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Thomas Byrne

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# Husserl's Early Semiotics and Number Signs: *Philosophy of Arithmetic* through the Lens of "On the Logic of Signs (Semiotic)"

Thomas Byrne 

Husserl-Archives: Centre for Phenomenology and Continental Philosophy, Institute of Philosophy, KU Leuven, Belgium

## ABSTRACT

This paper demonstrates that Edmund Husserl's frequently overlooked 1890 manuscript, "On the Logic of Signs (Semiotic)," when closely investigated, reveals itself to be the hermeneutical touchstone for his seminal 1891 *Philosophy of Arithmetic*. As the former comprises Husserl's earliest attempt to account for all of the different kinds of signitive experience, his conclusions there can be directly applied to the latter, which is focused on one particular type of sign; namely, number signs. Husserl's 1890 descriptions of motivating and replacing signs will be respectively employed to clarify his 1891 understanding of the authentic and inauthentic presentations of numbers via number signs. Moreover, his schematic classification of replacement-signs in Semiotic will illuminate the reasons why he believed the number system to be necessary for the operation of replacing number signs.

## KEYWORDS

Husserl; phenomenology; surrogate; arithmetic; semiotics

## 1. The Connection between *Philosophy of Arithmetic* and "On the Logic of Signs"

Edmund Husserl dedicates his 1891 *Philosophy of Arithmetic* (hereafter PA) to resolving a long standing problem; namely, that philosophers and mathematical theoreticians still have not yet properly accounted for how we can present, enumerate with, and calculate via numbers. Husserl believes that he is able to succeed where others have failed because of his different methodological approach. He claims that these experiences can be clarified by revealing and describing the psychological origin of the concept of number. One must, he contends, trace back the experiences by means of which numbers are given and exercised.<sup>1</sup> Moreover, he recognizes that our consciousness of numbers is not monolithic. Numbers can be given in two distinct kinds of experience and that, if his project is to be successful, both of these and the interrelationship between them have to be fully accounted for.

**CONTACT** Thomas Byrne  T.byrne3@gmail.com  Husserl-Archives: Centre for Phenomenology and Continental Philosophy, Kardinaal Mercierplein 2 – box 3200, 3000 Leuven, Belgium

<sup>1</sup> It was originally Carl Stumpf, who was Husserl's mentor in Halle, who formulated this methodology. Husserl adopted and revised it in accordance with his own purposes. See Stumpf, *Über den Psychologischen Ursprung der Raumvorstellung*, v, see also 1–7. For a discussion of Husserl's alterations of Stumpf's method, see Ierna, 'The Beginning of Husserl's Philosophy Part 1', 8–12; Willard, 'Introduction to Philosophy of Arithmetic', xv–xvii.

Concerning the first kind of experience, Husserl states that a number can be directly presented before the human mind in certain perceptual experiences. I can have an “authentic presentation” (*eigentliche Vorstellung*) or an in-person and immediate awareness of the number. Husserl goes to great lengths to pinpoint and describe the psychological mechanisms responsible for these authentic presentations, dedicating the entire “First Part” of PA to that task. His rich conclusions can be summarized with the help of an example. When presented with three toothpicks scattered before me, I am not only able to see them as various items, but can also, on that basis, authentically present the number three. To begin to do so, I must first notice and count out each toothpick in temporal succession before collectively combining them, such that I can then see three toothpicks.<sup>2</sup> If I also abstract from the content of the presentations of these toothpicks by treating them as mere somethings,<sup>3</sup> the number three would then be authentically presented.<sup>4</sup>

These authentic presentations of numbers; however, can only occur in very few cases. Husserl claims that, as a result of the limitations of our psychic capacities, humans are capable of authentically presenting only those quantities that are less than or equal to five, ten, or twelve things, depending upon which quote one pulls from the text.<sup>5</sup> While I can immediately present three toothpicks, I am unable to authentically see, for example, 38 of them. I may enumerate the toothpicks one by one, finally reaching the number 38, but when I look up at all of them, I cannot see 38 toothpicks. As one cannot authentically see these higher numbers, a tool was created by means of which one can be presented, count, and solve arithmetic equations that concern or contain them; namely, number signs. I somehow become aware of the numbers 38, 349, or 8,784 when I read the corresponding signs on the page. Husserl states that this (more common)<sup>6</sup> manner of becoming aware of numbers via signs is a case of inauthentic presentation: The number signs inauthentically present their higher numbers.

The second task of PA is to elucidate the psychological origin of these inauthentic presentations of numbers. The value of this project, for Husserl, is obvious. He believes that I use numbers in a blind, purely mechanical, or pre-logical manner when I calculate with number signs that inauthentically present their signified numbers. The clarification of the genesis of these inauthentic presentations allows for me to instead have a logical understanding of the calculation experience. I not only come to the correct conclusion by mechanically manipulating the numbers, but because I also comprehend how they

<sup>2</sup> See Husserl, *Philosophie der Arithmetik*, Hua (= Husserliana) XII, 17–34 and 64–76; for the English text, see *Philosophy of Arithmetic*, CW (= Collected Works) X, 18–35 and 67–79.

<sup>3</sup> This abstraction is necessary, because the concept of a number is not determined with regards to its content. Anything can be collectively combined with anything else. I can pick out and collectively combine the moon, a lemon, and Barack Obama. While these three (materially determined) objects are then given to me as a group, it is only by treating them as mere somethings that this collective connection can generate the authentic presentation of the (materially indeterminate) number three. See Husserl, *Philosophie der Arithmetik*, Hua XII, 14–17 and 77–89; for the English text, see *Philosophy of Arithmetic*, CW X, 15–18 and 81–93.

<sup>4</sup> Husserl further claims that the content of the authentic concept of number can be given by reflecting on the experience of collectively connecting. As I am unable to discuss this rather problematic (but not psychologistic) tenet of Husserl’s early philosophy and all that it entails, I refer the reader to Bernet et al., *Introduction to Husserlian Phenomenology*, 17–24; Willard, ‘Husserl on a Logic that Failed’.

