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Abstract

This treatise will fully embrace the interdisciplinary approach and will attempt to apply theoretical physics to works of literature. There is no escape from the search for an ultimate connection between all disciplines of human thought. Culture, progress, their relationships with material things are all inevitably connected, even if this connection is its all-prevalent absence. Recent developments in quantum physics and post-human philosophy have provided the key to the intimate substance of all things – information. Although, the numerous branches of information structures are to be studied separately to grasp, appreciate and use their manifestations, to truly understand reality it is necessary to understand the nature of information itself. The two works of literature examined here are Mary Shelley's *Frankenstein* (1818) and Herman Melville's *Moby-Dick or, The Whale* (1851). In the first part, *Frankenstein* will be subdivided into homeostatic informational systems and the observer effect will be examined with respect to each system. Then the information theory will be applied to the character of Ahab in an examination that will focus on the nature of a willful observer and how it operates in the realm of literature.

MONTCLAIR STATE UNIVERSITY

“I Shall Watch Their Progress”:

The Observer Effect and Information Theory in Literary Systems.

Submitted by

MICHAEL L. SHOHET

A Master’s Thesis Submitted to the Faculty of

Montclair State University

in Partial Fulfillment of the Requirements

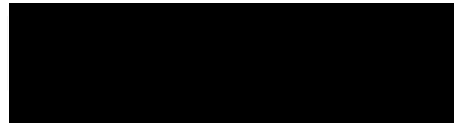
for the Degree of Master of the Arts

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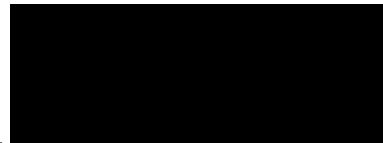
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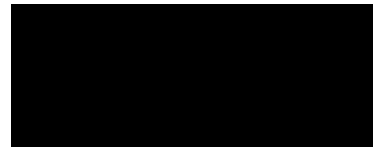
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The Observer Effect and Information Theory
in Literary Systems**

A thesis

Submitted in partial fulfillment of the requirements

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Montclair, NJ

2021

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I. Introduction

In his 1958 book *Physics and Philosophy*, Werner Heisenberg establishes a fundamental locus of truth – a substance observed. By claiming that “the transition from the ‘probable’ to the ‘actual’ takes place during observation,” Heisenberg provides the observer with a power over all reality (Heisenberg 23). The repercussions are monumental. Since observation “selects of all possible events, the actual one that has taken place,” the observer documents and measures actual reality and, as a result, allows it to exist (Heisenberg 23). The observer is so powerful, that by only the act of watching, he is understood to alter the very instance of existence that is being watched. This is the so-called observer effect, first proposed by Heisenberg as part of the quantum theory. The crown jewel of modern physics, the quantum theory concerns itself with the strange microcosm that composes the entire underlying basis of all reality. This domain is something so fundamental that its laws can be witnessed in all comprehensible phenomena, including works of literature.

In the following pages, I will uncover and examine the observer effect and its parent theories of quantum mechanics and informational reality in two canonical texts of the English language: Mary Shelley’s *Frankenstein* (1818) and Herman Melville’s *Moby-Dick or, The Whale* (1851). I will trace the role of the observer in these works and connect this subject to how it is understood in the quantum and in the information theories. By pursuing this line of discovery, I aim to apply theories of science to literary texts as a stubborn experiment in search for a supreme connection. I want to show that, as Shakespeare’s Hamlet already noticed, “there are more things,” things inescapably fundamental in the pursuit of exegeses (1.5.169). To do this, I will attempt to show that

literary analyses of even 19th-century novels can be recontextualized to allow for an informational examination. In this, I intend to prove that representational reality, which is what all literature is, is not only an augmentation, or rather a mode, of actual reality, but can also be explained, just like the non-literary reality, by using scientific theories.

