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## Passing the Calvino Test?

### Writing Machines and Literary Ghosts

Le langage articulé n'appartient qu'à l'homme, d'accord. Mais accomplit-il ce miracle, au moyen d'un nombre fini de règles, d'engendrer un nombre infini d'énoncés? Et peut-on en tirer argument en faveur de la place unique occupée par l'homme dans la création?

C. Lévi-Strauss and D. Eribon, *De près et de loin* (1988)

Half a century ago, in 1967, the novelist Italo Calvino delivered his famous lecture “Cybernetics and Ghosts” at various Italian universities. In an inspiring manner, he raised the question whether a computer will ever be able to replace a human poet. He asked whether or not a computer could possibly establish the interplay of linguistic signs, literary conventions, anthropological constants, social roles, and technical media from which literary texts have always emerged throughout history. From the very beginning, Calvino reminds his audience of a primal scene of all literature: a storyteller can use a limited amount of words to tell a potentially unlimited number of stories by selecting and arranging certain words, he puts “the possibilities implied in his own language” into a *specific form*, “by combining and changing the permutations of the figures and the actions, and of the objects on which these actions could be brought to bear” (Calvino 4). Influenced by Claude Lévi-Strauss’ structuralist anthropology, one of the most prominent theories of the mid-1960s, Calvino concludes that the basic narrative operations may not differ much between folks or cultures, “but what can be constructed on the basis of these elementary processes can present unlimited combinations, permutations, and transformations” (6).

It is precisely this dialectic relation between the invariance of patterns or forms and the variation of a limited number of elements that makes Calvino regard computers (at that time large mainframes only) as “electronic brains . . . capable of providing us with a convincing theoretical model for the most complex processes of our memory, our mental associations, our imagination, our conscience” (8). Of course, such an analogy between a human brain and a computer is not convincing for us today, neither from the point of view of neurosciences, nor from computer sciences and even less so when Calvino also compares the human brain to a chessboard “with hundreds of billions of pieces” (8). However, if we adopt the view of cybernetic epistemology, Calvino’s

approach of reflecting on similarities between nervous systems, computers and social systems is still a far-reaching conception.

Calvino's answer to his opening question whether a poet can be replaced by a computer is ambivalent. On the one hand, in a perfectly materialist manner, he argues that a poet has always been a writing machine insofar as he combines letters according to defined rules and historically rooted conventions. Consequently, a technical machine should also just as well be able to do this combinatorial work—but in a faster and more efficient way. On the other hand, Calvino doubts that any text produced by such a machine would be distinguished by those specific qualities of fiction, poetry and drama, which scholars so far have analyzed as their “literariness.” In order to decide this question, Calvino proposed a thought experiment following the famous “Turing test.” The mathematician Alan Turing introduced this test in 1950 to evaluate whether machines can think: a computer would have passed the test and thus had to be regarded as intelligent if a human evaluator was not able to reliably tell the difference between text messages delivered by a computer and those from a human being (cf. Turing). By analogy with this test arrangement, Calvino raises the even more speculative question whether or not a “writing machine” may be developed “that would bring to the page all those things that we are accustomed to consider as the most jealously guarded attributes of our psychological life, of our daily experience, our unpredictable changes of mood and inner elations, despairs and moments of illumination” (Calvino 12).

In this essay, I would like to follow the paths laid out by Calvino by exploring the relationship between language, media, and literary form. To this end, I will look into the history of combinatory literature, particularly of the Baroque period in Germany, and analyze its relations to both the history of ideas and the history of media technologies. Further, I will confront these historical examples of mechanical, as well as computer-aided text-producing machines, with Calvino's claim that works written by a “true literature machine” would have to be accepted by *human readers* as “literature.” Calvino—and this, I think, is the continuing provocation of his essay—asks for the specific features of “*literary*” texts, which allow readers to differentiate between “literature” and other forms of linguistic expression.

## 1 Reflecting on Language: Rule-based Poetics and Literary Machines

Calvino was a member of the international, though predominantly French, Oulipo group—the acronym is an abbreviation of *Ouvroir de la littérature potentielle* [Workshop of Potential Literature]—whose members kept with the long

tradition of combinatory literature. Jacques Roubaud, for example, even argued that a writer, instead of producing closed works, should only provide “constraints” (*contraintes*)—or rather algorithmic rules—to free the *potentiality* of literature:

The Oulipo is potential literature because the givens of a structure are those of all the virtualities of free objects, if they exist, of all the virtualities of the texts that realize it, necessarily multiple; the unicity of the Oulipian text actualizing a constraint. . . . being then envisaged only on the condition that this texts contain all the *possibilities* of the constraint—texts and virtual, potential readings: multiplicity again but, unlike that which traditionally results from the multiplication of examples, implicit and, at the outside, imaginary multiplicity . . . exhausted by the very gesture that announces or writes the structure. (Roubaud 95)

However, the Oulipo members have not only been developing their own “constraints,” but also investigated and reinvigorated historic examples from the Ancient world, the Middle Ages and the Baroque era, which they ironically qualified as “plagiarism by anticipation” (Le Lionnais 31). By referring to these long-known rule-based procedures, they argued that “inspiration,” in general, is a limited and overrated resource. From the Jewish Kabbalah to Ramon Lull’s *Ars magna generalis ultima* (1305–1308), from Athanasius Kircher’s famous *Ars magna sciendi* (1669) and Gottfried Wilhelm Leibniz’s *Dissertatio de arte combinatoria* (1666) to Raymond Queneau’s *Cent mille milliards de poèmes* (1961), and finally to the latest computer-based text generators, there have been lots of examples that can be traced back to only a few fundamental features, but also seem to have guided Calvino’s conception of the “literature machine.” First, there is a limited stock of signs from which an abundance of texts can be generated by using algorithmic procedures. Second, such text generation requires that the processes of word and sentence formation have to be reproduced in a sort of micro-grammar (cf. Cramer), and finally, it is to be expected that the result of this processing reveals a hidden meaning, something that could neither be predicted by the “author,” nor by the “reader.”

