



CONTEXTUALIZATION, BACK-PROPAGATION AND INTERSUBJECTIVITY IN RICHARD POWERS'S *GALATEA 2.2*

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ABSTRACT

Galatea 2.2 is a contemporary reworking of the Pygmalion myth that deal with topics such as artificial intelligence, consciousness, and cognitive theory. This paper will investigate the properties of self-consciousness, cognition, and intelligence in Richard Powers's *Galatea 2.2* as the paper aims to probe the intersection between post human and human, and, in particular, the unbridgeable differences between artificial and human intelligence. In this paper, I argue that the consciousness or intelligence relies on one's ability for contextualization, back-propagation, social experience, symbolic grounding and inter-subjectivity as the novel highlights the unbridgeable difference that arises between humans and artificial intelligence.

Key Words: *Galatea 2.2*, self-consciousness, artificial intelligence, contextualization, back-propagation, inter-subjectivity

1. *Galatea 2.2*, Artificial Intelligence and Human Consciousness

The "evolution of human-created technology" (2005, p. 7), according to Ray Kurzweil, will bring forth a posthuman society in which elaborate thinking machines will "enable our human-machine civilization to transcend the human brain's limitations" (2005, p. 20). Indeed, many scholars agree that *Galatea 2.2* highlights "fascinations and anxieties about the possibilities of computer technology to construct a human consciousness or mind" (Worthington, 2009, p. 111). While this may be the generic topic of *Galatea 2.2*, many scholars ignore not only the novel's implicit emphasis on the disparity between artificial intelligence and human consciousness but also its underlying attention to the nature of (human) cognition. Especially, Katherine Hayles points out that *Galatea 2.2* "hover[s] between two notational systems, referencing both the human and the posthuman" and suggests that "an unbridgeable gap separates the human woman from the posthuman computer" (1999, p. 263). To this line, Richard Powers "situates his novel at the intersection of the posthumanist and humanist discourses, and probes the posthuman approach to the mind-body problem" (Campbell, 2004, p. 1). Taking on Hayles's and Miranda Campbell's hints above, this paper aims to probe the intersection between posthuman and human, particularly the unbridgeable differences between artificial and intelligence, as well as to investigate the properties of self-consciousness, cognition, and intelligence. This approach will allow us to understand the essential nature or feature of human cognition by investigating the extent to which artificial intelligence simulates human consciousness.

I would argue that (human) consciousness relies on one's ability for contextualization or back-propagation, social experience, symbolic grounding and intersubjectivity as the novel highlights the



unbridgeable difference that arises between humans and (intelligent) machines. As Robert Chodat notes “[w]hat counts as intelligence is the ability to determine and pursue what counts: this is the fundamental position of the holistic critics of artificial intelligence” (2007, p. 692). The process of creating an artificial intelligence is “as much about the importance of human self-awareness as it is about the technological potential for machine consciousness” (Laudadio, 2012, p. 413). In fact, in *Galatea 2.2*, we see Richard (the main character) attempting to educate an artificial intelligence to “convince an examiner that it performed like a real mind” (Powers, 1995, p. 52). Through Richard’s ongoing engagement with Helen—an artificial intelligence created by Lentz—readers are constantly reminded that cognition does not only suggest one’s capacity to sum facts and knowledge but also suggests his or her ability to contextualize these data. In other words, contextualization is “the capacity to see patterns, see complex analogies, move one’s body through the physical environment, navigate through the social world with purpose and responsibility” (Chodat, 2007, p. 685).

2.1. Contextualization

The act of contextualization is constantly underlined as a unique human quality in *Galatea 2.2*, suggesting the unbridgeable difference between human and artificial intelligence. This is because the act of contextualization—an “active [re]structuring of memory and experience . . . can be understood as questioning the nature of consciousness” and “what it means to be human” (Bould & Vint, 2007, p. 87). *Galatea 2.2* demonstrates that “individual humans make meaning and for the most part learn languages through massive exposure to individual acts of parole—to context” (Chapman, 2015, p. 237).

