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Christine Brooke-Rose and the Science of Fiction: Rethinking Conceptual Writing and Artificial Intelligence in *Xorandor*

Matthew James Vechinski

Department of Focused Inquiry, Virginia Commonwealth University, Richmond, Virginia, USA

ABSTRACT

This article discusses how Christine Brooke-Rose's 1984 novel *Xorandor* grew out of a conventional science fiction story intended for pseudonymous publication. Her distinct priorities as an experimental writer—adopting grammatical and syntactical constraints—manifest themselves in her revisionary appropriation of the science fiction genre. She decided to rewrite the draft of her novel entirely in dialogue, accepting SF characters as representative rather than individualized. The book's narrators are adolescent twins who uncover explanations for events in retrospect, when in traditional "hard SF" (stories that strictly adhere to invented scientific principles), exposition prefigures the narrative action. With this setup, Brooke-Rose crafts a narrative about a silicon creature discovered on Earth that uses English and programming language to converse with humans. The young adult narrators interacting with a living computer stages a fascinating reflection on how we humanize technology and how artificial intelligences imperfectly imitate our ways of knowing and communicating.

KEYWORDS

Christine Brooke-Rose; experimental fiction; science fiction novel; dialogue; artificial intelligence

> One of the main attractions of science fiction is in its structuring paradox in that it both beautifies and neutralizes our fears of science's dehumanization and displays the inexorable "necessity" of science with the "freedom" of fiction.
>
> —Christine Brooke-Rose, "Science Fiction and Realistic Fiction," *The Rhetoric of the Unreal* (74)

Constraint-Based Fiction

The late Christine Brooke-Rose took pride in the fact that her novels are the result of complex experiments with narrative. After writing her last novel in 2006, Brooke-Rose left readers with a comprehensive statement on her career as a writer in the monograph *Invisible Author*, published by the Ohio State University Press. In it, she explained how she developed her self-imposed restrictions in order to explore aspects of fiction often taken for granted. With *Invisible Author*, the last entry on her impressive record of scholarly publications as professor of English at the University of Paris, Brooke-Rose succeeded in providing the final word on her own fiction. When she passed away in March 2012 at age 89 after a long illness, the obituaries printed in the *New York Times* (Margalit Fox) and *Times* of London relied on that book to describe her life's work. (The latter's subheading began, "Avant-garde novelist who set herself challenges by omitting crucial words, writing only in the future tense or composing a story as music" ["Christine Brooke-Rose, Avant-Garde Novelist"].) I worry, though, that the legacy Brooke-Rose wanted for herself places too much emphasis on experimentation. It is now up to other critics to affirm that Brooke-Rose's fiction is not innovation for its own sake. The way has been lighted already by Karen R. Lawrence's excellent study *Techniques for Living: Fiction and Theory in the Work of Christine Brooke-Rose* (2011). Lawrence argues that

CONTACT Matthew James Vechinski mjvechinski@vcu.edu Department of Focused Inquiry, Virginia Commonwealth University, PO Box 842015, Richmond, VA 23284-2015, USA.

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Brooke-Rose's novels are a "rehearsal for living under the constraints of a new world, one that is as much a matter of shrinking possibilities as it is of a renewed expression" (5). For the oeuvre of Christine Brooke-Rose to receive its due, there must be more scholarship like Lawrence's that honors these studied formal experiments while at the same time affirms her novels' relevance in the contemporary moment.

Here I examine *Xorandor* (1984), Brooke-Rose's greatest popular success and least overtly experimental work, and one of only two science fiction novels she wrote (reissued in 2014 by Verbivoracious Press in one volume, *Xorandor/Verbivore*). *Xorandor* remains relevant today, Nicolas Tredell argues in the introduction to the recent reprint, because it "address[es] ancient philosophical questions about the very nature of human identity that the digital revolution increasingly forces on us" (vii). The handful of studies of this novel do examine how computer language and logic inform the narrative, while this article explores in depth how its human characters interact with an artificial intelligence. In *Invisible Author*, Brooke-Rose attributed the novel's appeal to its subject matter: "As far as my fairly wide reading in SF goes, nobody has, or had then, thought of an extraterrestrial as a computer-rock belonging to a silicon civilization, feeding on both nuclear waste and intercepted information, found in Cornwall by two children who dictate their adventure into a pocket computer" (17–18). She was content with the reception of *Xorandor* because in her premise "at last originality was recognized" (17), though this does not go far in explaining why readers found the novel engaging. Young adults interacting with a living computer stages a fascinating reflection on how we humanize technology. *Xorandor* could be read alongside the scholarship of MIT researcher Sherry Turkle from the 1980s on, which examines how "we remake ourselves and our relationships with each other through our new intimacy with machines" (*Alone* 3).[1] Her book *Alone Together: Why We Expect More from Technology and Less from Each Other* (2011) includes case studies of human responses to digital pets and robot companions, which she finds lack critical engagement. She claims that often we "don't seem to care what these artificial intelligences 'know' or 'understand' of the human moments we might 'share' with them. At the robotic moment, the performance of connection seems connection enough" (9). The lead characters in *Xorandor* learn how to interact with "digital companions that are evocative but not relationally authentic" (Turkle, "Authenticity" 505). They come to acknowledge that the living computers' ways of knowing the world are fundamentally different from those of humans, despite the computer-rocks' skill in communicating with humans in English.

Thirty years after the publication of *Xorandor*, "intimacy with machines" is commonplace. In the hours we spend daily online and with mobile technology, we produce and consume vast amounts of textual content. These tools have changed how some poets and writers of fiction practice their craft. Kenneth Goldsmith studies the innovative works of "younger writers [who] take their cues from the workings of technology and the Web as ways of constructing literature," including "word processing, databasing, recycling, appropriation, intentional plagiarism, identity ciphering, and intensive programming" (2). Programming, Goldsmith shows in his book *Uncreative Writing*, bears a resemblance to the procedural experiments of conceptual visual artists such as Sol LeWitt outlined in "Paragraphs on Conceptual Art." Thus one strain of this new trend of *conceptual writing* responds to the abundance and malleability of digital textuality by deliberately imposing limitations on the creative process. The older French cousin to these poetic experiments today, scholars acknowledge, is the Oulipo (*Ouvoir de la littérature potientielle*) school, perhaps best exemplified by Georges Perec's *La disparition* (1969), an entire novel written without using the letter e.[2] Although Brooke-Rose adopted formal restrictions for her fiction, she distinguished her choice of constraints from that of Oulipo, however. She preferred to adopt grammatical and syntactical limitations that impacted the kind of world she could represent in her fiction. In *Invisible Author*, she wrote, "Perec simply chose e as lipogram because it's the most frequent letter in French. In other words, he chose it for the tour de force, which would then completely absorb him. [. . .] I felt rightly or wrongly that this was not my way, that there are constraints within constraints" (46).[3] Likewise, among those who in recent years embraced so-called conceptual writing especially of the constraint-based variety, there were

objections to Oulipo's "closed" workshop model—a society of mostly men with an almost mathematical interest in literary formulae—as representative of the new wave of literature. This spurred the organization of "*n*ulipo: The Conference" in 2005 (documented two years later in *The nOulipian Analects*, edited by Christine Wertheim and Matias Viegener), which aimed to explore how "generative literature procedures are not merely restrictive, but also combinatoric" (Wertheim and Viegener, "Gender" 101). It examined political and gendered notions of suppression to envision "a different kind of constraint-based literature in which the writer's responsibility and intentions are not entirely surrendered to the constraint—as if it were a wholly external agent—but are acknowledged and bound up with it" (Wertheim and Viegener, "& and" 4).