<sup>5</sup> For five being the maximum number of things one can authentically present, see Edmund Husserl, *Philosophie der Arithmetik*, Hua XII, 114; for the English text, see *Philosophy of Arithmetic*, CW X, 120. For ten being the greatest, see, in the respective texts, 224; 236, and for twelve, see 192; 202.

<sup>6</sup> Number signs may also motivate me to authentically present their corresponding smaller numbers. See section 5 below.

originate and operate, I grasp why I am able to come to the right result with them, such that the truth of my calculation is guaranteed. Moreover, by fully grasping number signs' functionality, I recognize the limits of their use and am thereby protected from implementing signs in an improper manner and from creating new signs, which would pervert my future calculations.<sup>7</sup>

The urgency of this task becomes all the more self-evident when one recognizes that there is not just a lack of understanding concerning the inauthentic operation of number signs. Rather, and more disturbing, a mistaken theory has been widely adopted. Scholars have erred by forgetting the distinction between authentic and inauthentic presentations, such that they think that when they are presented or calculate with number signs, that they are actually given the numbers themselves.<sup>8</sup> This confusion has resulted in an acute degradation of arithmetic. For example, imaginary, negative, and irrational numbers were "invented and applied for centuries before being understood."<sup>9</sup> Even the progress of mathematical studies has been greatly slowed because of this mistake. Rather than being able to develop and utilize signs with the insights into how they can inauthentically present their corresponding numbers, which philosophers should have provided, mathematicians have had to rely on the process of trial and error. Husserl deeply laments this, writing, "But how much mental energy has been wasted on this route, more governed by chance than by logic!"<sup>10</sup>

By assuming this specious doctrine, scholars have doomed any project to clarify the function of signs from the start. When they attempt to understand a number sign's operation, as they take the sign as the signified, they inspect only the former. Such a clarification instead requires that one (1) first recognize the difference between the number sign and its signified, (2) identify the relationship between them, and only then can one (3) reveal and describe the psychological origin of how the number sign can inauthentically present its signified number.

Concerning these goals, Husserl is exceptionally clear about the first and second in PA. Number signs inauthentically present their numbers by replacing (*ersetzen*) them or by serving as their surrogate (*Surrogat*) (these being equivalent). The third task, that of clarifying the psychological origin of this surrogative (or deputizing) function, then seems to be of utmost importance for the success of Husserl's enterprise. Only that investigation can resolve the crisis of arithmetic, as it can clarify the results of that study and help to speed the advancement of its research. Simply stated, it would establish arithmetic's ultimate grounding.

Despite its gravity, Husserl never directly addresses this question in PA, as he instead focuses on discussing the genesis of the number system. While the latter investigation is necessary for a correct understanding of number signs, as those signs are only able to execute their replacement function (for reasons that shall be explained below) within the context of this system, that analysis in no way clarifies the genesis and operation of

<sup>7</sup> See Husserl, *Philosophie der Arithmetik*, Hua XII, 256–83; for the English text, see *Philosophy of Arithmetic*, CW X, 271–99.

<sup>8</sup> Husserl extensively and caustically critiques, in the "Appendix to the First Part" of PA, the views of Hermann von Helmholtz and Leopold Kronecker, who he takes to be the two thinkers most responsible for proliferating this erroneous interpretation of number signs. See Husserl, *Philosophie der Arithmetik*, Hua XII, 170–78; for the English text, see *Philosophy of Arithmetic*, CW X, 180–87.

<sup>9</sup> Husserl, 'Semiotik', Hua XII, 369; for the English text, 'Semiotic', CW V, 48. See also, in the respective texts, 256–59; 271–74.

<sup>10</sup> *Ibid.*, 371; 49.

number surrogates themselves. In fact, whenever Husserl comes upon the opportunity to more fully scrutinize number signs' performance as surrogates, he simply asserts that they replace their objects without further elaboration.<sup>11</sup> It appears as if he wished for that term to be understood in its everyday sense; the sign replaces the object, it is its surrogate. The contemporary literature, following Husserl's lead, also has often taken this notion at face value.

Yet, Husserl did recognize surrogation as a highly complex and deeply problematic concept. In an attempt to clarify this idea, in a text from 1890, entitled, "On the Logic of Signs (Semiotic)" (hereafter LZ), he dedicates great efforts to explaining the origin of and psychological mechanisms behind the replacement function and to detailing the different species and genera of surrogates. As LZ plays this crucial function in Husserl's early philosophy, it is surprising to learn that his illuminating conclusions there have not been widely discussed in the literature.<sup>12</sup>

The project of LZ is even more encompassing. Husserl saw that he had not only omitted a thorough discussion of number surrogates from PA, but also that he had not fully accounted for the origin and operation of any signs. As such, in LZ, he seeks to address the genesis and function of all kinds of signs, as is clear from its subtitle, "Semiotics." This task is not overwhelming because, while Husserl recognizes that signs can have many different genetic origins, he takes there to be only two genera of signs. There are associatively motivating signs, and signs that serve as replacements.

In accordance with these conclusions, a reversal of perspective is required. Rather than neglecting LZ as an extraneous appendix to PA, as the majority of the research has done, it should instead be understood as the hermeneutical touchstone for the 1891 work. *The goal of this essay is to justify this interpretation by demonstrating how the insights in LZ can be used to illuminate Husserl's philosophical schema of PA in three specific ways.*

The following argument for this interpretation is divided into four sections. The next three provide a detailed analysis of LZ.<sup>13</sup> In each, a distinct element of Husserl's theory is investigated. In the final section, I cash out this close examination by demonstrating how those three discussed tenets can be respectively employed to clarify three conclusions Husserl arrives at concerning number signs in PA. I investigate his descriptions of (2) associatively motivating signs (which often kick-start the surrogative process) and of (3) replacement signs. In (4), I examine Husserl's differentiation of replacements on the basis of their distinct genetic formulations and degrees of necessity. (5) These insights

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<sup>11</sup> The reader can validate the fact that Husserl, in PA, is content to employ the words, "Surrogate," "surrogieren," and "ersetzen," as they are usually or ordinarily understood, by looking at any or all of the 21 times that he explicitly uses those terms within the context of a sign replacing its signified. To provide one most conspicuous example, when Husserl first takes on surrogates as the main theme to be investigated, he provides no clarification, but merely postulates that operation. He writes, "Accordingly, the symbolic presentation serves us as a provisional representation, and, in cases where the authentic object is inaccessible; even as a permanent one." Husserl, *Philosophie der Arithmetik*, Hua XII, 194; for the English text, *Philosophy of Arithmetic*, CW X, 206.