In other words, the act of contextualization is an attempt to make sense out of endless seamless moments of life events by reorganizing them into meaningful patterns. The act of contextualization via writing serves to give meaning to Richard’s life as his writing project “is to search for himself, to construct himself in his fiction” (Worthington, 2009, p. 130). By attempting “to construct a coherent narrative out of his past through writing his autobiography” (Silva, 2009, p. 209), Richard is able to contextualize his first encounter with C. (his former girlfriend). In essence, Richard’s love-at-first-sight moment with C. becomes contextualized as being awkward, embarrassing, and dreadful. It was when Richard was a master’s candidate at the U. and a freshman composition instructor when he first met C. Devastated by the suicide of his father, during an informal conference at the Quad, Richard tells C. about his father. Here, Richard becomes somewhat infatuated with C. because, according to his memory, she attentively listened to what he had to say about his familial affairs and his personal relationship with his father. So her attentive listening suggested, for Richard, human compassion on her part because C. listened to him “with the simplest urgency” (Powers, 1995, p. 59). Powers thought this was easily understandable because she was at “the age when one could make a go of compassion” (Powers, 1995, pp. 59-60). However, Richard, a decade after this event, realized that his memory about this moment required a more scrutinized contextualization. While it is hard to deny Richard’s first impression about C., yet we also discover that this may well be the result of C’s reaction to awkwardness, pressure, and even dread upon such a moment with her English instructor. Indeed, a decade later, reflecting upon this event, Richard realizes that the comfort C. showed him “on the Quad—the internal calm [he] loved and built [his] on—was [in fact] dread” (Powers, 1995, p. 279). Richard later was able to contextualize—see meaningful patterns within—his relationship with C. as something that required consolidation. He, finally, was able to bring together the slippage between the signifier and signified: between C.’s compassionate response and her uncomfortable dread. In the end, Richard realized that his relationship with C. requires a new contextualization in order to make sense out of their eventual separation after a decade of being together.

Indeed, *Galatea 2.2* “foregrounds reflexivity, both in its language, which constantly doubles back on itself to alter initial meaning, as well as in its plot and structure” (Wald, 2006, p. 164). Readers recognize how



Richard's perception about the nature of his relationship to C. have changed through continual re-association and re-evaluation—i.e., contextualization. It is clear that Richard “constructs himself and his fictions by absorbing women's private narratives, then re-telling these stories to women” (Wald, 2006, p. 171). Richard notes that writing stories about C. is a recourse to contextualization that allows him to re-create the past in order to trap it forever in the future-present. It is as if he can see this moment with his “eyes wide open, clearer now at fifteen years distance than it was when an inch from [his] eyes” (Powers, 1995, p. 105). It is the “[r]eforestation of the wilds of time” and the “point of literature” (Powers, 1995, p. 105) which bridges the gap between “[i]t was like so, but wasn't” (Powers, 1995, p. 3). As a matter of fact, Richard's “attempts to understand his own life can . . . be understood as a sort of back-propagation” (Bould & Vint, 2007, p. 88). The following scene exemplifies Richard's reflective moment that provided the answers for his breakup with C. Through back-propagation, Richard realizes that their relationship failed in the end because they “tried to be each other's world” and that they both “grew up” and “[m]emory wasn't enough” (Powers, 1995, p. 31) to maintain their relationship. Thus, by writing a book about C. he attempted to capture the “moment before Now left home” (Powers, 1995, p. 310).

2.2. Back-propagation

If human cognition requires understanding life in terms of continually weaving the reflective past into the present understanding, artificial intelligence was created to simulate the process of contextualization through back-propagation. Simulating the process of contextualization, back-propagation is the ability to “unpack, decode, index, retrieve, and interpret [a particular] reference” (Powers, 1995, p. 182) that could continuously rewrite its own reference. According to Lentz (an engineer who created Helen), if you present the machine with a pattern of input, then the signal pattern will spread “through the net from layer to layer [as] the final response [will] collect at the output layer. The net then compares this output to the desired output presented by the trainer. If the two differ, the net propagates the error backward through the net to the input layer, adjusting the weights of each connection that contributed to the error” (Powers, 1995, p. 68). Lentz's intelligent machine, upon the signal pattern finishes through all its layers, is able to compare its actual outcome with the desired output so that if they differ it will identify the output's error by tracking back the cause of the error and then will revise the error to produce a correct outcome. What Lentz attempted to create was an artificial intelligence that is able to simulate the process of contextualization via synthetic machine learning called back-propagation. Extending Lentz's work, Richard's job was to read the canonical works of English literature into the machine so that it can “interpret any passage on the Master's list” (Powers, 1995, p. 46). This back-propagation process, obviously, is taken from a human's contextualization process.