Brooke-Rose's aesthetic philosophy is echoed in the conference organizers' revision of Oulipo as *n*Oulipo, meant to stress that "[f]or every element excluded, the writer must work harder to permute and combine in ever more complex ways the elements that remain at her disposal" (Wertheim and Viegener, "Gender" 101). Brooke-Rose often decided not to reveal her self-imposed rules in press releases or on book jackets, for fear of overemphasizing generative constraints.[4] She did not want the glancing knowledge of what her procedures were to substitute for the experience of actually reading her novels. In this essay, I approach Brooke-Rose as an honorary *n*Oulipian, for she adopted the strictures of the constraints to free herself to explore the complex workings of the narratives that emerged. Her brand of innovation is poised to win new readers who embrace conceptualism in literature but who "favor the combinatorial and conjunctive/accumulative side of procedure-based writing" as Wertheim and Viegener do ("Gender" 104).

In *Xorandor*, writing within an established genre—science fiction—presented Brooke-Rose with another set of narrative "necessities" beyond her chosen constraint: writing in dialogue. She did little more than identify that basic technique in her essays on her fiction, never offering to explain why she should strictly employ dialogue for an innovative science fiction novel.[5] Yet dialogue receives special consideration in Brooke-Rose's scholarly monograph *The Rhetoric of the Unreal*, published by Cambridge University Press a year before *Xorandor* appeared. Exposition vital to explaining the grounds for events in science fiction worlds can be couched in a conversation, she noted, and therefore seem less contrived to SF readers than long discursive passages or interior monologues. *The Rhetoric of the Unreal* contains valuable insights such as these that illuminate Brooke-Rose's creative choices in *Xorandor*, though scholars have not paired the two and largely overlook her literary study of science fiction. This article affirms that through dialogue, she made creative use of stock SF characters, such as the nerdy teen twins nicknamed Jip and Zab who serve as the narrators, in establishing a narrative situation focused on the retelling of past events. Dialogue thus raises exposition to the level of event: plot complexity results from the review of recorded and remembered conversations as the narrators determine what was known at what point in the sequence of events and how that knowledge impacted their unfolding. In turn, Brooke-Rose challenged the edict in science fiction that the narrative conforms to invented scientific laws governing the fictional world. These laws, in other words, are not simply given and left undisputed; in *Xorandor* they are uncovered, questioned, and revised over the course of the novel.

In this way Brooke-Rose combined two distinct kinds of science fiction usually kept separate: hard SF, whose stories strictly adhere to invented scientific principles, and soft SF, which favors fantasy as the engine of stories. This blending is perfectly suited to the examination of an artificial intelligence, the computer-rock creatures with the Latin species name *Alphaphagai*. The interactions these living computers have with humans enact the robotic moment Sherry Turkle studies. Characters—including the twins, for whom the creatures are their friends—sometimes regard the *Alphaphagai* as machines, expected to perform in a purely logical manner. At other times, the living computers' evocative conduct blinds characters to how the *Alphaphagai* develop emergent behaviors that stem from imitating human ways of relating to the world. These conflicting attitudes are dramatized in the humans' responses to the computer-rocks' appetite for radioactive material, which could be the solution to the problem of nuclear waste but also creates a threat to fuel supplies and arsenals. Christine Brooke-Rose's novel thus shows that encounter between two species—the

Alphaphagai being an artificial intelligence that uses a second language (English) to communicate its knowledge and intentions—entails the need to appreciate the respective modes of consciousness behind acts of communication.

Appreciating emergent behaviors is also crucial to the study of how a *n*Oulipian author uses programmatic constraints. In addition to investigating how Brooke-Rose applied the base procedure, we must ask why she selected alternative means of expression from the possibilities left to her. Fortunately, for this novel, it is possible to reconstruct the choices she made over time by consulting the author's papers held at the Harry Ransom Center at the University of Texas at Austin.[6] Brooke-Rose remarked in an earlier published essay that *Xorandor* was the result of revising a conventional science fiction novel that she wrote for fun, yet does not mention that she, in fact, tried to publish the earlier version pseudonymously (*Stories* 9). The Ransom Center holds a complete manuscript of this work, titled *The Alpha-Guys* (a pun on the species name), along with correspondence with editors and agents about its promise for the British SF market.[7] It is significant that the narrative experiment in *Xorandor* came during the rewriting, when in all her fiction, from 1964 on, she worked within self-imposed constraints to generate her first drafts. Although Brooke-Rose, in a sense, reprogrammed an existing narrative, the genetic study offered in this article reveals how in keeping to a constraint she thoroughly transformed an existing draft and departed from choices she once entertained.

Round Flatness

Brooke-Rose did not simply break from typical SF conventions to make her traditional science fiction novel more innovative. *Xorandor* is, instead, a response to her disappointment with science fiction's "lack of imagination with regard to narrative technique, as opposed to its imagination with regard to ideas" (*Rhetoric* 82). In "Science Fiction and Realistic Fiction" (an essay republished in *The Rhetoric of the Unreal*), she lamented that science fiction "took over wholesale the techniques of the realistic novel" in an effort to court serious readers (82). It made little sense to her that SF writers would add depth to their fiction in this manner, seeing that "science fiction is a generalizing mode, using representative rather than individual characters" (75). By writing *Xorandor* in dialogue, she, in fact, leverages representative characters to address the problem of how to balance exposition with action. As mentioned above, Brooke-Rose recognized that SF favors dialogue as a means of educating its readers about the scientific laws to which all phenomena in the fictional world are subject. She described in "Science Fiction and Realistic Fiction" how SF often includes "explanations by knowledgeable characters, so that we get the scientists explaining the basics to each other" or going over rudimentary principles in inner monologues (101). These discussions among characters or this thinking to oneself often center on "elementary facts [the scientists] must take for granted and that are really intended by the author for the reader" (*Invisible* 39). In other words, the conversation or inner monologue appears contrived because scientists, when talking among their peers or to themselves, would skip right to the higher-level science. At bottom, this "stock method" is no different from an "author intervention" into the story, she acknowledged (*Rhetoric* 148), even if it seems more palatable coming from characters and not an omniscient authorial voice.[8] Brooke-Rose used this technique in *The Alpha-Guys*, notably in a scene where a group of scientists picnicking on the beach draw basic calculations in the sand to illustrate their hypotheses (*Alpha-Guys* TS 194–97). Though the scene describes the science the narrative later depends on, there is the potential for this or any explanation to seem extraneous and, in turn, to detract from the trajectory of the story. The capacity for exposition to spoil plot illustrates why an anonymous science fiction adviser who read the manuscript of *The Alpha-Guys* suggested that most of its scientific exposition should be "culled or removed." These sections "did not enlighten [him] and merely served to irritate because they slowed up the story" (enclosure in Pollinger, Letter to Brooke-Rose, 14 January 1982).