In German literature, for example, Baroque writers in the 17<sup>th</sup> century did not consider the successful work of art as an achievement of creative genius but rather adopted and varied poetic methods and procedures. Georg Philipp Harsdörffer, for example, in his *Poetischer Trichter* (1647–1653) claimed that “[e]ven though quite a few persons are born to create respectable art/ this art is not born with them; it has to be learned/ as everything that humans want to know” (2).<sup>1</sup> In addition, these poets also sought to enhance the poetic potential of the German language. Linguistic historiography has identified three ap-

proaches of Baroque linguists for explaining the motivation of linguistic signs.<sup>2</sup> Justus Georg Schottelius, who was noted for his linguistic patriotism, published a variety of influential studies on German language and literature such as *Teutsche Sprachkunst* (1641), *Teutsche Vers- oder Reim-Kunst* (1645) and, above all, *Ausführliche Arbeit Von der Teutschen Haupt Sprache* (1663) that were based on the idea of an “ideal German” preceding any specific language use and directly expressing the true being of things. Unlike these linguistic patriots, the theosophist Jakob Böhme held a mystical view of language and claimed that there is a God-given proto-language. According to Böhme, God in a very literal sense had created things by *naming* them. Hence Böhme regarded any linguistic activity of human beings only as a reconstruction of intrinsic properties of things (cf. Hundt 49). On the other hand, the linguistic universalism represented by Gottfried Wilhelm Leibniz and others is different from both aforementioned attitudes. Leibniz considered the whole world a closed system, an order of things that can be algorithmically produced and varied from a pre-existing and limited set of elements. The “universalists” were searching for the common grammatical structures of *all* languages, and beyond this, they were even trying to create an artificial and universal language. All these Baroque linguists and poets, however, have in common that they expected to draw conclusions about *hidden* organizational and creative principles either from analyzing the rules of word and sentence formation or from implementing mechanical principles into their poetic production.

In his *Ausführliche Arbeit Von der Teutschen Haupt Sprache* (1663), Schottelius claims that any language can be traced back to a limited number of stem words, “which moisten the whole tree of language like succulent roots/ so that its little shoots, its branches and venous twigs can spread assuredly and orderly in their unfathomable variety” (Schottelius 50).<sup>3</sup> Of course, these stem words do not suffice to name things precisely. According to Schottelius, the complex structure of a language is dependent of varying combinations of words from basic elements. Word stems, word-forming and inflectional morphemes can be combined quite flexibly to create new words exceeding the habitual language use. As the linguistic historian Andreas Gardt argues, words cannot be simply considered a semantic “sum” of its constituents but “rather a set of an atom-like combination of single units” (Gardt 206).

The anagram is certainly the simplest and best-known example of such a literary genre: it is a word game that is based on rearranging the letters of a word or a phrase. At first, the connection between a signifier and a signified is dissolved, then the signifiers are rearranged, and only finally semantics comes into play because signifieds (and referents) need to be found for the newly established strings of signs. These strings are the “variable product of the combinative function—and not as a preliminary absolute, *ne varietur*” (Starobinski

8). The anagram seems to have its origin in magical thinking. For example, the name anagrams of the Greek poet and grammarian Lycophron expressed the characters of persons that made them ideal for panegyric but also for polemical writing. In Jewish mysticism, the anagram was also used as a method of combinatory literature. Here is Claude Lévi-Strauss:

If such anagrams represent a particular application of a device which is both archaic and fundamental, it could conceivably have been perpetuated not by conscious observation of rules, but *through unconscious conformity with a poetic structure that was perceived intuitively through experience of previous models evolved in the same conditions*. After all, the objection that I come up against, on the part of conservative thinkers who refuse to accept that poetic inspiration depends on the play of a combinatory system, itself has its roots in a very old mysticism which, since the earliest times, may have consistently relegated the true mechanisms of aesthetic creation to the unconscious. (*The Naked Man* 651; emphasis added)

## 2 Combinatory Machines and Text Generators

This conjunction of the unconscious and the notion of “mechanisms of aesthetic creation” is important for the understanding of Baroque literature. In German Baroque, anagrams were popular as a creativity-stimulating parlor game at first, before they were eventually incorporated into literary texts. For Harsdörffer, the anagram or *Letterkeer* [letter twist] was a technique of poetic invention because it “can move letters and bring forth a different view” (*Poetischer Trichter* 17).<sup>4</sup> As he was convinced that poetic writing could be learned, he gave detailed instructions for producing a well-done anagram: it had to be written in German and was not allowed to contain any Latin words. This was a common concern of all Baroque poets including Martin Opitz who cited the anagram as evidence for the equality of the German language with Latin and other European languages. Furthermore, the anagram had to be formed *numerically correct*, i.e. no letters were to be omitted and it was to generate *semantically meaningful* verses (cf. Harsdörffer, *Poetischer Trichter* 18). These principles allowed for designing mechanical devices, and this also was reflected in many poetic treatises of that time.<sup>5</sup>

The rather simple principle of generating an abundance of signs from a limited stock also is the basic idea of more advanced mechanical devices, which have been constructed in the course of the last centuries to facilitate literary production by combining words or attributes. The prototype of such a logical machine was the *Ars magna* devised by the Catalan monk Ramon Lull.

Lull's machine consists of a stack of three concentric disks mounted on an axis where they are able to rotate independently. The disks were progressively larger from top to bottom. Nine fundamental terms, the so-called *principia absoluta* comprising the main topics of scholastic philosophy, were related to the letters from A to K. By rotating the disks, a large number of random statements were to be generated that could not have been predicted in advance. The *Ars magna sciendi*, Athanasius Kircher's adaptation and elaboration of Lull's *Ars magna*, illustrates a common tendency of the Baroque era. In addition to books, alternative *Aufschreibesysteme* (Friedrich Kittler) were developed, which stored traditional knowledge and generated new knowledge at the same time. However, neither the storing nor the production of texts were ascribed to an author and the texts were not written or printed in syntagmatic chains but machines were designed that generated texts from a "database" by using combinatorial procedures.