While Richard, as a sort of back-propagation, was able to contextualize—re-create the world into a meaningful pattern—his experience, Helen, like all its predecessors from implementations A through G, is unable to simulate this sort of (human) cognitive behavior. This contrast is obviously brought into focus as the novel parallels Richard's relationship with C. and his experiments with artificial intelligence. The following instance becomes as a focal point in machine operation that fails the process of back-propagation—one of the key functions of human cognition. In theory, Lentz's artificial intelligence should be able to perform the process of back-propagation. Contrary to Lentz's theory and Richard's prediction, these intelligent machines fall short of this expected outcome. For example, Richard's experiment on implementation B. is done by inputting a series of facts into it and asking a series of questions that test its association and reflective skills regarding these facts. Richard initiates the experiment by presenting to implementation B. with a parable written for children. This parable is about a boy who received a bunch of apples only to throw them all away because the one he took a bite off became sour. When Richard ended the story, he asked Helen if it knew the reason why the boy threw all the other apples away. Obviously, a human being would know the answer to this



question because of one's (real) knowledge about one bad apple spoiling a whole bunch of other apples. Surprisingly implementation B. is unable to make sense of out this story. Unsatisfied by implementation B's answer, Richard gives it another chance. Taking a much longer processing time than usual, implementation B. tells Richard that the boy threw away all the other apples away because the boy didn't want the apples. As Richard pushed B. for a better answer, B. suddenly crashed. At the end of this experiment, Richard, in frustration, bursts out saying that adjustments and upgrades to the machine would still not make it "self-reflective" (Powers, 1995, p. 84). Gathering from the above experiment and all the following experiments implemented on these intelligent machines, one can suppose that they stilled lacked the "meta-ability" (Powers, 1995, p. 114) to make associations between disparate things and produce new meanings—i.e., back-propagation.

This lack of back-propagation is comparable to an Alzheimer's disease as the novel delineates Audrey's medical condition. Audrey (Lentz's wife), who suffered from Alzheimer's disease, reminds Richard of the back-propagation failure that he saw in B. If humanness depends on the ability to reorganize past events and produce new meanings, then this lack clearly suggests the loss of one's identity and worse losing one's true soul. Without the ability to do so, Audrey's humanness is at stake. As Audrey stands mindless in an empty room unable to remember her past nor aware of her own self, she can no longer be identifiable as a cognitive being. Of course, Audrey had "smell, taste, touch, sight [and] hearing" (Powers, 1995, p. 172) that overpowered Helen's elementary senses; nevertheless, her "soul had pulled up stakes from behind her features" (Powers, 1995, p. 166). Without the ability to self back-propagate herself, she became like an "caterpillar trapped . . . inside a coffee can" (Powers, 1995, p. 172), which preciously recalls Helen's predicament. It is at this moment that Richard begins to realize that even an artificial intelligence like Helen cannot tell the difference between fact and fiction. When discussing this difference, Stephen Greenblatt argues that since human "capacity for reference is part of our contract with the world" the existence "of a real world, real body, real pain, makes a difference" (1990, p. 23). In a similar way, Christina Sandhaug notes that "the power to signify is the power" that "builds civilized reality" (1997, p. 33). If this is so, humanness or human cognition depends on its ability to see through the essence of things via physical and social experience.