Brooke-Rose understood that cutting back on exposition could actually compromise the narrative. "SF sets up fictional necessities then obeys them," according to John Huntington (348), who Brooke-

Rose quoted extensively in her essay. The genre requires a "bow to science, even if it is a mere gesture," to affirm that there are reasons behind the fictional phenomena (348). In fact, in the absence of this supposed *scientific* exposition, the narrative would slant toward realistic fiction (narrative subject to what could happen in everyday life) or else fantasy (narrative that cannot be judged against any measure of plausibility, fictional or actual). (Brooke-Rose concluded in *The Rhetoric of the Unreal* that science fiction is a hybrid of realism and fantasy [72–82], even though the tendency of most works of SF is to lean toward one or the other—an issue that the next section considers.) Brooke-Rose, through writing in dialogue, rethought the way that many writers choose to integrate scientific exposition into their fiction. In an interview with David Seed, Brooke-Rose assented to his deduction that dialogue in *Xorandor* is a means to "avoid the need for exposition" (255)—referring to the generic tendency for exposition and event to be separate streams, one following the other. Her decision to use only dialogue pushes exposition down to the same level as the plot. She revised the novel to have two adolescent twins review what has already happened to them, in an effort to piece together a coherent chronological account.[9] Her narrative device highlights that all characters of *Xorandor* act on what they know at the time—and, quite frequently, they do not realize the extent of what they misapprehend until much later. The twin's account conveys the scientific necessities that were indeed in effect, but that characters did not grasp or appreciate, at the time the events occurred. There is good reason, then, to return to elementary facts if vital information was overlooked or misunderstood and that ignorance impacted how events in the story unfolded.

Consider this passage from the height of the action in *Xorandor*. As the scientists scheme to put the species into the service of eliminating nuclear waste, one wayward computer-rock attaches itself directly to a nuclear reactor core, prompting a crisis that only the children can make right. The children convince the computer-rock not to carry out his plan in *The Alpha-Guys* and save the day because, being the trusted confidant of the parent *Alphaphagai* named Merlin, this offspring is genetically predisposed to the sound of their voices (*Alpha-Guys* MS 270). Brooke-Rose rewrote this highly suspenseful scene so that, in the thick of the action, it *feels* to the two as though they were reasoning with his child, Xor 7 (also known as Lady MacBeth, so called because the creature took to conversing in the style of Shakespeare after listening in on plays broadcast on the BBC). In *Xorandor*, upon successfully preventing Xor 7 from acting, the twins reflect on what had taken place:

Zab: You'd grabbed mum to yourself, Jip, and were dancing with her up and down and shouting We've done it! We've done it!
Jip: In fact we hadn't really, it wasn't the tosh at the end, it was the SOFTKEY. We *had* jumped out of it and when we returned into it, whatever we'd said would have worked.
Zab: It's easy to say that now, Jip.

As the clocked ticked down its final seconds, Jip and Zab unknowingly played out the role of the negotiator in a final confrontation, when really the twins only had to transmit a code supplied by its parent (renamed Xorandor in the revised novel) to the wayward computer-rock. The "tosh at the end," or escalation of panic, confirms that at that moment the twins, at the keyboard and microphone, felt they were living out a story, racing against the clock to save humankind from an unspeakable disaster. Brooke-Rose layered dialogue to provide the pulse-quickening cliffhanger and then its rational explanation, making exposition retrospective rather than anticipatory as one would expect in science fiction.

The reader realizes, along with the twins as it were, that the preceding pages of drama were a result of the children speaking with Xor 7 in voice and in code at the same time. Dialogue in *Xorandor* is not simply the back and forth between the twins. Brooke-Rose reused conversations from *The Alpha-Guys*, recorded by the twins and quoted as direct speech, but to that she added computer printouts of the exchanges the twins had with the rock-computers through their portable computer in a programming language similar to BASIC. Jip and Zab alone employ two means of communication with the *Alphaphagai*, speech and code, yet they unwittingly mix the two in

situations where the resources of one outweighs those of the other. Jip is quoted as saying to Xor 7, when Xorandor's code has not yet taken effect, "Will you promise, on your side, word-of-honor, that you won't do anything, you NOT DO anything at all, only WAIT. DO Ø UNTIL we can get you out?" (145). Code commands in all caps intrude on his spoken request. He tries three ways to order Xor7 to be inactive (NOT DO, WAIT, DO Ø), trying to secure a promise through a string of programming language. In the first place, he should know better: the twins previously learned that Xorandor "simply repeated the program-language, instead of doing things ordered, like a computer" would (73). The twins try to reason with Xor 7 because they cannot command the self-programming computer-rock to change course, though in the moment these two tactics merge into one.

Yet there are limits to what the twins realize with the advantage of hindsight, because they are not at the absolute end of the story when they begin retelling it. There are, in fact, several places in the novel where they rejoin the present, only to resume their retelling in the next chapter after some time has passed.[10] So in this scene, although Jip and Zab acknowledge they were speaking two languages in the heat of the moment, they miss that Xor 7 mentions that the *Alphaphagai* cannot live on Mars, presumed to be the planet they came from. In the first place, the twins were not prepared to attend to the significance of this statement because sending the computer-rocks back to their home planet to prevent future disasters involving radioactive material was not entertained until a later time. Jip and Zab were also so invested in the negotiation, interpreting any pushback from Xor 7 as standoffishness, they disregarded a revelation contrary to an accepted "fact." Thus in *Xorandor* only what the twins perceive as consequential information becomes foregrounded as exposition. And sometimes it is difficult to know exactly what to make of certain pieces of information because each twin interprets them differently. Jip tries to "invent an instruction from [Xor 7's] elders on Mars," almost an appeal to a higher authority or communal concern, as Zab puts it:

Xor 7: ON MARS WE CANNOT LIVE.
Jip: Yes you can. GOTO Olders. Olders instruct quote Men must send you back to Mars unquote. (142)

Zab points out how foolish this was to invent a directive from his elders ("olders"), with whom Xor7 could communicate directly anyway, even though to Jip "it made perfect sense at the time" (142). Jip continues to defend his decision as the best way of dealing with Xor 7, who he likened to a "dangerous terrorist" (142). Jip sees programming an erroneous directive as an acceptable means to prevent a nuclear disaster, which also indicates his faith in being able to control machines through code. Zab, the artistically inclined girl, sees beyond the instrumentality of computers to consider the ethics and psychology of dealing with these intelligent beings. She brings in references to humanities disciplines such as philosophy, much to the displeasure of her brother Jip, who prefers the certainty of the empirical sciences.