It has to be proposed that when these works were created, they could only be shaped according to already existing laws and infrastructures of language. And these laws of language structuring could then be explained, at the very fundamental level, in terms of informational structuring as it is approached in quantum physics. Because of this connection, it could be shown that, at the fundamental informational dimension, defined by the quantum, there is no divide between the real reality and the literary reality. As the literary is some representation or expression, or a version of some external reality, the same exact informational material is used for literary construction and same exact frameworks are used to organize that material. So the literary phenomena would necessarily manifest the same exact underlying nature of the phenomena that take place in the real world. Since a novel, or a short story, or a poem, or a film represents something that necessarily behaves according to scientific explanations, then the representation itself, the events in the novel, the relationships between the characters, the plot line developments, even syntactic word order, will also act in this way.

The representational/expressional signification of this kind does not end with the boundaries of the literary reality. It extends into the real, as the real world leaks into the literary. The literary does not just behave as a passive representation, but actively affects the outside reality through informational flows, just like the real world affects the literary back, through its observers. What this means is that works of art, i.e. these novels, while

reproducing or signifying reality, affect non-literary reality on a physical level. From this, it can be shown that the laws of language, the behavior of literary construction material, are the same as the laws of information, which is known to assume physical properties at the quantum level.

From Jacques Lacan we know that linguistic signs are the same as informational signs; they are placeholders for meaning, arising from signifiers pointing to their signified, and from these signifiers' "reducing to ultimate distinctive features and of combining according to the laws of a closed order" (Lacan 191). Informational structures act the same way, by reduction of their stored values, by pointing to other locations, and by changing and updating incessantly throughout these operations. They are indistinguishable ontologically – the characters in a novel and the reader himself are both informational systems. By taking these novels as case studies and examining them as these systems, it can be shown that, on the quantum level, literary information behaves universally in accordance with the philosophy of physics, just as all information behaves in the real world.

II. Mary Shelley's Informational Systems

In February of 1998, the observer effect was itself observed in a controlled experiment conducted at the Weizmann Institute of Science in Rehovot, Israel. The experiment demonstrated that a beam of electrons, sifted through a perforated barrier, was "affected by the act of being observed," and the beam's electrons shifted their behavior from the nature of waves to that of particles (Weizmann). This was not the first time the power of the observer was recognized and contemplated. The 18th-century

idealist philosopher George Berkeley insisted that some kind of an observer is needed for anything to exist at all. Although speaking of all methods of perception, Berkeley wrote that he couldn't deduce "how the Testimony of Sense can be alledged, as a proof for the Existence of any thing, which is not perceived by Sense" (Berkeley 22).

But even the Kantian school of idealism would not be enough to explain what the observer actually is, considering the growing prevalence of empirical approaches in science. More recent philosophy calls upon the observer to become an important component of the posthuman theory. In her book *How We Became Posthuman*, N. Katherine Hayles places the observer as a crucial player in the establishment of system reflexivity, a concept, which describes how closed, homeostatic systems of information maintain themselves through feedback loops.¹ Reflexivity itself is a notion of a larger theory of cybernetics, which Hayles attributes to the work of a mid-twentieth-century group of scientists and theoreticians, among them Norbert Wiener, who argued that human beings and "the social structures they devised operated as self-regulating mechanisms" constituted of information (Hayles 7). The cybernetic theory of reality further offered "a fully articulated epistemology that sees the world as a set of informationally closed systems," a revelation based on the work of Humberto Maturana and Francisco Varela (Hayles 10).

Hayles writes that although it would seem that in these type of procedural interactions "information [flows] from the system to the observer... the feedback can also loop through the observers, drawing them in to become part of the system being observed" (9). The resulting conceptualization "shifts from the cybernetics of the observed system to the cybernetics of the observer" (Hayles 11). A system then becomes

dependent on “mutually constitutive interactions between the components of the system,” including the observer, regardless of that system’s informational content (Hayles 11). As applied to human behavior, the observer could be considered a powerful character in the informational systems of human beings and their social structures, both commonplace subjects of literary representation.

It can be shown that literary works can be considered in terms of Hayles’s systems of informational content, composed of characters, plot lines, dialogue, all interacting with each other in accordance with theoretical conceptualization that has a basis in physical reality. More specifically, a set of characters can be understood as a closed homeostatic system and their relationship, as it develops in the narrative, as a process of that system. Another character could be established as an observer and then behave according to the quantum theory and Hayles’s conceptualizations, by feedback loops, outside measurements, and informational exchanges.