<sup>12</sup> To the best of my knowledge, there are six articles that discuss the tenets of LZ in some detail. These are: D'Angelo, 'The Foundations of Alterity'; Ierna, 'Husserl and the Infinite'; Majolino, 'Structure de l'indice et équivocité du signe' and '*La fabrique du renvoi*'; Zuh, 'How do categorial Representations Influence Everyday Intuition' and 'Wogegen wandte sich Husserl 1891?.'

<sup>13</sup> This discussion of LZ found in sections 2-4 is a revision and expansion of the analysis I present of that 1890 text in my forthcoming article, see Byrne, 'Surrogates and Empty Intentions'. In that article, the examination of LZ is placed in a different context; namely, I demonstrate how one can read it as the palimpsest for Husserl's, 'First Logical Investigation', thereby revealing the further historical and philosophical importance of LZ. See *Logische Untersuchungen*, HUA XIX, 30-112; for the English text, see *Logical Investigations*, Vol. 1, 181-233.

will be utilized to clarify Husserl's 1891 understanding of first, the way number signs can motivate me to authentically present their numbers and second, how number signs are able to replace their signified numbers. Finally, I show how it is by locating where number surrogates sit within Husserl's classificatory schema, that the reasons why the number system is necessary for number signs' operation and the logic behind Husserl's description of the genesis of that system can be accurately comprehended.

## 2. Motivating Signs

A grounding tenet of Husserl's semiotics in 1890 is that when I am presented with an associatively motivating sign, two different mental operations can occur: The sign can motivate me to execute an authentic presentation or to present a surrogate and in either case, to recognize the presented object as that which the sign signifies. Both kinds of motivation occur via the two steps of association; linking and reawakening.

I utilize the simple case, where I go to purchase a computer, to clarify these different experiences. When at the store, I perceive, for the first time, the laptop I will buy.<sup>14</sup> This is the authentic presentation<sup>15</sup> of the computer: I see the device, in person, in robust detail. Husserl claims that to any authentically presented object, there can become associatively tied a manifold of different authentically presented psychic or physical intentional objects or determinations.<sup>16</sup> For example, the computer may have an unusual dent from being previously dropped. This determination of the computer can be associatively linked to the computer itself. Importantly, the authentically presented written or spoken sign, "computer," can also become so linked to the perception of my computer itself.<sup>17</sup>

When I arrive home and video-call a friend with my laptop, she may ask me, "What colour is your computer?." Husserl states that I can answer this question because the associative link between the motivational (in this case, linguistic) sign, "computer," and the presentation of the computer is reawakened. When I hear those words, I am impelled or associatively motivated to authentically present the computer that is before me and recognize it as that which corresponds to the sign: It is taken as the sign's meaning.<sup>18</sup> I see it as the object that my friend is inquiring about. By doing so, I am able to see, know, and state to her, "The computer is grey."

Not only linguistic signs can perform this motivational and signitive operation; rather, all objects or characteristics that have been previously associatively tied to other objects or characteristics can reawaken their link. Husserl writes, "The word 'sign' in our definition is

<sup>14</sup> For a fully correct appreciation of this case, one must assume that I had never heard or thought about computers, nor had I seen any images of them, be they artistic representations, pictures, or movies prior to seeing this computer in the store. The reasons for this presupposition will become evident in section 4 below.

<sup>15</sup> Correctly stated, all perceptions are judgments for the early Husserl, as he was still a believer in Franz Brentano's tripartite division of phenomenon at this time. See Rollinger, *Husserl's Position in the School of Brentano*, 33–43.

<sup>16</sup> See Husserl, 'Semiotik', Hua XII, 352; for the English text, see 'Semiotic', CW V, 31–32.

<sup>17</sup> *Ibid.*, 352–53; 32.

<sup>18</sup> Husserl treats the terms, "meaning," and, "signified," as largely equivalent in LZ. With regards to direct signs, which we are primarily concerned with in this paper, he defines them as identical. See Husserl, 'Semiotik', Hua XII, 343–44; for the English text, see 'Semiotic', CW V, 23–24. See also, Majolino, 'Structure de l'indice et équivocité du signe'. For clarity, I will refrain, as much as possible, from using the term "meaning" throughout the rest of this paper when discussing Husserl's early semiotics. For a more extensive analysis of Husserl's understanding of the terms, "meaning," and, "signification," in LZ, see Byrne, 'Surrogates and Empty Intentions'.

to be taken in the widest conceivable sense.”<sup>19</sup> For example, if I were to walk into the philosophy library and see someone that is working on a laptop, which has a dent on it that is identical or similar to the one on my computer, this presentation could arouse the associative link. The dent would serve as a motivating sign, which impels me to recognize the signified authentically presented computer as mine.<sup>20</sup>

Husserl’s explanation of the second operation of associatively impelling signs, that is, their motivation to present a surrogate, is a result of his understanding of the function and purpose of thought. He explains that thinking can be divided into higher and lower level psychological activities. Higher activities are those which are more difficult to execute, that is, they require more strenuous mental effort, whereas the lower level, in contrast, are easier. Some examples of these higher and lower pairs are respectively; presentations in fantasy or sensation, presentations of more abstract or more concrete objects, presentations of relations or of absolute content, presentations of multiplicities or singularities, and presentations of psychical acts or objects.<sup>21</sup> The significance of this division comes to the fore when Husserl states that thinking is oriented towards expending less mental energy: Thought has the *telos* of becoming more efficient. The lower level thinking activities are therefore preferred to the higher, as they are less demanding.<sup>22</sup>

In order to achieve this goal of economized thinking my consciousness executes another mental process subsequent to the linking of the computer to the word. With regards to the direction of my interest at the time, I passively construct a presentation that is a poor facsimile of the computer, that is, one that requires less mental energy to be executed. This simpler presentation, for instance, of a grey square (not an idealization, but rather an imagined sketch), is then also associatively tied to the word, “computer.” The institution of this second link promotes efficiency because when I again hear that word, that tie can be reawakened instead of the one between the word and computer. Rather than being impelled to authentically present the computer as the signified of the sign, which requires a great deal of mental effort, the link between the word and the simple presentation of the square can be aroused.<sup>23</sup> Once presented, the grey square serves as the surrogate for or replaces the computer and it thereby allows for me to come to the right answer concerning the colour. By being motivated to present the square instead of the computer, I not only correctly grasp the pertinent characteristic of the object, but have also saved a great deal of mental energy.