This refers back to my considerations of linguistic theories from the Baroque era. Harsdörffer implemented methods of generating stem words and word formation rules in his *Fünffacher Denckring der Teutschen Sprache* (1651). He claimed that his machine was able to mechanically reproduce all possibilities of German without having to compile voluminous dictionaries. The *Denckring* consists of five rotating disks that the user has to cut out from the book at first: "This leaflet has to be cut out, parted into five disks and fastened onto five equal leafs of paper so that each disk can be turned around separately and when this has happened one has to glue that five-fold leaf back in" (Hundt 283).<sup>6</sup>

On the inner disk, there are 49 prefixes followed by 60 initial letters, 12 medial and 120 final letters as well as 24 suffixes. Leibniz calculated that Harsdörffer's *Denckring* makes possible 97,209,600 combinations. Further, he recommended applying the ideas of *ars combinatoria* to all sciences ("alle *scientien*"). In 1671, he even declared that he wanted to demonstrate that "all composite notions in the whole world are reduced to a few simple ones as their Alphabet; and by the combination of such an alphabet a way is made of finding, in time, by an ordered method, all things with their theorems and whatever is possible to investigate concerning them" (qtd. in Russell 283). Harsdörffer did not only use his *Denckring* for representing all possibilities of word formation but he also considered it a useful tool of literary writing:

This word-generating procedure then is completely accurate in creating a complete German Dictionary and we retain our opinion that all these composite words should be allowed as good German, especially in poems, even though they might not be used otherwise. (*Deliciae mathematicae et physicae* 518)<sup>7</sup>

This is Harsdörffer's solution of the problem of the non-semantic "blind" words. He thus resolves the problem that his machine inevitably generates words that make no sense in the German language by declaring the outcome of his *Denckring* to be the proper language. One could argue that this reveals the poetic potential of the machine; it becomes a generator of poetic invention or a mobile rhyming dictionary "for inventing rhymes by looking for the rhyming syllables on the third or fourth disk and then turning the second disk to add the rhyming letters" (Harsdörffer, *Deliciae mathematicae et physicae* 518).<sup>8</sup>

At a first glance it seems to be a huge step from the Baroque use of rather simple mechanical devices to the use of ever more advanced electronic computers. This step was already taken in the neo-avant-garde movements of around 1960, for example by the Oulipo's "Centre Pompidou Experiment" (1961, cf. Fournel) or, in Germany, by the "Stuttgarter Gruppe," where the mathematician and software engineer Theo Lutz produced his famous *Stochastische Texte* [Stochastic Texts] (1959) on the ZUSE Z 22 mainframe of the university's computer center. For the "Stuttgarter Gruppe," these first pioneering experiments seemed the "incunables of 'artificial poetry,'" as Reinhard Döhl recalls (cf. Döhl). According to Max Bense, the *spiritus rector* of the group, such computer-generated "artificial poetry" demonstrated, in the context of Concrete Poetry, that a poem had to be a reality in itself rather than an individual's statement about a pre-existent world, as is the case in "natural poetry":

By natural poetry, a sort of poetry is understood that . . . requires a personal poetic consciousness; it requires a consciousness that possesses encounters, experiences, feelings, memories, thoughts, imaginations, etc.; in short, a pre-existent world and the ability to express it. . . . Contrary to this, artificial poetry is a sort of poetry that does not possess—if it has been created for example by a machine—any personal poetic consciousness with encounters, experiences, feelings, memories, thoughts, imaginations, etc., in other words, where no pre-existent world exists and in which writing is no longer an ontological continuation by which the world-aspect of the words could be related to a subject. Thus, neither a lyrical ego nor a fictitious epic world can be meaningfully set apart from the linguistic specification of this poetry. Therefore, while for natural poetry an intentional beginning of the process of words is characteristic, only a material origin can exist for artificial poetry. ("Über natürliche und künstliche Poesie" 143)<sup>9</sup>

As "pure" and technological literature, "artificial poetry" was supposed to be liberated from the burden of metaphysical, hermeneutical or ideological traditions. Instead, the avant-garde artists of the computer age were called on to assign the authorship to a machine and, in the end, to pure mathematics.<sup>10</sup> At

first view, Bense's manifesto reads like the perfect technological ideology of the early 1960s, neglecting everything that has made literature—and poetry in particular—meaningful to human beings. However, Bense was well aware that the computers of his time could come nowhere near to generating the “absolute” poetry, that they would in no way be able to write their code themselves, but would remain limited to combining human and machine writing: “Of course, the differences mentioned above in the first place are valid only ideologically. Probably only the approximations are really existent” (*Einführung in die informationstheoretische Ästhetik* 144).<sup>11</sup>

### 3 Inside the Language Vacuum: Myth and Literature

The idea to generate literary texts on or with computers was soon taken up by other computer centers and individual artists during the 1960s, and it has been one of the main strands of so-called “electronic literature” ever since, culminating in more recent poetry generators by Nick Montfort, Scott Rettberg and others, as well as in more complex art systems such as John Cayley's and Daniel Howe's *The Readers Project*. All these attempts to replace or to expand “natural” by “artificial poetry” and to transcend traditional cultural conventions and institutionalized divisions of art and society have clearly placed electronic literature in the tradition of 20<sup>th</sup> century avant-garde movements. Yet, in order to be recognized as “literature,” these mechanically produced or computer-generated texts would still have to pass the “Calvino Test.” The benchmark for this thought experiment is very high. Calvino argues that avant-garde writers by then had only used computers to produce disorder instead of using them to produce “classicist” texts, against which computers then, in a second step, would be able to react autonomously by establishing a new and true avant-garde. In other words, a literary computer would have to be more than just an advanced tool at the disposal of an avant-garde artist. Instead, it would have to be able to initiate the revolt against the classical form *itself*:

The true literature machine will be one that itself feels the need to produce disorder, as a reaction against its preceding production of order: a machine that will produce avant-garde work to free its circuits when they are choked by too long a production of classicism. In fact, given that developments in cybernetics lean toward machines capable of learning, of changing their own programs, of developing their own sensibilities and their own needs, nothing prevents us from foreseeing a literature machine that at a certain point feels unsatisfied with its own traditionalism and starts to propose new ways of writing, turning its own codes completely upside down. To gratify critics who look for

similarities between things literary and things historical, sociological, or economic, the machine could correlate its own changes of style to the variations in certain statistical indices of production, or income, or military expenditure, or the distribution of decision-making powers. That indeed will be the literature that corresponds perfectly to a theoretical hypothesis: it will, at last, be *the* literature. (Calvino 13)