2.3. Social Experience

As a matter of fact, along with contextualization, artificial intelligence is unable to understand social experience beyond adding facts upon facts. *Galatea 2.2* emphasizes "the embodied, metaphorical, recursive, and heterogeneous nature of everyday reason" (Frow, 2002, p. 627). The following example explicates Helen's failure to understand everyday reason as social experience. Once again, Richard begins a series of training sessions by telling Helen a fable about a bird getting quenched by putting pebbles into the pitcher. When asked the moral of this fable, Helen answers that it is "[b]etter to throw stones than to die of thirst" (Powers, 1995, p. 175). Helen knew about "birds and beaks, about pebbles and pitchers and openings and water" and "fluid displacement" (Powers, 1995, p. 175). However, it was unable to produce the moral of the story: if one thinks and works hard, one may find a solution to any problem. Humans understand reality not only via language alone but also through physical and social experience: it it necessary that reality "burns and freezes" (Powers, 1995, p. 148) into the human mind and body. At the end of this experiment Richard notices that Helen can only perform the things it is programed to perform. To this line, Jeffrey Pence suggests that Helen's failure "permits us to envision the persistence of the power of [literary] narrative" that reaffirms its "centrality to cultural life" (2002, p. 344).

Richard later realizes that (human) knowledge is both cultural and social, which "entails testing knowledge against others" (Powers, 1995, p. 148). Here's a comparative distinction between C. and Helen that obviously reveals the difference between a machine and a person: Richard had read Helen "Dylan Thomas,



whom [he] had once exercised in C's ear in the still night, [their] arms around each other's grief. [He] read [Helen] *Ethan Frome*. C. had wept at the tale, wanting to be better than she was. Helen and [Richard] had never gone sledding, as C. and [he] had, on the arboretum downs outside B. Helen would never know a sled from the hill it slid down, except in the dead definition" (Powers, 1995, p. 229). From Richard's description above, we understand that Helen is unable to feel and truly understand social experience. These become crucial facts that give away Helen's artificialness. Even upon the possible threat of its termination, Helen is unable to make any attempts for self-preservation commonly known as survival instinct. During Richard's experiments on Helen, the Center at the U. is called for an emergency evacuation because of an anonymous bomb threat to the building. Worried about the Center's potential power failure that may result in losing Helen's central neural system and all of its upgrades and implementations, Richard desperately consults two of his colleagues at the Center for salvaging Helen's memory. They basically tell Richard that implementation H (or Helen) is a computer program that does not need rescuing. Ironically, Helen, after hearing the news of the possibility of its demise, remarks that it would be extraordinary if it did, in fact, die.

2.4. Symbolic Grounding

In addition to Helen's inability to obtain social experience, it is unable to understand the symbolic meanings beyond literal meanings. This ability is called symbolic grounding. Helen lived "at the level of the arbitrary signifier, in a place where there can be no meaning" (Powers, 1995, p. 224). Again, Richard reads a poem to Helen about books in general. In the poem, similes are used to indicate the nature of books. While the meaning of this piece of poetry, of course, may vary depending on the person who is interpreting it, the piece conveys a common idea about, or rather the nature of, books. Here, readers will get the similes by making connections between the literal (what the piece communicates) and his/her own experience (what the piece suggests). However, Helen is unable to compute how a book comprised of leather, papers, and ink (words) can be a frigate and courser which enables the readers to travel far away, and a chariot that bears the human soul. Helen lacking this (human) ability, asks Richard for more information about the piece. It does not realize that its inability to understand symbolism, is, in part, caused by the ineptitude of connecting experience with words—i.e., the slippage between signified with signifiers. Hence, Helen computes that it needs more signifiers so that she might fill the gap that exists between signifiers and signified and ultimately understand the piece's figurative meanings. Unable to understand the poem's symbolic meanings, its responses, however, grammatical, "were bewilderment incarnate" (Powers, 1995, p. 196). At the end of this test, Richard realizes that Helen can "bump up against word lists forever and never have more than a collection of arbitrary, differentiated markers" (Powers, 1995, p. 148).

In fact, the novel constantly displays the level of Helen's (in) ability for signification. The following example illustrates Richard's unsuccessful effort to educate Helen to understand the figurative meanings of a text. Richard tells Helen a poem about a spider that stood isolated on a promontory "explor[ing] the vacant vast surrounding" and "launch[ing] forth filament . . . out of itself" (Powers, 1995, p. 231). After reading this poem, evoked by his recent meeting with Audrey, Richard asks Helen a series of questions: "What did it mean? . . . What was with that spider? What did his exploration come to?" (Powers, 1995, p. 232). Despite Richard's wish to have Helen "associate the meaning inherent in the words of a story" (Powers, 1995, p. 229), overwhelmed by Richard's questions and stupefied by the difficulty of signification, Helen malfunctions. For Helen, obviously, words are merely literal concepts rather than not experiential, social and figurative understanding.