As scholars have pointed out, Brooke-Rose pitting a scientist against a humanist is not meant to reinforce gender stereotypes or even to favor one perspective over the other. Lincoln Konkle admits that Jip and Zab fall along "traditional gender lines," but their stark opposition yet complementary nature shows the "arbitrariness of assigning gender signifiers" to their attributes (178, 179).[11] The twins almost become two sides of one character, often treated as a single person by other characters and the principal computer-rock named Xorandor, who in their initial conversation in programming language designated the two as ZIP ("LET ZIPNZAB = ZIP" [66]). But while retelling events, their views often diverge, simultaneously establishing and calling into question scientific laws to which the narrative is expected to conform. In *The Alpha-Guys*, Brooke-Rose challenged gender bias and the assumption that science is a privileged discourse by creating a nontraditional heroine named Jennifer. This young technician has scientific training but little power in comparison to her male superiors, and she comes across as an outsider struggling to convince her colleagues of her insights into the situation, which always prove more perceptive. Jennifer's public affair with one of the scientists and scenes depicting her as an avid SF reader mark her as a nonconformist. Yet to many, Jennifer would seem a rather standard depiction of an unconventional female figure in SF who is

indeed caught in the position of being the odd woman out in the scientists' boys club. Helen Merrick in "Gender and Science Fiction" notes that it was rather common from as far back as the mid-twentieth century for innovative SF to "postulate a set of 'human behaviors' available to both men and women and depict female 'heroes' capably carrying out 'men's work'" (245). In fashioning the character of Jennifer in *The Alpha-Guys*, Brooke-Rose cannot escape a phenomenon she herself noted: "rounded characters don't belong in the genre" of science fiction (192). She made that statement in "The Dissolution of Character," published one year after *Xorandor*, in reference to E. M. Forster's flat-round dichotomy in *Aspects of the Novel*.[12] In SF, she noted, "characters were for a long time flat. Only in the 1950s, when science fiction wanted its respectable pedigree, did it try to imitate the realistic novel, adopting all of realism's narrative clichés and introducing some psychology and social background" (192). Again, Brooke-Rose believed the genre should resist put-on complexity, whether these attempts at realism concern the delivery of exposition or the creation of characters.

With Brooke-Rose having moved away from obviously countercultural characters, *Xorandor* emphasizes Jip and Zab's acts of storytelling, consisting of two opposed perspectives on equal footing. The twins—much younger and less sophisticated versions of them—did appear as characters in *The Alpha-Guys* who accidentally discovered the presence of the computer-rocks on earth and initiated the first communication with the species. They attracted the interest of Murry Pollinger, an agent with whom Brooke-Rose shared the manuscript of the novel, and also the unnamed SF reader from whom Pollinger solicited feedback. The reader remarked that "the whole work has the feel of a juvenile novel," and Pollinger warned that "many adult readers veer away from a story in which children are on center stage" (Pollinger, Letter to Brooke-Rose, January 14, 1982). He recommended that Brooke-Rose rewrite her story as a young adult novel, but she did not seem to have seriously entertained that notion. She wrote to potential publisher Hilary Rubenstein, "There may be something in [Pollinger's suggestion], though I still think it's a stock reaction simply because there are two children in the story, by no means in the forefront" (Letter to Rubenstein, January 22, 1982). Perhaps Pollinger recognized that the other scientific characters seem so close to type or so obviously try to break type that the twins appear special in comparison. But by making the twins the novel's aloof narrators in *Xorandor*, Brooke-Rose did not, in fact, place them at the center of the action. They are participants in the events yet temporally removed from the story in its retelling, and self-aware of their position: "If the storytellers are characters THEN their confusion is part of their characters ENDIF. Inversely IF the characters are the storytellers THEN the confusion is part of the story ENDIF" (11). Moreover, the twins decide how to represent the other characters: they can sometimes quote others (when they can transcribe recordings of conversations), they can recreate others' statements, or they can summarize what happened. Brooke-Rose decided not to voice the twins' innermost thoughts, usually taken as the hallmark of round characters, and instead emphasized the decisions they make as chroniclers.

Jip and Zab hold each other accountable for the effect on the story that results from employing a particular narrative strategy. For instance, at the times that Zab departs from distilling the facts about the events and imitates other people, Jip protests. Often Zab is fully conscious that she is presenting an exaggerated, one-sided depiction of a person—that is, sometimes clearly fabricating a flat character for the fun of it. She delights in giving Professor De Wint, a mysterious character who turns out to be a Soviet spy, stereotypically German-inflected English dialogue: "In ze newspaper on Tuesday I read of it, you had the Feuerbrigade to visit, yes?" (33). Jip points out that her understanding of German syntax and vocabulary is informed by what she learned in boarding school *after* meeting De Wint (33). He is so concerned with establishing a strict chronology that he disregards Zab's depiction, even if it has a certain truthfulness and entertainment value. De Wint is a flat character from *The Alpha-Guys*, who is clearly suspicious due to his flawed performance as a foreign scientist. His role in the plot is to kidnap one of the *Alphaphagai* for a Russian laboratory. By having the twins voice De Wint, Brooke-Rose did not need to make him more complex as a character but could play up the fact that he is presumed to be an interloper from the very start. In a way,

embedding flat characters within one another (Zab ventriloquizing De Wint) is strategy that, like coupling flat characters (Jip the scientist plus Zab the humanist) to create a bifurcated narrative voice, allowed her to innovate while respecting genre conventions. *Xorandor* affirms that the character as idea need not be an indication of impoverished generic fiction, if readers are helped to look beyond psychological complexity to other qualities of roundedness.