This utopian (or rather dystopian?) vision serves as a corrective against the “author function” that—at around the same time, although with a different focus—had also been famously attacked by Michel Foucault and Roland Barthes. Instead of incorporating the intentions of an author in the interpretation of texts, as had been traditionally practiced in literary criticism, the literary scholar of the future would “give place to a more thoughtful person, a person who will know that the author is a machine, and will know how this machine works” (Calvino 16). On the one hand, this “more thoughtful person” would have to know very well “that literature is entirely involved with language” (18); on the other hand, however, he would also have to realize that “literariness” can never be the result of algorithmic production only, be the sentences syntactically correct or not. Although, for Calvino, literature is “a combinatorial game that pursues the possibilities implicit in its own material, independent of the personality of the poet” (22), it also, seemingly paradoxically, is a mode “*to escape from the confines of language*” (18; emphasis added) in order to express the inexpressible. This transgression is not determined; it can by no means be formalized but rather emerges as an unpredictable outcome of the combination of elements. The literary qualities of this combinatory game only become apparent if the reader

at a certain point is invested with *an unexpected meaning*, a meaning that is not patent on the linguistic plane on which we were working but *has slipped in from another level*, activating something that on that second level is of great concern to the author or his society. The literature machine can perform all the permutations possible on a given material, but the poetic result will be the *particular effect of one of these permutations on a man* endowed with a consciousness and an unconscious, that is, an empirical and historical man. It will be the *shock that occurs only if the writing machine is surrounded by the hidden ghosts of the individual and of his society*. (22; emphasis added)

The “other level” mentioned by Calvino is myth, the “buried part” of every story, which has been repressed from consciousness, but where, nonetheless, those “ghosts” are thought to be hidden that only literature can bring to the fore.

Myth is nourished by silence as well as by words. A silent myth makes its presence felt in secular narrative and everyday words; it is a *language vacuum* that draws words up into its vortex and bestows a form on fable. . . . Literature follows paths that flank and cross the barriers of prohibition, that lead to saying what could not be said, to an invention that is always a reinvention of words and stories that have been banished from the individual or collective memory. (19; emphasis added)

This reminds of all the efforts from Lull to Harsdörffer to reveal something hidden behind the mere combination of letters, something that may be brought to the fore by unfolding the potentiality of language. However, this does not yet answer the question of how specific qualities of *literary* texts can be described. Calvino seems to have this in mind when he reflects on “the relationship between combinatorial play and the unconscious in artistic activity” (20). His definition of myth as a “language vacuum” may be surprising, since without any doubt literary texts consist of nothing other than inscription.

“Cybernetics and Ghosts” was certainly inspired by the works of Claude Lévi-Strauss with whom he was in touch since he had moved to Paris in 1967, at the heyday of Structuralism when Lévi-Strauss’ seminal books *Anthropologie structurale* [Structural Anthropology] (1958), and *La pensée sauvage* [The Savage Mind] (1962) had a strong impact on intellectual debates and when he was in the midst of working on his four-volume opus magnum *Mythologiques* (1964–1971). Lévi-Strauss’s structural anthropology aims at discovering *deep* structures that exist in all cultures and determine all forms of cultural expression, including literature. In myths, he argues, anthropologists can discover “the complete range of unconscious possibilities” that are to be expressed, for example, in artworks according to rule-based combinatorics. The number of possible combinations, however, according to Lévi-Strauss, is not unlimited (*Structural Anthropology* 23).

To be more precise, myths are *linguistic* constructions—but of a specific kind. They are “both the same thing as language, and also something different from it” (209). To understand this difference, Saussure’s famous distinction between the language-system (*langue*) and the meaningful speech acts (*parole*) is to be complemented by a third level: the “mythic language” that consists of different elements, the so-called “mythemes” (209). Mythic language is thought to be an underlying permanent structure, a “specific pattern [which] is timeless,” as “it explains the present and the past as well as the future.” By exploring the grammar of mythic language, Lévi-Strauss believes to identify objective structures of the human unconscious, and as he claims “to show, not how men think in myths, *but how myths operate in men’s minds without their being aware of the fact*” (*The Raw and the Cooked* 12; emphasis added). As “second-order codes,”

myths both determine and limit the possibilities of free expression of human beings (using the “first-order code” of human language):

[I]f it were possible to prove in this instance, too, that the apparent arbitrariness of the mind, its supposedly spontaneous flow of inspiration, and its seemingly uncontrolled inventiveness *imply the existence of laws operating at a deeper level*, we would inevitably be forced to conclude that when the mind is left to commune with itself and no longer has to come to terms with objects, it is in a sense reduced to imitating itself as object; and that since the laws governing its operations are not fundamentally different from those it exhibits in its other functions, it shows itself to be of the nature of a thing among things. The argument need not be carried to this point, since it is enough to establish the conviction that if the human mind appears determined even in the realm of mythology, *a fortiori* it must also be determined in all of its spheres of activity. (10; emphasis added)

This is a far-reaching assumption, since for Lévi-Strauss these “basic and universal laws” operating at a deeper level define an “inventory of mental patterns” (10),<sup>12</sup> which, as a whole, afford a general set of possibilities of human thinking and expression. This corresponds to Calvino’s claim that such mythic structures are still determining artistic creativity today; in other words, that they *constrain* and *frame* the products of human imagination, which otherwise would be amorphous. If this is the case, established literary genres and formal conventions can be traced back to very basic cultural patterns, even to anthropological dispositions at last (cf. Eibl). It is not by coincidence that none other than Johann Wolfgang Goethe claimed that all literary genres (“Dichtarten”) can be reduced to three “pure *natural forms* of poetry”: “the clearly telling, the enthusiastically excited and the personally acting: Epic, Lyric und Drama” (Goethe 187).<sup>13</sup> The idea is that such generic structures are based on deeply rooted mental representations from which lots of various literary forms have developed subsequently. These forms, of course, can be regarded as reactions to fundamental cognitive and social problems of humankind—as had been myths, cultic rituals, songs and prayers before. Every literary text, in Lévi-Strauss’ understanding thus is a singular event that is based on an underlying structure: “events in this sense are only one mode of the contingent whose integration (perceived as necessary) into a structure gives rise to the aesthetic notion” (*The Savage Mind* 27).

Of course, this integration into given structures is also subject to media technologies. It makes a difference whether a story is told by a storyteller or a poem is performed by a reciter—or if the text is silently read from a book or even from a computer screen. And it makes an even larger difference when

aesthetic practices are carried over to software systems so that stories and poems, performances and games are always and inevitably co-produced in a more or less autonomous way by networked computation and under the influence of “Big Software” corporations (Cayley 17).