<sup>19</sup> Husserl, ‘Semiotik’, Hua XII, 340; for the English text, ‘Semiotic’, CW V, 20.

<sup>20</sup> Husserl provides the example where the characteristic, of having a particular metallic shine, is associatively tied to the element, aluminium. When I come across an object that has this specific kind of metallic shine, but do not yet know what kind of metal it is, that characteristic can serve as a sign, which reawakens the associative link and motivates me to recognize the authentically presented metal as aluminium. He writes,

At one time we are interested, for example, in the characteristics of aluminium as such, so far as they enrich our knowledge of this metal. But at other times, just those very same properties, confirmed as belonging to an as of yet unknown body, can serve as the signitive mark to determine that that body is, precisely, aluminium.

Husserl, ‘Semiotik’, Hua XII, 341; for the English text, ‘Semiotic’, CW V, 21.

<sup>21</sup> See Husserl, ‘Semiotik’, Hua XII, 351–52; for the English text, see ‘Semiotic’, CW V, 31–32.

<sup>22</sup> On all of these points, see Husserl, ‘Semiotik’, Hua XII, 350–52; for the English text, see ‘Semiotic’, CW V, 30–32.

<sup>23</sup> Concerning this replacement process, Husserl uses the example where the presentation of the word, “sphere,” associatively motivates me to present a ball, which functions as the sphere’s surrogate. See Husserl, ‘Semiotik’, Hua XII, 353; for the English text, see ‘Semiotic’, CW V, 32–33. The reason I have instead chosen to use the example of the square surrogating for the computer is because the case where the ball replaces the sphere is of great complexity, as this concerns a genetically primary and principally necessary surrogate (see section 4 below). It is only once the operation of surrogates as such has been described, can the constitution and operation of those more complex surrogates be addressed.







to be presented with the computer. The surrogation of the square for the computer is then, according to the schema Husserl has devised, to be defined as a kind of misidentification. The presentation of the square can provide me with the correct answer to my inquiry about the colour of the computer, because I have “confused” the former for the latter. To clarify this point, Husserl assigns variables to the pertinent correlates of the replacement experience. We label the computer as G, the square as X, and the grey colour as  $\alpha$ . Husserl then exposits, “A judgment applies to an object X, provided only that X has property  $\alpha$ ; G possesses the property  $\alpha$ ; thus, the judgment also holds true of (*gilt von*) G in just this respect.”<sup>25</sup> When presented with the grey colour of the square ( $X\alpha$ ), I mistake it for the grey colour of the computer ( $G\alpha$ ). As the computer is in fact grey ( $\alpha$ ), I “correctly” judge that it is so coloured, even though I have no authentic presentation of this in this case.

This mistaking or inauthentic presenting is possible because of the passive reawakening of the surrogate. With regards to my interest<sup>26</sup> in the colour of the computer, my passive consciousness, for the sake of saving mental energy, switches out one object for another or more appropriately, allows for the execution of one presentation rather than another. In this case, the word, “computer” associatively motivates me not to execute the presentation of the computer, but rather of the square. As I am not actively aware of the replacement, I can take the object presented before me as the computer, rather than as the square that it is.

Turning to his logical examination, Husserl seeks to explain how surrogates operate reliably. He believes that most of our thinking is executed by means of replacements and moreover, that in the vast majority of cases these surrogates do allow for us to accurately comprehend the object of interest. Surrogates do not operate in a dependable manner by means of random chance, but rather because there is some mechanism that ensures their trustworthiness. Husserl’s logical investigation is dedicated to discovering this guarantor.

The problem Husserl identifies concerns not the surrogates themselves, but rather that which often allows for the consciousness of them; the operation of the associatively motivating sign. As we know, when I perceive such a motivational sign, it can arouse the presentation of the surrogate by means of the blind psychological mechanism of association. As this reawakening occurs passively, it is not rationally controlled and it therefore seems more likely that I would be impelled by the sign to execute any number of presentations that would not allow for me to correctly understand the object of my concern. He explains, “It certainly would be quite well conceivable a priori that a psychological arrangement of our nature should force our practical (extralogical) judgments always or predominantly to error, and only exceptionally to truth.”<sup>27</sup>

While the associative connection between the motivating sign and the surrogate introduces a certain randomness, Husserl explains that the surrogative experience is reliable because of the relationship between the replacement and the replaced. It is the latter

<sup>25</sup> *Ibid.*, 360; 39.

<sup>26</sup> Husserl emphasizes that it is the direction of my interest that serves as the referee for which surrogate is aroused. As will be important for the juxtaposition of LZ and PA, he affirms that the same presentation can serve as a surrogate for different signified objects, depending upon my interest at the time. See Husserl, ‘Semiotik’, Hua XII, 352–53; for the English text, see ‘Semiotic’, CW V, 32–33.

<sup>27</sup> Husserl, ‘Semiotik’, Hua XII, 358; for the English text, ‘Semiotic’, CW V, 37.

connection that serves as the check upon the former. This is the case because a requirement must be met for one presented object to serve as the replacement for another: The surrogate must be “a rough approximation” (*eine grobe Annäherung*)<sup>28</sup> or within a certain range of similarity of the replaced object with regards to the direction of my interest. As I am concerned with the colour of the computer, the grey colour of the square has to be roughly the same as that of the computer if it is to serve as the surrogate.