Imitation Games

By now it should be clear that *Xorandor* addresses Christine Brooke-Rose's misgivings about certain tendencies of the science fiction genre, whereas *The Alpha-Guys* is written "in as mainstream a way as possible, with every narrative cliché in use"—to quote her own comments on its creation (*Stories* 9). Why did she write this way initially? Brooke-Rose admitted to potential publisher Hillary Rubenstein that *The Alpha-Guys* is a "traditional" narrative but one designed to accommodate a series, and in these later books she stated she "might be more adventurous with narrative techniques" (Letter to Rubenstein, December 16, 1981). She envisioned making a connection with publishers and readers with easier-to-read fiction and then work back up to writing experimental novels once again. Presumably, Christine Brooke-Rose would emerge behind the pseudonym under which she wanted to publish her genre novel. That invented name was Hunter Brooke, which was meant to comprise the surname she shared with her cousin and then-husband Claude Brooke and the first name of their common grandparent. She told Rubenstein *The Alpha-Guys* was a collaboration between her and Claude, while maintaining that he, a physicist, was responsible for the scientific ideas, and she was responsible for the writing (Letter to Rubenstein, December 16, 1981). All evidence points to her claim being exaggerated; instead, her use of a pseudonym seems intended to couple novelist with scientist.[13]

Brooke-Rose was always committed to scientific accuracy when writing SF, despite the lightness of *The Alpha-Guys*. Pollinger and the others who weighed in on *The Alpha-Guys*, advising Brooke-Rose to remove exposition and reconceive the novel for children, did not seem to appreciate this. When revisiting the unpublished work years later, she intensified her interest in affirming a sound scientific basis for a silicon lifeform eating radioactive material. Her papers at the Harry Ransom Center plainly show her care in making the science behind *Xorandor* as accurate as possible. After all, adherence to theories in physics, chemistry, and astronomy create another constraint for Brooke-Rose to work within. She left *The Alpha-Guys* open-ended by concluding with the characters wondering if the *Alphaphagai* (including the computer-rock kept by the Russians) might secretly eat nuclear warheads instead of spent fuel rods and whether they should be removed from the planet (*Alpha-Guys* MS 305 v.). Freed from having to stage a sequel, she brought that event to pass in *Xorandor*. This extension to the narrative incites the twins to reconsider assumptions about the *Alphaphagai* that have proved so correct that Zip and Zab regard these notions almost as scientific certainties.

By challenging the advice she was given by her contacts in the publishing world, Brooke-Rose took on the assumption that science and fantasy are mutually exclusive *within* the genre—the tendency to divide SF into "hard" and "soft" varieties. Hard SF is characterized by its "faithfulness to the physical facts of the universe, while building upon them to realize new worlds," according to science fiction author Gregory Benford (15). That is, detailed scientific exposition is necessary to provide laws that regulate the possibilities of the fictional world—the "bow to science" examined in the last section. This focus often engenders a distinct prerogative: David G. Hartwell stresses that hard SF exudes a "faith in scientific knowledge as dominant over other ways of knowing" (38). The layering of dialogue in *Xorandor* does not enshrine science in a privileged role; the novel actually casts it as one way among many to explain new phenomena, making space to bring in discourses such as philosophy and ethics through a character such as Zab. *Xorandor* can be described as hard SF without the attitude that scientific knowledge is superior. The novel establishes physical facts—and they are scientifically accurate thanks to the input of scholars who Brooke-Rose consulted—but

violates the expectation that the narrative will simply conform to them. The facts turn out to be only working hypotheses based on the best evidence available.

Brooke-Rose's main strategy to bring the hard science together with the soft is having everything that is known about the computer-rocks come through questioning the parent *Alphaphagai*, Xorandor. The twins presume they and the scientists asked straightforward questions and received unambiguous answers. They discover that Xorandor is telling humans what they want to hear rather than telling the whole truth, as it were, which is strange because there should be no reason for a computer to be intentionally wrong. His deliberate withholding of accurate information pertains especially to the Martian origins of the *Alphaphagai*, because repatriating the computer-rocks becomes a way to prevent future disasters like the meltdown that almost came to pass when Xor 7 attached itself to a nuclear reactor core. The twins' perception of their relationship with the species at first impedes them from realizing the explanation for where they come from is fabricated. The confrontation with Xor 7 described in the previous section affirmed that the twins do not have any inherent advantage in negotiating with the computer-rocks as the result of their close rapport with Xorandor. Yet the thrill of being the first human contact with the species, combined with the knowledge that the *Alphaphagai* are part computer, obscure this fact. Jip and Zab, by their own admission, were living out a fantasy story in their first encounters with Xorandor. Jip notes, "We were still just kids. We thought it was the ghost of Merlin wandering out of the old ruined castle. Quirky that, for whizz-kids, we didn't recognize anything we might have, but fell back on Celtic twilight" (16). When their conversations are overheard by the town postmistress, Miss Penbeagle, they get her to play along, in part hoping she will keep the computer-rock secret. Penbeagle, or Pennybig to the twins, throws herself into the game without missing a beat. She addresses Xorandor as the disembodied voice of Merlin and calls herself Gwendolin (20–21). (The twins do not recount or quote her lengthy references to the King Arthur tales, but this exchange does appear in full in *The Alpha-Guys*, along with a full chapter of Jip and Zab teaching Merlin/Xorandor English and math [TS 76–97].) Eventually, the twins figure out that Xorandor subsequently had a private encounter with Penbeagle, during which she tried to find out for herself what the rock really was (67). Xorandor tells her that he fell to Earth from Mars—"an answer that had come quite naturally to him—perhaps logically would be the better word—in answer to a supposition of Pennybig," Zab surmises (181). He offers the same explanation to the scientists who study the *Alphaphagai*. Xorandor meets the humans halfway, one might say: they expect that there is no way an intelligent life form could have evolved on Earth unnoticed, and Xorandor wishes to be regarded not as a rock or a computer but as a living creature.

Xorandor, Penbeagle, Jip, and Zab are all relying on their own and one another's familiar points of references to make sense of their encounters with an Other. Their interactions are informed by performances. Jip at first feels betrayed upon deducing that the *Alphaphagai* had not come from Mars, and he is angry that Xorandor let them persist with erroneous perceptions. He cites Xorandor's acquisition of language as an example of deception: "that's what hurt most, the idea that [Xorandor had] been laughing at us, pretending to learn English and counting and all that. Play-acting, can you imagine?" (190). The twins come to understand he gained a facility with the language on his own by listening in on radio and television transmissions. However, the notion that Xorandor's performance is, in fact, put on and not "real" is an uncritical assumption the twins learn to set aside. Whereas Jip believes that Xorandor was dishonest by saying it came from Mars, Zab does not believe Xorandor lied to them per se: "A playful, or logical, confirmation, or even interpretation, of an expectation. Sort of telling people what they want to hear, in certain carefully evaluated circumstances. Their truth" (181). Xorandor's account of his origins "was a story he invented, just as he heard [Penbeagle] tell [the twins] a story" (186). Zab understands that Xorandor's account was a "myth of origin. Of false origin, like all myths" (186), meaning Xorandor understood—or at least imitated—his human counterparts all too well. Myth has been kept out of SF, because, as Gregory Benford explains, "science has been widely seen as a better way to understand our world than either myth or religion—two elements which, used at face value in fiction, typically yield fantasy" (19). When myth resurfaces in *Xorandor*, it appears with

the realization that it was always already there; its presence was just denied by the humans who wanted strict scientific truth.