The programmable and networked computer is adding something that has not been available in books and other print media. It is certainly true that, as Katherine Hayles puts it, “electronic text is more processual than print, it is performative by its very nature.” But I am inclined to doubt that electronic text, as Hayles continues, is “independent of whatever imaginations and processes the user brings to it, and regardless of variations between editions and copies” (Hayles 101). When the “work” itself *is* a processing entity, “the computer is also a writer, and the software programs it runs to produce the text as process and display also have complex and multiple authorship (not to mention the authoring done by hardware engineers in configuring the logic gates that create the bit stream)” (Hayles 105). One may regard this quite explicitly as a turn against any notion of “creativity,” at least if creativity is only considered an activity of a particularly gifted person. Instead, according to Actor-Network Theory, “creativity” is either distributed between various human beings *or* between human and non-human actors, and it can be distributed across time and space (cf. Schäfer). In this process, something effectively happens or emerges “for another first next time” (Harold Garfinkel): “an ‘event’ occurs which has a positivity of its own that cannot be limited to its origins and determinants, no more than to its effect” (Hennion and Grenier 346).

But still, it is important not to forget Calvino’s statement that even such peripheral “events” can only be regarded as “literature” if the reading of such a text-as-process is in a dialogue with previous experiences of reading literature. In order to experience a piece of electronic literature *as literature*, the reader has to *simultaneously* correlate the output of the computer system with his imagination, which is inevitably rooted in traditional notions of fiction, poetry or drama that—to rephrase Lévi-Strauss—operate in his mind without him being aware of the fact. This still is the case even if a current reading comes into conflict with the reader’s horizon of experience. Consequently, Calvino in defining “literariness” insists on the existence of the “ghostlike” imprint of symbolic processes. To enable the rise of the aesthetic notion, the capability of computers to generate and to form syntactically correct sentences is not enough. As Peter Gendolla argues:

. . . it rather is crucial that the paradigmatic fields generated by them, or better, that the horizons of association producing the ‘ghostlike’ possibilities or variants of contextualization that suddenly emerge in the interfaces between the encoding by machines and the decoding by

humans, are *poetically* ‘correct’. Aesthetic or literary demands are only fulfilled through a *double* reflection: by opening up *both* intertextual *and* intermedial realms of allusion, by *simultaneously* combining imaginary and physical-medial elements of man and machine. (171)

## 4 The Readers Project

*The Readers Project* (2013) by John Cayley and Daniel Howe is a project whose various installations and performances comment on *and* play with these issues. The project consists of a collection of “art systems” that relate to writing *and* to reading, to human readers’ encounters with literary language. However, it is essential that the “readers” that the title of the project refers to are not—or at least not only—human beings who are reading a literary text. Instead, they are software agents that traverse a projected page following different behavior patterns. Here, for example, is the artists’ description of the so-called “Unconstrained Perigram Reader”:

Having read a word, this reader also looks around at its typographic neighbors. Whereas the Perigram Reader is only interested in its ‘east-erly’ neighbors, this reader will consider whether any adjacent word, even the preceding word, would form a perigram. If it finds such a phrase, the reader may read in the direction of the viable word. This reader wanders and may be momentarily caught in eddies and loops. It is also, however, weighted to proceed slowly through the text. Visually, it ‘haloes’ the words at the center of its attention. (Cayley and Howe)<sup>14</sup>

The output of the “readings” of this (or any other) “reader” is represented on different displays *within* the artwork, which means that the whole of the work as it can be experienced by a human reader consists of an arrangement of various screens, depending on the particular setting of the installation. Scott Rettberg, as an example, gives an instructive report from an exhibition in Dundee in which already the use of the past tense indicates that this is only *one* particular staging of the project:

The human reader . . . experienced the work on a wall-mounted screen. The operations of the reading agents were represented in two different ways—by a highlighted portion of the text that represented the reader’s attention, and through an iPad tethered to the main display that represented the program’s focus by showing the individual word that had drawn the program’s focus at the given time. The human reader’s experience of the work is not limited to the operations

of the agents, but also reading the texts the system moves through, in this case ‘misSpeltLandings’ and ‘poeticCaption’—both of which are also meditations on the process of reading in typographic space. (3)<sup>15</sup>

Rettberg’s report illustrates that, on the one hand, the human readers are confronted with a fixed narrative text that is and remains *one* component of the work, but, on the other hand, also with constantly changing instantiations of additional *poetic* texts that are generated during the reading process. This reading process, at the same time, turns out to be also a writing process. The textual events are emergent phenomena of co-dependent agencies of human and non-human actors. *The Readers Project* thus, in addition to the conventional reading of a story, also raises the awareness for the simultaneity of program and process, of pre-scripted procedures and the performance, or more generally for the interactive nature of meaning-making “between several media *within* one work” (Ricardo 2). Here, subjectivity does not only refer to the “experiences” of the human readers, but also to that of the machines, which recursively observe their own operations. This is why for Francisco Ricardo, *The Readers Project* is one of the seminal works which demonstrate that “the procedural, not the structural or medium-specific, has become the new foundation of this [what he calls the ‘engagement’] aesthetic. . . . Thus we can see . . . both a dispersal and a unification of time and space, of creation and reception, of event and of place” (111).

This becomes even clearer in *How It Is in Common Tongues* (2012), another derivative of *The Readers Project*. Here, Cayley and Howe entangle the novel written by Samuel Beckett, *How It Is* (1961), as a source text and use the Google search engine for finding the largest phrases from *How It Is* in what they call the “Commons of language”—the Internet. These readings generate found phrases that are then indexed and footnoted with URLs discovered via Google. In addition—and this is a crucial point—the resulting text was printed and published in a print-on-demand book. Thus Beckett’s text in *The Readers Project*’s adaptation “is made entirely of the words of others yet is also utterly mediated by Google’s search engine algorithm” (Emerson 184) and recaptured by *The Readers Project*. The resulting book is a material manifestation of a stitched-together text, the fragments of which were co-authored by thousands of human contributors and compiled by a hidden search algorithm. As bound book it re-enters the traditional literary system of book culture and thus reflects the ramifications of a communications system in which “online” and “offline” are continuously entwined.