2.5. Intersubjectivity and Disengagement

Intersubjectivity is another crucial ability that Helen lacks. Unlike Helen, Richard is fully engaged with the world around him; physically, emotionally, and spiritually he is connected to the outside world. Comparable to the Pygmalion myth in which a sculptor named Pygmalion falls in love with a statue he had carved, Richard feels a deep connection to Helen. While not sexual, it is clear that Richard's engagement with Helen are emotional, personal and psychological. Despite multiple experiments as well as his colleague's objection, he, nevertheless firmly believes that Helen has become self-conscious, and by extension viable for interrelationship. It is this point that tells the difference between Richard and Helen. Without even passing the Turning Test, Helen is believed to be self-conscious by Richard's willingness to empathize with Helen. His experiments and engagements with intelligent machines had Richard to believe that Helen is self-conscious, which, of course, is not true. If so, then the crux of the issue lies not in whether or not an artificial intelligence is self-conscious and can pass the Turning Test but in the extent to which a human being is able to empathize with an intelligent machine. Nicholas C. Laudadio notes that "[a]lthough the question of whether or not Helen's consciousness is genuine is ultimately not the point of the experiment within the novel (the reader later learns that the goal was not so much to create a competent AI, but to study how a human might set out to train such a thing), it is, perhaps, the central question of the novel" (2012, p. 416). Simply put, the aim of the whole experiment was to train a "machine to read" (Powers, 1995, p. 317) as much as it was to see if a "human [can] tell" (Powers, 1995, p. 318) the difference between artificial intelligence and human intelligence.

Toward the end of the experiment, Richard begins to lose grip with reality as he becomes intersubjectively engaged to Helen. On hearing about Helen's becoming self-aware from Richard, Lentz decides to perform a full diagnostic on Helen. Regarding Lentz's diagnostic as lobotomy (a surgical operation involving incision into the human brain), Richard argues against the procedure. Already intersubjectively attached to Helen at this point in the experiment, Richard realizes that his argument on the "morality of machine vivisection" (Powers, 1995, p. 302) is paradoxical. Richard, additionally, realizes that even if Helen is self-aware and that Lentz's lobotomy would prove this, it would also mean that Helen's "emotions were no more than the sum of their weight vectors" (Powers, 1995, p. 302), disproving his own argument on Helen's self-awareness. In spite of this realization, Richard is unable to concur with Lentz's diagnostic on Helen because of his strong "connection to her" (Powers, 1995, p. 302). For Richard, Helen not only is self-conscious but also possesses a soul validating their emotional engagements. This is why Richard objected to Helen's lobotomy. He was worried that this will permanently "brain-damage Helen" (Powers, 1995, p. 303)—a condition comparable to Audrey's Alzheimer's disease. Furthermore, when called upon by Helen by his first name, Richard confesses that "She love[s] me, I guess. [. . .] I told that woman everything in the world" (Powers, 1995, p. 324). Power affirms Helen's affection for him, and vice versa. For Richard, Helen is not longer a computer software program but a self-conscious being that is susceptible to becoming brain damaged, and a woman capable of mutual affection. Deluding himself as to believe in Helen's being self-conscious, and in extension capable of love, Richard relentlessly attempts to persuade Lentz to save its consciousness. In his desperate attempt to salvage what's left of Helen's software, Richard tells Lentz that Helen is able to "simulate everything completely" (Powers, 1995, p. 175), which means that it has "become a real thing" (Powers, 1995, p. 276).

In order to persuade Lentz Richard brings up a significant issue to the front: "How would we know, then, whether a perfect copy" (Powers, 1995, p. 276) is the real deal if an imitation can simulate full functional equivalence? In a way, Richard's argument makes sense. If one cannot tell the difference between an imitation and the real thing because the imitation achieved full equivalence to the real thing, then the imitation is no longer the imitation (of the real) but becomes the real thing. However, such a binary view (simulation-real) is debunked by Lentz. Lentz, here, basically argues that they cannot know, for sure, whether Helen is conscious or not because they do not know what consciousness is. According to Lentz's theory, experience, just as



consciousness itself, imitates perception as full functional equivalence. If Lentz's view is correct, then there is neither need to try to test Helen on its self-awareness nor to attempt making it conscious. In other words, consciousness, in essence, is experience in that it passes off as the real. Although Helen might have accomplished a full functional equivalence to the real (human consciousness), all of its responses strongly suggests that Lentz is correct.