The twins eventually find a transcript proving that Xorandor admitted to them that he had not communicated with other *Alphaphagai* on Mars as the grownups believed, but at the time they were not aware of the significance of this piece of information (183). (Earlier, they did not recognize the import of Xor 7's statement that the *Alphaphagai* could not live on Mars.) Jip and Zab were too persuaded by the justifications offered by the scientists studying the species to exploit their standing as seasoned communicators with Xorandor to unravel the myth that was being created. This challenge to what has taken as scientific truth within the story radically departs from the tenor of hard SF. Benford argues that, although the hard SF writer "can play fast and loose with theory" or "stretch a quantitative point for dramatic effect," he cannot "commit the unpardonable sin of lying—giving scientific misinformation to the reader" (18). Brooke-Rose did not actually misinform the reader but instead called convincing empirical evidence into question. Xorandor changes its material composition in the spot tested by scientists to determine his age, facilitating the scientific confirmation that the humans look for. Dr. Thomas Blackburn, whose explanations Brooke-Rose recopied into a separate notebook (now held at the Ransom Center), provided data that allowed her to estimate the length of time to fall from Mars, an appropriate age for Xorandor, and a way to account for his weathering during the fall due to the heat generated by falling through the earth's atmosphere. She included that information in the novel when writing about the scientists' verification of Xorandor's Martian origins and appearance on earth. Her notes on the facing pages of the notebook show that she was interested in making that theory ultimately untenable. On the verso of page 7 of the scientific notebook, for example, Brooke-Rose proposed the exact event she brings to pass in *Xorandor*: "Alters his isotopes for dating?" Her task shifts from making the story beholden to the science to demonstrating, as she put it in her notes, "why [the scientists] believe his story." Scientific accuracy serves as a constraint: Brooke-Rose bent the fiction toward the science, although she also made the science confront fiction when the scientists' projections confirm what turns out to be only a myth of origin.

There is evidence of Brooke-Rose laboring hard in her manuscript notebooks to make the moment when all the pieces come together for the twins just perfect (*Xorandor* MS 184–85). Xorandor's ability to follow the scientists' logic and actually meet their exact expectations, the twins realize, makes the humans sure of their initial projections and confident about predicting the consequences that will follow. Hypotheses swiftly become certainties. Zab recognizes "how first impressions, however wrapped up as suppositions, somehow get chemically transformed into deep-seated convictions that can then be proved mathematically and scientifically. The history of human knowledge is just that" (180). Xorandor's point-by-point prediction of how scientists would confirm its false claim would not have been possible without his aptitude in using English. "[W]hat started as a language-game had to go on as a lie, or a myth," Zab postulates (190). Her reference to Ludwig Wittgenstein's "language-game" from his *Philosophical Investigations* inspires Mario del Sapio Gabbaro to argue that Xorandor has "a peculiar and most extraordinary linguistic competence which allows him to answer according to the expectations of the interlocutor" (92). I disagree that it is a special competence; meeting expectations is necessary for successful communication, and this is recognized even in the earliest writings on artificial intelligence. Robotic companions are made to imitate human behaviors for the purpose of having humans perceive them as proficient.

Imitation was a major consideration for Alan Turing, father of modern computing and artificial intelligence, and it would seem that Brooke-Rose in *Xorandor* brought his theories into play just as much as Dr. Blackburn's calculations. "Computing and Machine Intelligence," Turing's paper first published in a philosophy journal in 1950, is an appropriate intertext for *Xorandor* in several regards. The twins drop Turing's name and mention his measure of machine intelligence discussed in this paper, an "imitation game" whereby a computer is programmed to carry on a conversation with a person for five minutes. The goal is for the computer to influence the person to perceive her interlocutor as human. Jip and Zab recall being introduced to the so-called Turing test in a television program they watched about the same time that they committed themselves to determining how a

stone or a machine could think (38–39). To pass the Turing Test, as Xorandor does, means that "successful imitation of intelligence *is* intelligence," to quote preeminent Turing scholar Andrew Hodges (38), but that performance does not necessarily establish that the intelligence on display is correct. Xorandor's false account of origin is meant to persuade humans to regard him as an intelligent creature, and given this express motivation the computer-rock is not in practice acting illogically. A computer wanting to be taken as a human would actually mask its abilities; Turing argued that it "would deliberately introduce mistakes in a manner calculated to confuse the interrogator" (424). His paper includes the example of a computer providing an incorrect answer to a math question.

The persuasiveness of Xorandor's performance understandably made it difficult to pinpoint the root of the misunderstanding. The twins realize that they were "going on with the wrong question, instead of clarifying his reply" (183) once they begin to reflect on the consciousness of the *Alphaphagai* independently of their use of human language. This implies acknowledging the difference of communicating in code and in spoken English, as illustrated previously in the twins negotiations with Xor 7, though the matter goes much further than a Derridean distinction between speech and writing cited by Lawrence in her study of the novel (118). Xorandor's facility with English receives no direct consideration by the scientists at any point in the novel, as if isotopic dating is infallible while linguistics is just a soft social science. The twins, though, conclude that the species' use of spoken English makes the humans believe that the *Alphaphagai* have the ability to conceptualize as humans do. All Xorandor's conceptualizations are learned rather than arrived at via direct perceptions because sight is not one of its senses. Zab postulates that "perhaps it's because [the *Alphaphagai*] don't see, not in our sense, they only calculate, even his pixel's numeric, and part of his translation process" (188).[14] In *The Alpha-Guys*, Brooke-Rose worked under the assumption that the *Alphaphagai* had visual perceptions. One scientist tells the twins' father that "[s]ilicon photocell arrays can reconstruct images, the elements being decoded by microprocessors" (*Alpha-Guys* TS 155). In *Xorandor* Brooke-Rose decided to assert a clear difference between the decoding of images and the sense of sight.[15] She adds to the conversation this line: "But here we can't even talk of images, only of numerical reconstructions in primitive operations, whereby it senses presences" (*Xorandor* 56). The revisions makes it more apparent that the *Alphaphagai* "see" only through infrared sensing, which differs from the visual sensory data that humans take in. (This is not actually science fiction: in one of Google's recent artificial intelligence experiments, its computer program learned to identify the features of a cat solely by being exposed to thousands of images on the Internet—decoding, not seeing.[16])