The text can be read again in the same manner as Beckett’s novel, since the corpus text appears to be exactly the same and additionally, the print-like act of reading is supplemented by a different kind of attention that is directed

at the activities of the software “readers.” Therefore, Manuel Portela convincingly described the reading experience of the *Readers Project* as “meta-reading”:

Since the readings of the machine are offered as writing to human readers, the writing *of* reading and the reading *as* writing contained in *The Readers Project* turn readers into *metareaders* who are forced to read their own act of reading the program reading. . . . Automated generative writing is presented as an act of reading that rewrites the text and makes it available for *literary* reading. (346; emphasis added)

I completely agree with Portela’s analysis—but still: What is *literary* reading in this instance, and how does it relate to “meta-reading”? Do both acts of reading depend on different forms of reflexivity? Following reader-response theorist Wolfgang Iser, communication in literature is

a process set in motion and regulated . . . by a mutually restrictive and magnifying interaction between the explicit and the implicit, between revelation and concealment. What is concealed spurs the reader into action, but this action is also controlled by what is revealed; the explicit in its turn is transformed when the implicit has been brought to light. (Iser 168)

It is evident that this classical conception of an act of *literary* reading is derived from the reading of a printed text. For centuries, the combination of natural language, script, paper and print technologies provided the dominant media of written communication. Literature, then, has always been—and, as I insist, will have to be in future—the medium of *aesthetic* reflection of such communication. In such a meta- or “inter-discourse” (that can be distinguished from but also incorporates elements of scientific, religious, philosophical or any other discourse) reflexivity is not a *definiens*, but an *interpretament* of art. Its point of reference is the *self-perception* and *self-reflection* of the reader whose experiences, however, depend on the engagement with the work of art and the interpretation of the author’s intentions (cf. Hilmer 245). If “meaning” always is a result of such reflexivity, then, in my understanding, literature can be described as a specific form of the use of language that activates a *surplus of the possibilities* of language—or, in Calvino’s terms, that releases the hidden ghosts of literature. Hence, we have to deal with the paradox that even though language can say more than one can assert, it can at the same time also say nothing without asserting anything. Literary texts, then, mediate the assertive statements of a “sense of reality” with the “sense of possibility” of language.

In a piece like *The Readers Project* as well as in its derivatives it can in no way be unambiguously differentiated *who* or *what* is “reading” whom or what. It is

precisely this automation of the mutual observation of human and non-human actors that is made available to literary *aesthesis* as a distinct and reflexive perception of perception. Thus, literature maintains its function of creating an aesthetic distance—that is to say, a deliberate *disruption* or *defamiliarization* (to use the classical Formalist term) of (at least partially) automated social and technical interactions.

In addition to the reading of a linear poetic text, *The Readers Project* demonstrates that now far more complex media-technological and social conditions have to be reflected as well. This piece therefore clearly shows that, in current media dispositives, technical “disruptions” also participate in the constitution of meaning—something that only can be taken into account in reflexive acts of meta-reading. One might conclude that by realizing this, *The Readers Project* is the closest any piece of electronic literature has come to meeting Calvino’s requirements of the “true literature machine.” It arguably is not a coincidence that Nigel Thrift coined the term “technological unconscious” to describe the influence of technical devices on the historical occurrences of the unconscious (cf. Thrift). However, it is still an open question to what extent the latest computer-based and networked media technologies will have a profound effect on the way in which writers and readers produce and experience literary artifacts. As has been shown, both Lévi-Strauss and Calvino insisted that any sort of aesthetic experience is based upon an *unconscious* conformity with given poetic structures that have had a lasting influence on literary communication to date. Although Calvino’s “true literature machine” has never been nor will probably ever be realized in the future, it will remain one of the main focuses of electronic literature to reflect upon the mutual impact of the unconscious poetic structures from ancient times and the manifestations of the “technological unconscious” in environments of the latest networked computer architectures.

## Notes

- 1 All translations from previously untranslated German sources were done by Brigitte Pichon and Dorian Rudnytsky. Original text: “Ob nun wol etliche zu wolermeldter Kunst geboren / so ist doch die Kunst nicht mit ihnen geboren; sondern muß erlernet werden / wie alles / was wir Menschen wissen wollen” (Harsdörffer 2).
- 2 In the following, I mainly draw upon the books of Andreas Gardt, Stefan Rieger and Markus Hundt.
- 3 Original text: “welche als stets saftvolle Wurtzelen den gantzen Sprachbaum durchfeuchten / dessen Spröslein / Ast- und Aderreiche Zweige in

schönester Reinigkeit / steter Gewisheit und unergründender Mannigfaltigkeit / reumiglich und hoch ausbreiten lassen” (Schottelius 50).

- 4 Original text: “so kann man die Buchstaben versetzen und eine andere Meinung heraus bringen” (*Poetischer Trichter* 17).
- 5 Philipp von Zesen, for example, in his *Helikon* gave recommendations to facilitate writing anagrams by using cardboard letters: “So that the poet, who wants to imitate this, does not have to think so much about the spelling and interpretation of the letters and names, I advise him to cut out all letters from card-games. He should take as many as are in the word, lay them down and invert them until one or several meaningful words have been created from the first, which he can use for his creation. Or, in order not to have to cut up so many card-games, and so that the godless people can keep their bible as a whole, I should like to advise him that he write down a letter on one card-game only, or on something else, and then mix them up and change them around.” Original text: “Damit aber auch der dichterische künstler / so dieses nachkünsteln wil / nicht so viel kopfbrechens / mit verschreib- und ausleschung der buchstaben und nahmen / haben dürfte / so geb’ ich ihm den raht / dass er ihm alle buchstaben aus karten oder spiel-blättern schneide / und dan ihrer so viel nehme als im nahmen begriffen seind / selbige verlege und wider lege / so lange / bis eines oder etliche worte aus dem nahmen zusammengebracht hat / die einen guten und folkommen sin haben / und die er zu seiner erfindung brauchen kan. Oder / damit er nicht so viel schneidens mit den spiel-blättern bedürfe / und die Gottlosen ihre Bibel auch gantz behalten / so wil ich ihm den raht geben / dass er nuhr auf ein karten- oder spiel-blatt / oder auf sonst etwas einen buchstaben schreibe / und sie also gantz verlege / und ümwechsele” (Zesen 174).
- 6 Original text: “Dieses Blätlein muß heraus geschnidten / in fünff Ringe zertheilet / und auf fünff gleich-grosse Scheiben von Papyr / also aufeinander geheftet werden / daß man jeden Ring absonderlich umbdrehen kan / wann solchs geschehen / muß man dises fünfffache Blatt wider hinein pappen” (Hundt 283).
- 7 Original text: “Ist also dieses eine unfehlbare Richtigkeit / ein vollständiges Teutsches Wörterbuch zu verfassen / und beharren wir in der Meinung / daß alle solchen zusammen gesetzte Wörter / welche ihre Deutung würcken für gut Teutsch zulässig / sonderlich in den Gedichten / ob sie gleich sonsten nicht gebräuchlich” (Harsdörffer, *Deliciae mathematicae et Physicae* 518).