In the case of *Frankenstein*, because of its epistolary mode, the entire novel can be seen as a structure built on multiple levels of observation. The very top observer in the system of the novel is, of course, the reader, the ultimate critical portal through which the novel’s system is connected to the outside. But the immediate observer within the ontological, literary system of the book is Margaret Saville. In the language of atomic physics, she is, what Heisenberg calls, the main “measuring device” that must be separated from the phenomenon that “we are going to study” (Heisenberg 25).

Margaret appears to be the ultimate observer of both Victor’s story and more importantly, of Robert Walton’s. Margaret’s effect on Walton seems to be his heightened concerns for carefulness and caution, or at least his conscious effort to convey this

concern in his letters. The March 28th letter painstakingly informs Margaret that Walton will “do nothing rashly” and that she knows him “sufficiently to confide in [his] prudence and considerateness whenever the safety of others is committed to [his] care,” the others here being his ship crew (Shelley 11-12). Then the July 7th letter assures Margaret that Walton “will not rashly encounter danger” and will be “cool, persevering, and prudent” (Shelley 13).

Here it can be comprehended that Walton’s actions are affected in some way by either his sister’s actual concern for his safety, or his own perception of what she may be expecting of him. Her perceived watchfulness therefore, while she does not even have a single line of dialogue in the story, weighs immensely on Walton’s mental state and consequently, his actions. Laura Claridge points to Walton’s confessing his failure as a poet to Margaret and proposes a parent-child relationship between the two characters.² Claridge ascribes Walton’s zeal to succeed at his expedition to a “compulsion on Walton’s part to prove himself” to the maternal Margaret (16). The observer in Margaret becomes an even stronger influence once Claridge’s ideas are taken into consideration. This is how the observer affects the system, by an underlying psychology of the text itself. The changes in the system can be seen in the interactions between the characters, their informational exchanges and manipulations.

Trapped in the Arctic ice, Walton writes of his imminent death and through his sister laments his own fate – “Oh! my beloved sister, the sickening failings of your heart-felt expectations are, in prospect, more terrible to me than my own death” (Shelley 153). Here Shelley establishes Margaret as a vantage point from which Walton’s own attitudes and motivation stem forth. Margaret’s supposed desire of Walton’s safe return, another

maternal aspect, which is never actually expressed by her explicitly, is the measuring device of Walton's behavior. For some reason, he imagines that this is what she must want – Claridge's hypotheses again come into forefront, as the mother imago ravages through Walton's psyche. Although Margaret is only present in Walton's mind, this concern is enough to alter his decisions and to upset the system of his venture.

When his crew makes him promise to turn back once a passage through the ice becomes available, Walton tells his sister that he "in justice, or even in possibility" could not "refuse this demand" (Shelley 154). While at the same time, here and in other letters, he indicates that he had not "conceived the idea of returning," and that he had "rather die than return shamefully," unable to achieve his discoveries (Shelley 154-155). So Walton seems resolute to continue his quest, even until his death. Yet he turns back for England. Something disturbs and stops him, something that he considers worse than death. According to his letter, it is his sister's influence. Walton emphasizes that she expects him to return safely and also to uphold proper ethics towards the safety of his crew. Here Margaret can be understood as an observing presence, which measures, and at the same time influences, the outcome of Walton's entire voyage, the process, which is subjected to, what Heisenberg calls, her "method of questioning" (Heisenberg 26).

The closed system of the ship, with Walton as the driving force of its function, is constantly being watched and measured by Margaret. The system and the observer therefore become one and the same. Margaret is in Walton's head and so is one with the system. As Walton's decisions and his entire enterprise feed back through Margaret into the final outcome, reaching a homeostasis, which involves his decision to return in disgrace.

Margaret's influence is so great that even the impassioned speech by Victor during the mutiny, urging the crew to go on with their expedition albeit certain death, to "be more than men," could not readjust Walton's motives (Shelley 155). Here Walton could've taken the chance to pick up Victor's torch and fan the flames of his crew's courage, or perhaps even straight-out ordered them to go on. But instead, he simply asks the men to "consider" what Victor has told them (Shelley 155). Because, Walton explains, he "cannot lead" his men "unwillingly to danger," the collective justice and moderation of Margaret's watchfulness surely are at play in his mind (Shelley 156). It becomes undeniable that Margaret shifts Walton's process, and by being an established observer affects and changes the trajectory of his adventure.