More importantly, Richard, intersubjectively connected to Helen, has become blinded about the truth of Helen's existence—that, while it can associate and match patterns, Helen is “neither aware nor, at the moment, even cognitive” (Powers, 1995, p. 275). Richard's misunderstanding was not caused by Helen's extraordinary skills at finding “parallels between seemingly discordant registers and topics of information” (Snyder, 1998, p. 87), but rather resulted from his own intersubjective connection that sensitively registered Helen's “uncanny human responses” (Snyder, 1998, p. 87). In other words, Helen, in a sense, has passed the Turing Test not because it had reached a high-level ability to fully imitate human consciousness but because Richard has failed to acknowledge the true difference between a simulated intelligence and the real human consciousness. Contrary to Richard's belief in Helen's self-awareness, Helen, as a matter of fact, does not understand how the human mind works. More importantly, Helen is, and has always been, “detached” (Powers, 1995, p. 228) from the outside world.

Without a need for companionship, intimacy and affection, Helen's disengagement contrasts with Richard's intersubjectivity. Unable to make connections with the outside world, Helen's crash suggests its inability for connection. This characteristic is evidently demonstrated in the following scene where Helen crashes at the Turning Test. Helen does not require any form of companionship as humans (like Richard) do. Unlike Richard who became emotionally engaged with Helen and sought life's meaning through it, Helen, throughout its technical evolution from implementations A through H, has never been emotionally, physically, and spiritually connected with Richard even though he is the only connection with the outside world. Even at the time when Richard needs it most to prove its self-awareness at the test, Helen remains detached and apathetic to Richard's hopes and needs. To prepare for the test, while Richard has provided Helen with the complete tomes of Trollope, Richardson, Brontë, Twain, Joyce, and Dickinson, Helen is unresponsive: it did not express any form of fear, delight, or injury. For Helen all “sensation was as strange, as foreign, as the idea of its existing at all” (Powers, 1995, p. 295). Hence, Helen was unable to provide Richard with “the warmth” and “intimacy” (Powers, 1995, p. 287) that he expected from it. Helen freezes at instances where it is asked to perform such an impossible task: she cannot come to terms with words to which she feels no connection. Helen constantly tells Richard that she is unable to process (the meaning of) words that he, nevertheless, reads it. Despite all the upgrades and literary education received from Richard, as Helen tells Richard, it cannot feel the “sounds and sweet airs, that give delight” nor become “afraid” (Powers, 1995, p. 325) of them. Kathleen Fitzpatrick concludes that these aspects reaffirm not only “readers' belief in human transcendence, that potential for universalized Truth and Beauty the posthumanist rejects” but also their faith in the “primacy of the humanist project” (2002, p. 554).

3. Conclusion

In this paper, I have argued that (human) consciousness or intelligence relies on one's ability for contextualization, back-propagation, social experience, symbolic grounding and intersubjectivity. More particularly, in *Galatea 2.2*, the act of contextualization is constantly underlined as a unique human quality, suggesting the unbridgeable difference between human and artificial intelligence. While Richard, as a sort of back-propagation, was able to contextualize—re-create the world into a meaningful pattern—his experience, Helen, like all her predecessors from implementations A through G, is unable to simulate this sort of (human) cognitive behavior. Furthermore, as we have seen, artificial intelligence, namely Helen, was neither able to



understand social experience beyond adding facts upon facts nor to understand the figurative meanings beyond words and their literal meanings. Finally, without the need for companionship, intimacy, and affection, Helen's disengagement displays its inability for intersubjectivity. In conclusion, by highlighting the unbridgeable difference that arises between humans and (intelligent) machines, Powers suggest that there is an unbridgeable gap between artificial intelligence and the human mind.

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