- 8 Original text: “Erfindung der Reimwörter / wann man die Reimsilben auf dem dritten und vierten Ring suchet / und die Reimbuchstaben auf dem zweyten Ring darzu drehet” (Harsdörffer, *Deliciae mathematicae et physicae* 518). Text generators based on rotating disks, however, are no peculiarity of the Baroque era but there also have been some interesting examples in recent times, e.g. in the Fluxus movement. André Thomkins produced his polyglot machine dogmat-mot (1965), which allows the user to produce “mobile dogmas.” This machine consists of ten hexagonal cards, each with 12 words that are common in each of the three languages German, English and French (there are 48 German-French, 60 German-English and 12 German-French-English words). The hexagons pivot on a plane and form phrases in three directions on the hexagonal roof. They can even be arranged differently on the ten slots, so that the number of combinations can further increase. Ferdinand Kriwet wrote many of his texts on disks, among them are three-disk-texts whose disks overlap and thus make combinations of elements possible. Dieter Roth produced so-called “Lese-rollen” (reading rolls)—paper webs with abstract ornamental patterns—for the “Apparat zum Simultanlesen” [apparatus for simultaneous reading]. This machine was invented by his fellow-artists Daniel Spoerri and Jean Tinguely and consists of a rotating rod driven by an engine.
- 9 Original text: “Unter der natürlichen Poesie wird hier die Art von Poesie verstanden, die . . . ein personales poetisches Bewußtsein . . . zur Voraussetzung hat; ein Bewußtsein, das Erlebnisse, Erfahrungen, Gefühle, Erinnerungen, Gedanken, Vorstellungen einer Einbildungskraft etc., kurz, eine präexistente Welt besitzt und ihr sprachlichen Ausdruck zu verleihen vermag. . . . Unter der künstlichen Poesie hingegen wird hier eine Art von Poesie verstanden, in der es, sofern sie z. B. maschinell hervorgebracht wurde, kein personales poetisches Bewußtsein mit seinen Erfahrungen, Erlebnissen, Gefühlen, Erinnerungen, Gedanken, Vorstellungen einer Einbildungskraft etc., also keine präexistente Welt gibt, und in der das Schreiben keine ontologische Fortsetzung mehr ist, durch die der Weltaspekt der Worte auf ein Ich bezogen werden könnte. Infolgedessen ist auch aus der sprachlichen Fixierung dieser Poesie weder ein lyrisches Ich noch eine fiktive epische Welt sinnvoll abhebbar. Während also für die natürliche Poesie ein intentionaler Anfang des Wortprozesses charakteristisch ist, kann es für die künstliche Poesie nur einen materialen Ursprung geben” (Bense, “Über natürliche und künstliche Poesie” 143).
- 10 Cf. Max Bense, *Einführung in die informationstheoretische Ästhetik. Grundlegung und Anwendung in der Texttheorie*. “The analytical description of texts via mathematical means of a statistical or topological kind from the beginning

suggested reversing the procedures of separation into the technical procedures of synthetically structuring the texts. The idea became more obvious when it became possible to use information-processing computers with their ability to program saving, selection, classification, repetition and connection of entered data. . . . With this, the idea of an artificial poetry entered the experimental literature of the avant-garde, which now could be defined as synthetic or even technologic poetry.” Original text: “Die analytische Beschreibung von Texten mit mathematischen Mitteln statistischer und topologischer Art legte von Anfang an den Gedanken nahe, die exakten Verfahren der Zerlegung in technische Verfahren eines synthetischen Aufbaus der Texte umzukehren. Verstärkt wurde der Gedanke, als es möglich wurde, datenverarbeitende Rechenanlagen mit ihrer Fähigkeit zur programmierbaren Speicherung, Selektierung, Sortierung, Repetierung und Verknüpfung von eingegebenen Daten heranzuziehen. . . . Damit drang die Idee einer künstlichen Poesie in die experimentelle Literatur der Avantgarde ein, die zugleich als synthetische oder sogar als technologische Poesie definiert werden konnte” (Bense, *Einführung in die informationstheoretische Ästhetik* 109).

- 11 Original text: “Selbstverständlich gelten die angeführten Differenzen in erster Linie nur idealtypisch. Wirklich existent sind jedoch wahrscheinlich nur die Annäherungen” (Bense, *Einführung in die informationstheoretische Ästhetik* 144).
- 12 This approach, however, has not been without controversy. Karlheinz Stierle, for example, raised the objection that structural anthropology was not able to explain the relationship between the deep mythical structure and the specific form of any of its literary adaptations. Cf. Karlheinz Stierle: “Mythos als ‘bricolage’ und zwei Endstufen des Prometheusmythos.” *Terror und Spiel. Probleme der Mythenrezeption*, edited by Manfred Fuhrmann. Munich 1971, pp. 455–472, p. 456.
- 13 Original text: “Es giebt nur drey ächte Naturformen der Poesie: die klar erzählende, die enthusiastisch aufgeregte und die persönlich handelnde: Epos, Lyrik und Drama” (Goethe 187). In German, the term “Gattung” denotes a group of objects that have distinguishing or typical features in common; it has deeper structural connotations than the similar but more flexible English term “genre.”
- 14 Cf. <<http://thereadersproject.org/readers.html>>.
- 15 *misSpeltLandings* and *poeticCaption* are texts from John Cayley.