Here, the entire voyage can be seen as a Hayles homeostatic system, and the informational processes in it, Walton, Margaret, the crew, the ship's course, the Arctic, bounce against each other in certain ways. Because it is a literary representation, and specifically a faithful one, the voyage's informational content acts the same exact way, as it would be constructed in the real world. That is, the underlying quantum of both the novel's social structure of the ship and some informational system of a real ship would be subject to the observer and to his influence in the specific way described by Hayles and Heisenberg. Walton's informational state is no different from an informational state of an actual 19th century Arctic explorer, who would also have had similar concerns about his family, finding himself in a similar situation, and so forth.

Both systems would behave according to the same laws and are influenced by an observer in exactly the same way. This is because there is no difference between how language acts on a page and how reality acts on a purely informational level. People, their

bodies, their mental states, and their social structures are arranged the same way as all of these things are arranged for their fictional counterparts. And here, we can see clearly, that there is no difference between an observer created in flesh and bone and an observer created in language. They have their systems and their processes, and act within these as attested to by Heisenberg.

Walton, of course, is himself an observer. Shelley establishes him as a sort of a camera eye that records Victor's story and projects it back out onto Margaret's screen. As

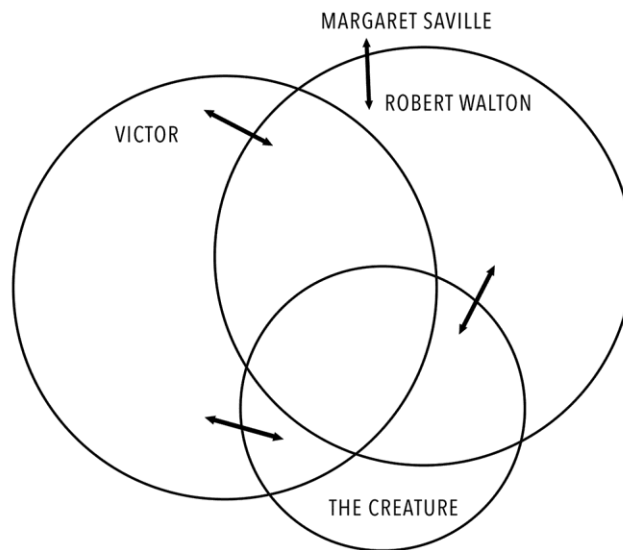


Figure 1.

a key information maker, he measures the entire endeavor against the sensibilities of his audience by documenting it. He also becomes a participating factor in the final outcome. He alters some crucial moments simply by recording information and feeding it back into the fundamental system of the novel, the informational complex of Victor and his creature. For Walton to be able to do this, Shelley provides him with the proper eloquence and some vivid personality traits. She infuses his dialogue with very

pronounced allusions to the visual to formulate him as a powerful watcher, literally and subliminally.

In the first three quarters of the novel Walton is still somewhat outside Victor's system. We can get the approximation of *Frankenstein* at this point as Figure 1. The diagram can be thought of as a snapshot, one of the moments of the overall informational exchange during the novel. The sizes of the systems and their positions shift ceaselessly to accommodate all changes. Victor's system would come to dominate by the end of the

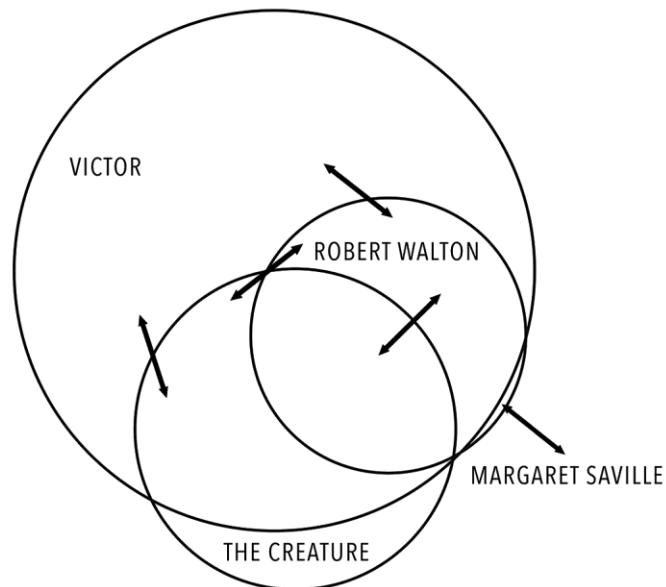


Figure 2.