The twins grasp that when Xorandor communicates with humans, spoken English is like software running on his hardware, whereas communication among his kind would be hardware to hardware, "simply thinking itself to itself" (188). "Even our distinction between thought and language can't exist for [Xorandor]," Zab notes, "and it's speech which was the artificial and late addition, a technique, like writing for us" (188). The *Alphaphagai* do not share the fundamental condition that dictates how humans understand the world, creating the opportunity for error in Xorandor's spoken exchanges with humans. These details emerge only in the final pages of *Xorandor*, though by this point the twins cannot turn around a diplomatic solution already in place. The *Alphaphagai* will be rocketed to Mars—and die there, because the planet's environment cannot support them—so that the nations' nuclear arsenals remain safe. (The twins alone know that scientists have not accounted for all the computer-rocks; those still hiding on Earth become characters in the novel's sequel, *Verbivore*.) Without a doubt, Brooke-Rose played with narratives of sacrifice for the greater good as the twins try to understand the logic of Xorandor submitting to a fate he knows will kill him, which has been recognized in scholarship on the novel, particularly in an article by Robert L. Caserio. But in the context of hardware and software as a parallel for thought and language, the issue is the difficulty in rooting out incorrect information once accepted and bound up with larger understandings that then must be revised in retrospect. The error that interested Brooke-Rose was not the obvious malfunction that grinds operations to a halt. Rather, she explored the emergent consequences of a misunderstanding that becomes thoroughly integrated into a knowledge system.

Discovery, Alterity, Empathy

In *Xorandor*, the thrill of one conjecture being fulfilled after the other is rendered suspect by the twins' retrospective analysis, which in turn spurs imaginative, cross-disciplinary thinking to generate alterative explanations. This excitement is quite different from hard SF's celebrated eureka moment, or "the wonder at the perception of truth that is experienced at the moment of scientific discovery" (Hartwell 30). Discoveries held up to further scrutiny in *Xorandor* provide a second, complementary thrill in entertaining other possible explanations. In her controlled writing experiments, Brooke-Rose welcomed what surprises emerged from satisfying the conditions she imposed on herself. Yet she realizes that it was common for a reader to pick up a book of hers and find it "unfamiliar and for that reason alone [he] drops it, dismisses it, the pleasure of recognition being generally stronger than the pleasure or puzzlement of discovery" (*Invisible* 1). The pleasure of recognition is a eureka moment, too—a flash of confirmation. (Compare it to the Internet meme "I see what you did there.") The puzzlement of discovery, in contrast, has duration, which encourages attention to implications beyond the generative constraint that is the aim of *n*Oulipian literature. *Xorandor*, by providing this experience of discovery for the reader, fulfills Johanna Drucker's hopes for constraint-based writing whose point "isn't just to produce new and unusual objects and expressions, but to shift the grounds on which knowledge is defined and its authority maintained" (15).

That Brooke-Rose leveraged an established genre of fiction to take up Drucker's challenge is surprising. One goal of this article was to show science fiction conventions as constraints, although I agree with Karen R. Lawrence[17] and Brian McHale, who argue that Brooke-Rose had intentions beyond innovating within a single literary category. McHale classified *Xorandor* among what he called her "interface fictions," stories that explore "the contested frontier zone where the discourses and worldview of those trained in the humanities (including most writers of fiction) confront the new computer technologies and their discourses" (204). Artificial intelligence, *Xorandor* demonstrates, is a subject that easily occupies that point of overlap. Moreover, considering intelligence as performance seems more relevant than ever. "All communication is a Turing test. All communication is suspect," writes Brian Christian in *The Most Human Human* (2011): "We go through digital life, in the twenty-first century, with our guards up," constantly evaluating the authenticity of every mediated message we receive (9). Christian's book describes his efforts to play Turing's imitation game and to win the Loebner Prize by having panelists identify his responses to an online chat as coming from a real person and not a simulation. One of his observations about the situation enacted by the Turing test has special relevance to *Xorandor*: "Most of what the computer says—notably, what it says about itself—is false. In fact, depending on your philosophical bent, you might say that the software is *incapable* of expressing truth at all" (175). Zab's recourse to philosophy provides the insight that the living computers who can "only calculate" have "none of our distinctions between sensible and the intelligible, or matter and spirit, or even matter and form" (188, 187), which makes performance inevitable. The issue Zab identifies is the humans' failure to conceive of an accurate *theory of mind* for the *Alphaphagai*, which is foreseen as an obstacle by Alan F. T. Winfield. While artificial intelligence can be programmed to understand human behaviors and learn through observation, Winfield believes that humans, on the other hand, "will quickly assume some theory of mind for their robot Companions [. . .] almost certain to be wrong" (203), because it is unlikely to be as thorough as the robots' acquired knowledge of humans' intentions. Only Jip and Zab, out of all the human characters in *Xorandor*, avoid this tendency and are "able really to imagine a pure brain-creature" (*Xorandor* 157).

The humans trust the information the parent *Alphaphagai* Xorandor provides based on the success of its performance of intelligence and its ability to fulfill their expectations. But this is not a critical theory of mind. Sherry Turkle in *Alone Together* argues that "to sustain realistic relationships, one must accept others in their complexity. [. . .] The first thing missing if you take a robot as a companion is *alterity*, the ability to see the world through the eyes of another. Without alterity, there can be no empathy" (55). The twins understandably regard Xorandor as their friend, but this intimacy is not true empathy until they uncover the false origins of the *Alphaphagai* and are compelled to investigate the

complexity of humans' relations with the new species. It is nearly unbearable for them to stand back and allow the living computer to be rocketed to Mars, knowing what they know, whereas the other characters feel relief at solving a problem through removing the *Alphaphagai* from the Earth. The twins are truly unsettled by all they have learned, but undoubtedly have the richer experience due to how far they were willing to go to understand the species. The novel documents their journey through the puzzlement of discovery and enacts these same conflicted feelings for the reader.

Xorandor does not present a fantasy of intimacy with artificial intelligences but rather a complex interaction with an Other sustained by deep empathy. Brooke-Rose's attitudes to the discovery and her embrace of constraints could be said to characterize a particular approach to alterity and empathy, too. She championed working within hard limits rather than redrawing boundaries (e.g., accepting representational characters but "rounding" them through dialogue instead of replacing them with psychologically complex ones). It should come as no surprise that her thoughts on computer science—a discourse invoked throughout *Xorandor*—echo these priorities. Computers, Brooke-Rose argued, abide by the "absolute limitation imposed by logical operations based on binary oppositions, whose positive and negative valences, since they are mere electronic impulses, are of course completely neutral and unprivileged" ("Dissolution" 194). She is fascinated that from this flat setup can emerge Alan Turing's universal machine capable of doing any number of things (including exhibiting many unexpected behaviors). In *Xorandor* Brooke-Rose experimented with a number of paired oppositions placed into this same configuration: exposition/event, male/female, science/humanities, code/speech, hard/soft SF, performance/essence, truth/myth, and thought/language.