The reason why Husserl asserts that this serves as a check on the motivating sign’s operation is because he believes that when surrogates are not within this degree of similarity, “... then the symbols do not fulfil their purpose, the flow of thought stops (*hört auch alsbald das Verständnis auf*), and we note to ourselves that we are lacking the true concepts.”<sup>29</sup> If the motivating sign arouses a surrogate that is not within the range of affinity with the replaced, then that surrogate cannot perform its function. If the sign, “computer,” impelled me to execute a presentation of a red circle, as it is evidently not within the grade of approximation of the computer (with regards to the interest in the computer’s colour), Husserl believes that I would recognize the difference between them. This surrogate cannot be mistaken for or inauthentically present the computer. My “thought stops” and I see the circle as an inappropriate replacement. As a result, I do not take the world in an incorrect way: I do not think that the computer is red nor do I respond to my interlocutor’s question concerning the colour erroneously. As I can no longer utilize this presentation as a surrogate, I instead authentically present the computer, which despite requiring more mental energy, allows for me to correctly know its colour.

#### 4. Classifications of Surrogates

As Husserl realizes that replacements can be formed and function in several different manners, he is not content to provide just this overarching exposition of how all surrogates operate and operate reliably. Instead, he works from these conclusions so as to augment his semiotics by differentiating replacements on the basis of their genetic origins and degrees of necessity. A close examination of these distinctions will be of great help for interpreting Husserl’s theory of number surrogates in PA, as it is by locating where those signs sit within this model, that his discussion of their conception can be fully illuminated. These divisions are charted in [Figure 2](#) below.

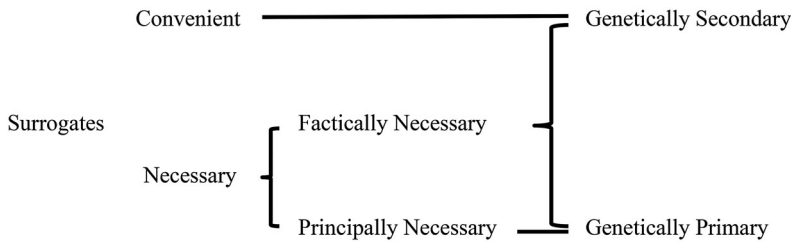
Husserl begins with the distinction between convenient and necessary surrogates,<sup>30</sup> which concerns whether or not the object that is replaced can be authentically presented. When the square replaces the computer, it is possible for me to recognize that I am dealing with a surrogate. In this case, I can reawaken the associative link between the word and the computer itself: I can (when sitting in front of my computer) execute the authentic presentation of it. This is to say that it is, in that case, convenient for me to present the square, as I save mental energy by doing so, but it is not necessary.

Necessary surrogates, in contrast, do not allow for this shift to authentic presentation. This restriction could be in place for two different reasons. On the one hand, the authentic presentation may be factually denied to me. I am incapable of being authentically

<sup>28</sup> *Ibid.*, 353; 32; my translation.

<sup>29</sup> *Ibidem.*, my translation.

<sup>30</sup> For Husserl’s description of convenient surrogates, see Husserl, ‘Semiotik’, Hua XII, 351–54; for the English text, see ‘Semiotic’, CW V, 30–33. For his theory of necessary surrogates, consult in the respective texts, 354–57; 33–36.



**Figure 2.** Husserl's differentiation of surrogates.

presented with that object because of the particular situation or place I find myself in (for example, when I am not within perceptual range of my laptop). On the other hand, surrogates that are principally necessary are those that have, regardless of circumstances, signified objects that can never be given authentically. Husserl cites the surrogates that stand in for God and the souls of others as the clearest examples of principally necessary replacements.<sup>31</sup>

The third division, which cuts across the other two, concerns whether or not the replacement is constituted before or after I have been authentically presented with the to-be-signified object. The replacement of the computer, as I have explained it,<sup>32</sup> is an example of a genetically secondary surrogate. It is when I was in the store and *first* saw the computer that my consciousness *then* constituted the simpler or lower-level replacement.

For genetically primary replacements, the situation is reversed. I constitute the surrogate before or without the possibility of the authentic presentation of the signified and for this reason, these replacements cannot be convenient. To explain Husserl's thought process here, I apply his analysis to a counterfactual example. My friend has come back from Chile after having discovered a new animal species, which he has termed, "Threshdohr." He has no pictures of this creature and I am therefore left to rely on his descriptions to comprehend what this animal looks like. My friend tells me about some of the animal's features, such as the fact that it is red, has horns, and its feet are hooved. Husserl writes that when this happens,

The single properties are given; their grouping and interrelationship is easily accomplished in phantasy, conforming to familiar models; and the image of a 'something' (*Vorstellung eines 'Etwas'*) which resembles the projected phantasm serves as an adequate substitute for the subject at issue – which then also, in case it does itself show up sometime, can be recognized.<sup>33</sup>

Husserl is stating that although I have not yet perceived the Threshdohr, I can imagine an object to serve as its surrogate. Not any image; however, can perform this function. The replacement I fashion is one that I take to be similar to the Threshdohr on the basis of the description of my friend. It can be a surrogate as it is ostensibly within the range of approximation of an actual Threshdohr. This formation occurs in several stages. First, as the characteristics (hooved, horned, and red), which my friend mentions to me, are familiar, I can present them in phantasy. These features are first separately given and then cohere together into one presentation of what I imagine a Threshdohr to look like. The united imaginary authentic presentation can then be associatively linked to the

<sup>31</sup> See Husserl, 'Semiotik', Hua XII, 356; for the English text, see 'Semiotic', CW V, 35.

<sup>32</sup> See note 14 above.

<sup>33</sup> Husserl, 'Semiotik', Hua XII, 355; for the English text, 'Semiotic', CW V, 34.

word, “Threshdohr.” When someone says that word again, the associative tie is aroused and I present that replacing image. This process becomes more complicated when Husserl explains that one further step normally occurs. He writes,

If we are sufficiently familiar with representations which arise in this manner, and which are very rich in content, then there immediately ensues a surrogation of them by means of substitutive representations that are more convenient, poorer in content, or even wholly external (that is, by means of a symbolization of the second level), answering to our mental drive toward economy, which has been repeatedly mentioned (entsprechend dem wiederholt erwähnten ökonomischen Zuge unseres Geistes).<sup>34</sup>

This quote, which demonstrates well the tortuous manner in which Husserl composes his insights in LZ, is claiming that my consciousness may not be content with the first surrogate I have constituted, because it is rich in detail. As a result of the energy-saving tendency of consciousness, I could then come to passively formulate a second replacement that is poorer in content and requires less exertion on my part than the first. This second surrogate, which may perhaps be just the outline of a bull that is coloured in red, is associatively tied to the word, “Threshdohr,” such that it can serve as its replacement when I come upon that word in speech or writing once more.