## Works Cited

- Bense, Max. "Über natürliche und künstliche Poesie." *Theorie der Texte: Eine Einführung in neuere Auffassungen und Methoden*. Cologne: Kiepenheuer & Witsch, 1962, pp. 143-147.
- . *Einführung in die informationstheoretische Ästhetik. Grundlegung und Anwendung in der Texttheorie*. Reinbek: Rowohlt Verlag 1969.
- Calvino, Italo. "Cybernetics and Ghosts" [1967]. *The Uses of Literature*, translated by Patrick Creagh. New York: Harcourt Brace Jovanovich, 1986, pp. 3-27.
- Cayley, John. "Terms of Reference and Vectoralist Transgressions. Situating Certain Literary Transactions over Networked Services." *Amodern* 2. Oct. 2013. 3 July 2017 <<http://amodern.net/article/terms-of-reference-vectoralist-transgressions/>>.
- Cayley, John, and Daniel C. Howe. *The Readers Project*. 2013. 3 July 2017 <<http://thereadersproject.org/readers.html#PerigramReader>>.
- Cramer, Florian. "Combinatory Poetry and Literature in the Internet." 2000. 3 July 2017 <[http://cramer.pleintekst.nl/essays/combinatory\\_poetry\\_\\_permutations/combinatory\\_poetry\\_-\\_permutations.tex](http://cramer.pleintekst.nl/essays/combinatory_poetry__permutations/combinatory_poetry_-_permutations.tex)>.
- Döhl, Reinhard. "Vom Computertext zur Netzkunst. Vom Bleisatz zum Hypertext." 16 Apr. 2000. 3 July 2017 <[https://www.netzliteratur.net/computertext\\_netzkunst.htm](https://www.netzliteratur.net/computertext_netzkunst.htm)>.
- Eibl, Karl. *Die Entstehung der Poesie*. Frankfurt am Main: Insel Verlag, 1995.
- Emerson, Lori. *Reading Writing Interfaces: From the Digital to the Bookbound*. Minneapolis, MN: University of Minnesota Press, 2014.
- Fournel, Paul. "Computer and Writer: The Centre Pompidou Experiment." *Oulipo: A Primer of Potential Literature*, translated and edited by Warren Motte. Lincoln, NE: University of Nebraska Press, 1986, pp. 140-142.
- Gardt, Andreas. *Sprachreflexion in Barock und Frühaufklärung: Entwürfe von Böhme bis Leibniz*. Berlin: W. de Gruyter, 1994.
- Gendolla, Peter. "Artificial Poetry: On Aesthetic Perception in Computer-Aided Literature." *Literary Art in Digital Performance: Case Studies in New Media Art and Criticism*, edited by Francisco J. Ricardo. New York: Continuum, 2009, pp. 167-175.
- Goethe, Johann Wolfgang. "Noten und Abhandlungen." *Werke: Hamburger Ausgabe, Band 6: Gedichte und Epen II*, edited by Erich Trunz. Munich: C.H. Beck, 1981, pp. 187-189.

- Harsdörffer, Georg Philipp. *Deliciae mathematicae et physicae. Der mathematischen und philosophischen Erquickstunden zweyter Theil* [1651]. Frankfurt am Main: Keip, 1990.
- . *Poetischer Trichter*, vol. II [1647–1653]. Darmstadt: Wissenschaftliche Buchgesellschaft, 1969.
- Hayles, N. Katherine. *My Mother Was a Computer: Digital Subjects and Literary Texts*. Chicago: University of Chicago Press, 2005.
- Hennion, Antoine, and Line Grenier. “Sociology of Art: New Stakes in a Post-Critical Time.” *The International Handbook of Sociology*, edited by Stella R. Quah et al. London: Sage, 2000, pp. 341–355.
- Hilmer, Brigitte. “Kunst als reflexive Form und als reflektierende Bewegung.” *Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft*, vol. 55, no. 2 (2010): pp. 235–246.
- Hundt, Markus. “Spracharbeit” im 17. Jahrhundert: Studien zu Georg Philipp Harsdörffer, Justus Georg Schottelius und Christian Guentz. Berlin: W. de Gruyter, 2000.
- Iser, Wolfgang. *The Act of Reading: A Theory of Aesthetic Response*. Baltimore, MD: The Johns Hopkins University Press, 1978.
- Le Lionnais, François. “Second Manifesto.” *Oulipo: A Primer of Potential Literature*, translated and edited by Warren Motte. Lincoln, NE: University of Nebraska Press, 1986, pp. 29–31.
- Lévi-Strauss, Claude. *Structural Anthropology* [1958]. Translated by Claire Jacobson and Brooke Grundfest Schoepf. New York: Basic Books, 1963.
- . *The Naked Man: Mythologies, Volume 4* [1971]. Translated by John and Doreen Weightman. Chicago: University of Chicago Press, 1981.
- . *The Savage Mind* [1962]. Chicago: University of Chicago Press, 1966.
- . *The Raw and the Cooked: Mythologies, Volume 1* [1964]. Translated by John and Doreen Weightman. Chicago: University of Chicago Press, 1969.
- Portela, Manuel. *Scripting Reading Motions: The Codex and the Computer as Self-Reflexive Machines*. Cambridge, MA: The MIT Press, 2013.
- Rettberg, Scott. “Visions of Reading.” *Vagant* 2. 2011. 3 July 2017 <[http://elmcip.net/sites/default/files/files/attachments/criticalwriting/visions\\_of\\_reading.pdf](http://elmcip.net/sites/default/files/files/attachments/criticalwriting/visions_of_reading.pdf)>.
- Ricardo, Francisco J. *The Engagement Aesthetic: Experiencing New Media Art Through Critique*. New York: Continuum, 2013.

- Rieger, Stefan. *Speichern/Merken: Die künstlichen Intelligenzen des Barock*. Munich: W. Fink Verlag, 1997.
- Roubaud, Jacques. "Mathematics in the Method of Raymond Queneau." *Oulipo: A Primer of Potential Literature*, translated and edited by Warren Motte. Lincoln, NE: University of Nebraska Press, 1986, pp. 79–96.
- Russell, Bertrand. *A Critical Exposition of the Philosophy of Leibniz*. Nottingham: Spokesman, 2008.
- Schäfer, Jörgen. "Reassembling the Literary: Toward a Theoretical Framework for Literary Communication in Computer-Based Media." *Beyond the Screen: Transformations of Literary Structures, Interfaces and Genres*, edited by Jörgen Schäfer and Peter Gendolla. Bielefeld: [transcript] Verlag, 2010, pp. 25–70.
- Schottelius, Justus Georg. *Ausführliche Arbeit Von der Teutschen Haupt Sprache* [1663]. Tübingen: Niemeyer, 1967.
- Starobinski, Jean. *Words upon Words: The Anagrams of Ferdinand de Saussure*. Translated by Olivia Emmet. New Haven, CT: Yale University Press, 1979.
- Thrift, Nigel. "Remembering the technological unconscious by foregrounding knowledges of position." *Environment and Planning D*, 22, no. 4 (2004): pp. 175–190.
- Turing, Alan. "Computing Machinery and Intelligence." *Mind* 59, no. 236 (1950): pp. 433–460.
- Zesen, Philipp von. *Sämtliche Werke, vol. X/1: Hoch-Deutscher Helikon* [1656]. Edited by Ferdinand van Ingen, Ulrich Maché and Volker Meid. Berlin, New York: de Gruyter, 1977.