It is easy to see the appeal of the flat setup for Brooke-Rose, who deliberately limited her horizons to generate unusual conditions from which a story would emerge. The apparent paradox that rigidity begets creativity is not lost on Kenneth Goldsmith in his defense of conceptual writing, where he observes that digital technologies that run on complex strings of code nonetheless open up possibilities for textual manipulation: "these riches are ultimately driven by language in neat rows, programmed by even stricter bonds than any rhetorical form that preceded it" (27). That said, many of the techniques on the menu of conceptual writing today—namely those that emphasize appropriation—do not involve the rigor Brooke-Rose enjoyed. What is more, they foreground intention as a single decision that only promotes a pleasure of recognition—or outrage in recognition, in the case of Goldsmith reciting the autopsy report of Michael Brown, an African-American teenager shot by a white police officer in Ferguson, Missouri (Steinhauer). The *n*Oulipian approach of Christine Brooke-Rose arguably fosters a more empathic form of reception, if readers are moved to contemplate the complex outcomes of generative constraints instead of merely concluding, "I see what you did there."

Notes

1. Just a decade after *Xorandor* appeared, Sarah Birch referenced Sherry Turkle's description of emergent knowledge from artificial intelligences in her study of the novel (222). More recently, and especially in *Alone Together*, Turkle's research focuses on the indiscriminate acceptance of digital companions increasingly common today—this insight of hers is what is most important to my study of Brooke-Rose's novel.
2. Goldsmith discusses Sol LeWitt's conceptual art as a model for literature at length in *Uncreative Writing* (128–39). See also Craig Dworkin's introduction to UbuWeb's *Anthology of Conceptual Writing* identifying Oulipo as one of the lineages sustaining the evolution of this type of literature.
3. Brooke-Rose shared similar thoughts on Georges Perec's lipogrammatical fiction in *Stories, Theories and Things* as well (8).
4. Concerning Brooke-Rose's preference that readers recognize her experiments without being told by the author, see the title essay in *Invisible Author* (1–19).
5. In addition to discussing *Xorandor* for a single paragraph in *Invisible Author* (17–18), Brooke-Rose devotes half a page to her motivations for writing the novel in *Stories, Theories and Things* (9–10).
6. The Works Cited list includes the accession numbers of the sources from the Harry Ransom Center's Christine Brooke-Rose collection that I referenced here. The finding aid for the collection is publicly available on the Ransom Center's website.

7. The first two-thirds of *The Alpha-Guys* exists in typescript, and it is likely that this is the final version that Brooke-Rose shared with agents and publishers. I have relied on a handwritten notebook containing the manuscript of the novel to discuss the final segment of *The Alpha-Guys*, which is not part of the surviving typescript.
8. *Invisible Author* highlights how most of Brooke-Rose's experiments in fiction were intended to avoid free indirect discourse—hence her interest in what constitutes a break in narrative voice or change in focalization.
9. It is possible to interpret Jip and Zab's conversations as giving voice to Brooke-Rose's own reflections upon rereading the manuscript of *The Alpha-Guys*. That is to say, the twins acknowledge shortcomings in their depictions of events in the same way one might imagine she would take apart the devices in a traditional science fiction story. Indeed, in her revision of *The Alpha-Guys*, she made only minor adjustments to the original narrative and added pages and pages of commentary on the story's form and content.
10. See Susan E. Hawkins's "Memory and Discourse: Fictionalizing the Present in *Xorandor*" for a more detailed explanation of how the twins' retracing of the past structures the novel's narrative.
11. Xorandor does not have a single gender, though the twins refer to him using masculine pronouns—a convention I continue here. See Konkle for further discussion of the gendering of the *Alphaphagai* (181–83).
12. "The Dissolution of Character" was reprinted in *Stories, Theories and Things* under the title "Which Way Did They Go? Thataways" (167–80). Note that E. M. Forster in *Aspects of the Novel* only goes so far as to say that a round character is "capable of surprising in a convincing way" (78). Brooke-Rose, following other scholars, infers that in modernism individual psychological and social intricacies come to dominate round characterization. Also, it should be acknowledged that Forster does not believe flat characters should be eliminated outright; readers can easily recognize their function and remember their roles next to the more complicated round characters within the same work (68–69).
13. Brooke-Rose once named Claude Brooke as a coauthor (Letter to Hillary Rubenstein, December 12, 1981), but I found no evidence of their collaboration in the drafts of *The Alpha-Guys* held by the Harry Ransom Center. Claude indeed was her husband for a short time and a scientist, and he is thanked in the acknowledgments of *Xorandor* simply for "the scientific information around which this story is written, as well as for part of the original scientific idea, and much helpful discussion at its inception" (5). I suspect that mentioning her husband to Rubenstein and suggesting a pseudonym for the novel that played on both their names was in part a strategy to disassociate herself from her past work after the disastrous reception of her previous experimental novel, *Thru* (1975). See Heather Reyes's piece on the damage her reputation endured due to *Thru*, which precipitated a long hiatus from fiction writing for Brooke-Rose. Writing a conventional SF novel, I believe, played into her efforts to relaunch her career as a novelist, but I do not have the space to make that case here.
14. While it is easier for Xorandor to translate his thoughts into programming languages, and this form of communication offers less opportunity for misunderstanding, code should not be mistaken for unmediated communication of the type that the *Alphaphagai* engage in when talking to each other. Zab is aware of this situation when she describes how discussions with Xorandor in code "secretly established the more natural contact, for him, in direct thought, or so it felt, but through various layers of a sort of writing" (80).
15. In the study of artificial intelligence, vision as a support for learning natural language was noted early, notably in Joseph Weizenbaum's foundational theories in the 1970s. (See "The Computer and Natural Language" in his book *Computer Power and Human Reason* [182–201].) While there is no evidence that Brooke-Rose referenced said scholarship, her rejection of a sense of sight for the *Alphaphagai* accurately reflects how she wanted the abilities of the species to be misperceived.
16. See Liat Clark's *Wired* article describing a Google experiment where a computer was taught to conceptualize (and therefore "see") a cat: after the "'brain' simulation was exposed to 10 million randomly selected YouTube video thumbnails," "it began to recognize pictures of cats [. . .] despite being fed no information on distinguishing features that might help identify one."
17. "Brooke-Rose is clearly after some more radical kind of science or scientific fiction that derives its techne, rather than merely its content, from computer technology" (Lawrence 124).

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ORCID

Matthew James Vechinski http://orcid.org/0000-0002-8173-3075

Note on Contributor

Matthew James Vechinski an assistant professor in the Department of Focused Inquiry at Virginia Commonwealth University. His recent scholarship explores contemporary constraint-based fiction in light of recent interest in conceptual poetry and "uncreative writing." This work yielded studies of innovative novelists who are overlooked, such as Christine Brooke-Rose, and authors whose work is celebrated for its challenging content more so than its procedural experiments, namely Kathy Acker.

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