## 5. Number Signs, Surrogates, and System

I stated in section 1 that this close reading of LZ is to be cashed out by showing how Husserl’s descriptions of the functions and genesis of all signs can be employed to clarify his theory of number signs in PA in three ways. The first two illuminations, which concern the two distinct functions of number signs, are directly accessible. On the basis of the above analysis (section 2), we can say that an authentic presentation of a smaller number can become associatively tied to a numerical sign. If I am then presented with that sign again, the link can become reawakened, where the sign motivates me to collectively combine a certain amount of objects and authentically present the number once more. All of this is to say that number signs, which impel me to execute an authentic presentation of their corresponding small number, operate as the motivational signs as depicted in element 1 of [Figure 1](#) above.<sup>35</sup>

We know that number signs normally do not execute this motivating function, but instead operate as surrogates.<sup>36</sup> It is now clear (from section 3) that when numbers signs serve as replacements, they do so by being confused or mistaken for their natural or conceptual numbers. Whenever I am aware of a higher number or calculate, I do not deal with the authentically presented numbers, but rather with the replacement number signs alone, while still taking myself to be given the number. I operate in a mechanical manner only with the sensuous number signs. Husserl writes, “It is a fact that *in praxi* all numbering and calculating could dispense with recourse to the underlying concepts.”<sup>37</sup> The replacement of the number sign for the number, “makes the conceptual method entirely superfluous.”<sup>38</sup>

<sup>34</sup> Ibidem.

<sup>35</sup> This insight can help one to more clearly understand, in particular, chapter 10 of PA, entitled, ‘Operations on Numbers and the Authentic Number Concepts.’ See 181–92; 191–203.

<sup>36</sup> See Husserl, *Philosophie der Arithmetik*, Hua XII, 194, 236–38, 260; for the respective passages in the English text, see *Philosophy of Arithmetic*, CW X, 205–06, 250–53, 275.

<sup>37</sup> Ibid., 242; 256.

<sup>38</sup> Ibid., 257; 272.

The fact that number signs replace their numbers in this manner makes it understandable (but does not justify) why philosophers of arithmetic had fallen into the trap described in section 1. As those thinkers did not execute a proper investigation of number signs, they could be and were perpetually tricked by the replacing sign, which masquerades itself as the replaced. Simply stated, this mistaking of the number surrogate for the signified number had become permanent for them.

A more extensive examination of Husserl's descriptions of number surrogates in the 1891 text is required for one to understand the third way LZ can help to clarify PA. Even though *number signs perform their replacement operation in the same manner as all other surrogates*, number surrogates are different in that they can only execute that function within the context of a number system. It is seemingly for this reason that Husserl is more concerned with describing the genesis of the number system in PA than he is with providing a full-throated analysis of number surrogates.

There is; however, a serious problem with Husserl's description of the origin of the number system. Without a full explication of the replacement process, the reasons why he thinks that the number system is necessary remain obscure. As such, the following is dedicated to utilizing LZ so as to clarify why Husserl believes that the number system is required. It will be revealed, by applying four insights from LZ (discussed in sections 3 and 4) to Husserl's theory of number signs from PA, that number surrogates face a number of obstacles that other surrogates do not, which *seem* to preclude the execution of their replacing operation. After these difficulties particular to number surrogates has been made clear, I conclude the paper by showing how the establishment of a number system discharges those problems, such that (according to the Husserl of 1891) number surrogates can be utilized both for enumeration and calculation in a manageable and reliable manner.

The first seemingly problematic characteristic of number surrogates is that they must function in a univocal manner. When I see the number-sign, "7,420," this cannot sometimes signify and replace 7,420 things and at other times, 5, 34, or 985 things. The signification must remain unequivocal despite my shifting interests if it is to be consistently reliable and thereby, able to be used in a rigorous arithmetic. It is only when the sign is unambiguous that I can have a definitive recognition of it and am able to immediately distinguish, compare, and contrast this number sign to others.<sup>39</sup> Yet, as we know, Husserl emphasized in LZ that surrogates are equivocal, in that they can inauthentically present different referents depending upon the direction of my interests.<sup>40</sup> This plasticity of the replacement function seems to preclude number surrogates from operating in a univocal manner, which they must if a precise arithmetic is to be possible.

Second, we remember that it was the linguistic motivating sign that impelled me to present the grey square, which served as the surrogate for the computer (element 2 of Figure 1). In contrast, there is (normally) nothing that motivates me to present the number surrogate. When I seek to utilize a number surrogate, I become conscious of it by generating it (element 3 in Figure 1). From this, Husserl concludes that if a precise calculus, which employs these number surrogates, is to be developed, then number signs have

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<sup>39</sup> *Ibid.*, 225; 238.

<sup>40</sup> See note 26 above.

to be constructed in such a manner that they are easy to call up.<sup>41</sup> Yet, as there is an infinite amount of numbers, which could lead one to conclude that there are also an infinite amount of number signs, it seems that only one with psychological powers much greater than any human could employ number signs as surrogates in this way. It simply appears inconceivable that one could generate one out of an infinite amount of number signs so as to inauthentically signify this particular quantity.

Third, Husserl claimed in 1890 that surrogates can replace their signified objects because they are a rough approximation of the latter. Number surrogates clearly do not seem to meet this resemblance-requirement: These signs do not appear to analogize their signified numbers or at least they do not approximate them in a similar manner to how the square's colour parallels the computer's colour.

