analogical extensions in digital domains such as code reuse. Such extensions remain topics for future research.

The framework's applicability is not necessarily limited to physical objects. Textual practices such as quotation, paraphrase, and pastiche can be understood as forms of discourse reuse, in which a textual occurrence is detached from its original sign function and redeployed in a new context—with variable degrees of tampering (exact citation vs. paraphrase) and bricolage (the cento, the anthology). Exploring this extension systematically, however, lies beyond the scope of the present article.

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Endnotes

1. For an alternative perspective on waste, referring to anthropology but also to biosemiotics, see Reno 2014. ↩

2. English translation of terms from Italian are by the author. ↩

3. Cf. Mattozzi 2006, which emphasizes the relevance of Latour's Actor-Network Theory (e.g., Latour 1994). A radical extension of the notion of object into "hyperobject" is proposed by Morton (2013). ↩

4. The approach is already thematized with respect to the semiotics of objects in Fontanille 2002b; also see Festi and Valle 2005. ↩

5. See Deni 2002a, Marrone 2002, and, especially for a critique of “form/function” in design, Mattozzi 2006:30ff. and Mattozzi 2009:§5.1. Also see Beyaert-Geslin who, precisely in opening, asks the reader to “overcome form and function” (2012:17). ↩

6. The other two modes are *actualization*—recalling something from the cultural reservoir into action—and *realization*, the act of putting it concretely into discourse. See Section 8 below, following Dondero 2025, for the full sequence. ↩

7. *Non tutto il resto è noia: virtù semiotiche dell’upcycling*, communication presented at the Seminar *L’upcycling come pratica ecologica e culturale*, Turin, 16/01/2025. ↩

8. To avoid misunderstandings, here the term *form* is used in Hjemslev’s sense, and in relation to substance, not in relation to function, as discussed previously. ↩

9. https://www.merriam-webster.com/dictionary/cord, accessed 07/29/2026. ↩

10. https://www.merriam-webster.com/dictionary/rope, accessed 07/29/2026. ↩

11. https://www.merriam-webster.com/dictionary/wire, accessed 07/29/2026. ↩

12. Bordron (1991), thus, distinguishes between “composition,” “agglomeration,” “chain,” “configuration,” “architecture,” and “fusion.” ↩

13. This is what Proni calls an “internal syntax” (2002:47). In the model of Mattozzi, Sperotto, and Poli, this defines “intra-objectual relations” (2009:98), which in turn are only part of the network of relations in which the object is taken, and which I do not consider here. ↩

14. In the lithic industry, the flaked stone remains also/still a stone. Bordron (1991) proposes the Aristotelian classification between “homeomers”, objects that are divided into objects of the same nature, and “anomeomers,” which properly are divided into parts. ↩

15. See, for example, https://www.reddit.com/r/Denmark/comments/sg5iqi/danishcookiesboxusedassewingboxinitaly/. ↩

16. The animal fits the definition of body; therefore, setting aside bioethical aspects, it is possible to make use of it. This is what happens in domestication. But is reuse of the living possible? For example, the galgo is a Spanish greyhound bred exclusively for hunting purposes. Specimens with poor abilities or those injured are abandoned or killed. The galgo object is broken and is discarded. However, many volunteer associations

exist that rescue the dogs for family adoption. The new object “pet dog” is composed of a (single) pre-existing object, a “hunting dog.” In this case, evidently, we have $O_n \rightarrow O_p$ and $I_t = 0$, and the passage through the hypernym “dog.” ↩

17. For an introduction to the complex question of technical objects in semiotic perspective, see Mattozzi 2006. ↩

18. I would like to thank Eleonora Chiais and Camilla Robuschi for the discussion on this point (personal communication). A boundary case worth noting is the use of yogurt cultures to produce new yogurt: here the yogurt component both triggers fermentation (functioning as starter) and persists as yogurt within the new product. The starter is reused as such, materially incorporated rather than merely functionally continuous. Such liminal cases—where material persistence, functional iteration, and incorporation into the new object intersect—raise questions about the framework’s boundaries and suggest productive directions for future research. ↩

19. A modal characterization of objects—in Greimassian terms, their deontic and epistemic dimensions: wanting-to-use, knowing-how-to-use, being-able-to-use, having-to-use—would constitute a natural and productive extension of the framework proposed here. Such a characterization would enrich the description of functions, their fields of exercise, and forms of appropriation. It would also provide additional analytical tools for distinguishing types of reuse (e.g., opportunistic reuse driven by knowing-how from institutionalized reuse driven by having-to). This extension lies beyond the scope of the present article but remains an open direction for future research. ↩

20. I owe both examples to Reviewer 3 of this paper, whose acute commentary prompted me to explore the outer limits of the framework more carefully. ↩

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