Finally, just as is the case with the surrogates that signify God and the souls of others, so also are larger number signs genetically primary and principally necessary. We remember that the genetically primary, but factually necessary Threshdohr-surrogate is constituted on the basis of the descriptions of someone who has already seen that animal: I formulate my surrogate by approximating the characteristics of the animal that my friend conveyed to me. In contrast, with regards to greater quantities, it is not only the case that I cannot intuit them, but also (assuming no idealization of psychic capacities) that no human could ever do so.<sup>42</sup> Even if some alien creature or God, who had greater psychological powers, could see this and were to explain what the number looked like, the surrogate I formed on that basis would still be tentative. While I could go and have an authentic and fully accurate presentation of a Threshdohr in Chile and thereby determine whether or not the surrogate I constituted resembles that animal, as I cannot authentically see 839, I could never check the number surrogate against the number itself, such that I could never know if that number sign is appropriate. It seems as if the number surrogate would always be imprecise and in doubt in a way that is entirely unacceptable for an exact calculus.

As number surrogates do not seem to be univocal, manageable, within the pertinent range of approximation, and exact, it clearly appears *as if* they could not function as surrogates. According to the Husserl of 1891, it is these apparent problems that the number system resolves.

Husserl's explication of the genesis of the number system is surprisingly clear. As this topic has been extensively covered in the literature,<sup>43</sup> I only briefly summarize the points relevant for current purposes. Husserl claims that we are able to devise the number system by capitalizing on the fact that lower numbers can be authentically presented. In other words, the surrogative function of number signs is possible because of their motivating operation. For the creation of a functional number system, which discharges the above discussed problems, it is necessary that we associatively tie certain kinds of signs to the authentic presentation of these smaller numbers in a rigorous and methodologically precise way.<sup>44</sup> Husserl claims that the system, which satisfies this requirement, is one that operates

<sup>41</sup> See Husserl, *Philosophie der Arithmetik*, Hua XII, 227–28; for the English text, see *Philosophy of Arithmetic*, 239–41.

<sup>42</sup> *Ibid.*, 191–92; 202–03.

<sup>43</sup> I refer the reader to Micah Tillman's brilliant analysis, 'Husserl's Genetic Philosophy of Arithmetic', see specifically, 148–61.

<sup>44</sup> See Husserl, *Philosophie der Arithmetik*, Hua XII, 225–26 and 235–37; for the respective English texts, see *Philosophy of Arithmetic*, CW X, 238–39 and 249–51.

with a base number.<sup>45</sup> The base number that has become by-and-large standard today is that of ten: We conceive large quantities of objects as consisting of groups of ten.<sup>46</sup>

The establishment of a base-number is most advantageous because it erects a number system that is recursive. During the psychological genesis of this number system for me, (when I first learn to count), I begin by associatively linking each number sign (1, 2, 3 ...) to one and only one authentically presented number. When I reach number nine and then want to signify the next number in the series, I do not learn a new sign, but rather am taught to once more utilize or recur back to the first number in the system.<sup>47</sup> By placing a zero behind the number 1, the number sign can be recognized as referring to ten ones. To signify the next number, I replace the zero with a one in the ones column, such that the sign now refers to a group of ten with one left over. The same recursivity, of course, applies when I reach twenty: Instead of inventing a new sign, I reapply the number sign 2 in the tens column, such that this number signifies two sets of ten.

Once I have learned this recursive number system, I (normally) do not experience number signs in this manner: I am able to move away from this more mentally taxing approach. When I see the number sign, “7,486,” today, I am not associatively impelled to explicate the referent as seven sets of ten sets of ten sets of ten sets, four sets of ten sets of ten sets, eight sets of ten sets, and six left over. Instead, as has been emphasized in this paper, the sign replaces the number, where I deal and work only with the former in a mechanical manner.<sup>48</sup> On the basis of this sketch of Husserl’s views, it can now be revealed how this genetic origin of this systematic ordering of the number signs and the arithmetic system to which they belong allows for number surrogates to execute their replacement function.

First, the recursivity of the number system allows for all numbers signs to refer to their numbers in a univocal manner. We are assured that the smaller numbers signs signify in an unambiguous way, because we have set them up such that they have a one-to-one correspondence to their authentically presented numbers. It is because, as Tillman writes,

The algorithm for constructing complex number signs out of simple signs so exactly mirrors the algorithm for conceiving of large numbers as collections of smaller numbers that the number sign allows us to tap into, or link up with, the system of number conceptualization.<sup>49</sup>

By continuing the formulation of number signs according to the established recursive method beyond those that have authentically presentable numbers, the univocal link between the signs and their numbers is maintained, where each higher number sign continues to have a one-to-one correspondence to its number.

This recursive structuring of the number system also removes the ostensible problem, that I would only know that these higher number signs are precise and employable in an exact arithmetic if I were to check them against the authentically presented larger numbers

<sup>45</sup> *Ibid.*, 223–42; 241–56. For further information on this point, see Hopkins, *The Origin of the Logic of Symbolic Mathematics*, 132–40; Ierna, ‘The Beginning of Husserl’s Philosophy Part 1’, 34–36; Tillman, ‘Husserl’s Genetic Philosophy of Arithmetic’, 148–51.

<sup>46</sup> *Ibid.*, 228–33; 241–47. Ten is not the only base-number that could have been widely adopted. In fact, Husserl affirms that a system with the base number 12 (which he frequently writes is the greatest number we can authentically present) may have been even more practical and efficient.

<sup>47</sup> *Ibid.*, 235–40; 249–54.

<sup>48</sup> See in Husserl, *Philosophie der Arithmetik*, Hua XII, the section entitled, “Arithmetic does not operate with ‘authentic’ number concepts,” from chapter 10, 190–92; for the English text, see *Philosophy of Arithmetic*, CW X, 200–03.

<sup>49</sup> Tillman, ‘Husserl’s Genetic Philosophy of Arithmetic’, 156.



(as I test the Threshdohr surrogate against the presentation of the Threshdohr itself). It is not necessary for me to perform this (impossible) task as the direct correspondence between the sign and the signified number guarantees number surrogates' accuracy.

Numbers signs can be easily brought to consciousness, compared, contrasted, and used in calculation because of the number system's repeating nature. Concerning generation, I do not have to memorize 10,000 distinct signs to be capable of counting to that large sum. Instead, I only must remember 10 number signs (0-9) and continually implement them in the repetitive manner described above. I am able to straightforwardly compare and contrast number signs because their recursivity is structured via columns (ones, tens, hundreds, etc.): I place a number sign in a distinct column depending upon how many amounts of tens that sign is supposed to signify. When I am then presented with two number signs, I can immediately ascertain which quantity is greater by first examining the left most column (which concerns the greatest multiples of ten) and contrast the number signs found there ( $\overline{778} > \overline{341}$  and  $\overline{778} > \underline{(0)78}$ ). If this does not settle the matter, I continue comparing the number signs in the columns from left to right until I find a disparity ( $\overline{665} > \overline{663}$ ) or ultimately see them as equal ( $1,356 = 1,356$ ). Finally, I only need memorize the addition, subtraction, multiplication, and division tables for the number signs up to 10 in order to be able to execute those operations with even greater number signs. For example, I do not have to memorize the result of 248 divided by 8 in order to know the answer to this problem. I am instead able to exploit the recursivity of the system by dividing (mechanically manipulating) (sign) 24 by (sign) 8 and then (sign) 8 by (sign) 8, so as to arrive at the answer, (sign) 31.<sup>50</sup>

Finally, Husserl surprisingly claims that the repetition of the number system establishes a structural similarity between the number signs and numbers. Even though the signs are scribbles on the page, he still asserts that they do meet the approximation requirement by having this structural analogy to their signified numbers.<sup>51</sup> Dallas Willard explains this well by writing,

That is, <the signs> designate the precise number that they do in virtue of co-reference to the type of physical, sense perceptible structure which they essentially manifest ... What they designate (the various numbers) are designated in virtue of having and *as* having a relationship – a structural analogy or similarity – to the numerals employed.<sup>52</sup>

<sup>50</sup> Concerning all of these points, see Husserl, *Philosophie der Arithmetik*, Hua XII, 256–57 and 238; for the respective English texts, see *Philosophy of Arithmetic*, CW X, 281–92 and 252.

<sup>51</sup> Husserl is remarkably consistent about the fact that surrogates need to be within the range of similarity to their replaced objects in PA. For example, he claims that the process rudiment is able to perform its signitive and surrogative function because it resembles the quantity of objects that would be authentically presented if I collectively combined them. He writes,

<The process rudiment> offers, on the one hand, an *approximation* of the authentic quantity-formation and of the authentic subsumption under the quantity-concept ... The process rudiment than serves, according to our previous analysis, as a sign for the intended full process.

Husserl, *Philosophie der Arithmetik*, Hua XII, 212–13; for the English text, *Philosophy of Arithmetic*, CW X, 225, emphasis and translation mine. For more information on the process rudiment, see Ierna, 'The Beginning of Husserl's Philosophy Part 1', 17–20 and Hopkins, *The Origin of the Logic of Symbolic Mathematics*, 122–36 and, 'Authentic and Symbolic Numbers', 50–57.

<sup>52</sup> Willard, 'Translator's Introduction to Philosophy of Arithmetic', LIII–LIV, emphasis original. Willard continues, on page LIV, writing,

And it is only because of the structural correspondence of the numeral system to the order in the concepts, and the structural correspondence of the concepts to the order among the numbers themselves, that the mere manipulation of sensible signs, the numerals, serve the epistemic goals they do in arithmetical practice.

With this final point recognized, the value of LZ for understanding Husserl's discussion of the genesis of the number system in PA is revealed: By placing the latter work in the context of the former, we can properly grasp why the particular recursivity of that system is required for number surrogates to be constructed and function in a reliable, manageable, precise, and correctly analogizing manner. The full importance of LZ is realized when this insight is paired with those arrived at above; namely, that by reading PA through the lens of LZ, we do not just know *that* number signs can either motivate me to authentically present the smallest numbers or serve as their surrogates, but we also understand *how* this occurs and *why* Husserl describes these experiences in the way he does. With the explication of these three points, I have hoped to demonstrate why, "On the Logic of Signs (Semiotic)," is to be recognized as a historically and philosophically important work, not only because it contains Husserl's sole detailed explication of surrogates. Rather, LZ is also shown to be significant because a close reading of it motivates the crucial hermeneutical reversal, where one now sees this short 1890 text as the necessary introduction to and proper context within which to read his *Philosophy of Arithmetic*.<sup>53</sup>

## ORCID

Thomas Byrne  <http://orcid.org/0000-0002-8809-3664>

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<sup>53</sup> I find it necessary, as an addendum, to mention one of the more serious difficulties of Husserl's theory of surrogates. In both PA (193–94; 205–07) and LZ (371–72; 49–50), Husserl suggests that linguistic signs are also able to function as surrogates. This seems; however, out of step with everything else he writes in both texts. On the one hand, it is self-evident that linguistic signs (words and sentences) could function as associatively motivating signs, which impel me to authentically or inauthentically present the signified objects. On the other, it seems inconceivable that language signs themselves could replace their signified objects, as they do not resemble them (as Husserl will later emphasize in his Logical Investigations. See *Logische Untersuchungen*, HUA XIX, 586–89; for the English text, see *Logical Investigations*, 218–20. Concerning the evolution of Husserl's understanding of the meaning and signitive operations of linguistic signs, see Byrne, 'Surrogates and Empty Intentions'.) While Husserl quickly recognized this problem, he still tried, for a very short period of time, to maintain this tenet by claiming that the grammar of language performs the same function for linguistic signs that the number system does for number signs: The framework of grammar and the number system establishes a parallelism between the pertinent signs and their signifieds, such that the former structurally resembles the latter. Reto Parpan brilliantly examines Husserl's attempts to argue for this point in the second half of the first chapter of his dissertation. See 'Zeichen und Bedeutung', 30–52. Husserl soon saw that this solution was untenable and, for this reason amongst others, had already, by 1893 or 94, entirely given up the idea that signs function as surrogates. See 'Anschauung und Repräsentationen. Zur Klassifikation der Repräsentationen (1893–94)', Hua XII, 406–11 and 'Psychologische Studien Zur Elementaren Logik (1894)', Hua XXII, 92–123. For the respective English texts, see 'Intuition and Repräsentationen: Towards a Classification of Repräsentationen', CW V, 452–58 and 'Psychological Studies in the Elements of Logic', CW V, 139–70.

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