novel. But his system draws to its planned conclusion precisely because of Walton's presence and observations. Without Walton it would be unclear how the story would play out.

Victor is the main driving force behind his own clockwork. "Nothing can alter my destiny," he tells the sympathetic Walton (Shelley 18). Victor also sets up the main system outcome, so to speak, along with this outcome's components and processes – "I must pursue and destroy the being to whom I gave existence; then my lot on earth will be fulfilled and I may die" (Shelley 153). What is then evident is how the system of

Victor/the creature feeds back through Walton, draws him in and then incorporates him into its codes and processes. This can be seen when Walton is recruited into Victor's mission of destroying the creature. "Swear to me, Walton," Victor urges on his deathbed, "that he shall not escape; that you will seek him and satisfy my vengeance in his death" (Shelley 150). Victor's ego – the information that is Victor – absorbs Walton here, like an amoeba consumes a paramecium. This is palpable because Walton does not put up any protest against this request. He doesn't even ponder it, but simply continues with his story. Walton's taking of the monster-killing baton is a mechanical course of events. Thus the observer in Walton becomes one with the system he is observing, exactly as Hayles proposes it. The overall change in the novel can be seen in Figure 2.

After he becomes part of the Victor/the creature's informational complex, Walton modifies it to bring it to its pre-programmed conclusion in a very specific way. In the final scene of the novel Walton encounters the creature in Victor's cabin. The creature has made his way onto Walton's ship and is now grieving over Victor's dead body. Walton startles the creature, and the monster goes for the window in an antisocial display of shameful evasion. It is here Walton's observer role takes control and fully imbeds him into the fate of these characters.

Walton informs that in this moment he "shut his eyes involuntarily, and endeavored to recollect what were [his] duties with regards to" the creature (Shelley 158). It is indicated earlier that the creature's hideousness is the factor of Walton closing his eyes. But when read closer, Walton's immediate state is not indicative of fear, but of calculation. As a matter of fact, Terry Thompson notices, "Walton is the only character in the entire novel who does not flee or tremble in horror when first confronted by the

monster face to face” (Thompson 301). The reason for this becomes clear when considering Walton’s role as the observer of the system.

The emphasis in the description of his reaction to the creature is on automatic, unconscious action. Walton follows his programming, in line with Victor, who programs him earlier with this exact situation – a chance meeting with the creature after Victor’s death. Victor also warns Walton “in advance about the creature’s immense size and grotesqueness,” which according to Thompson is one of the reasons Walton does not run away (Thompson 301). Walton is mentally prepared for this encounter; there is no escape for him, as he is informationally initiated into Victor’s system.

Walton also suspiciously does not let the creature escape without a conversation. Should he not be sufficiently frightened to try to end this situation as quickly as possible? Walton, as the principal character established as a system observer, has to play his part for the system to complete itself. The construction of the entire narrative depends on his participation. And he does it by feeding his observations back into the system. Walton tries to shame the creature and tells him that Victor may still be alive if only the creature felt any guilt before he exacted his “diabolical vengeance to this extremity” (Shelley 158). Here the informational currents that convey that the creature’s motivation was vengeance come from Walton. This information is fed back into the system, along with feelings of shame, to provoke yet another reaction from the creature. Walton’s informational substance begins to leak back into the creature to unite the two characters.

The unity between Walton and the creature is further accentuated when the creature mentions Henry Clerval, Victor’s childhood friend whom the creature kills in Ireland. How does the creature here know that Walton knows who Clerval is? Is there a

hole in the story? When approached from a purely informational analysis, this familiarity makes sense. It is because Walton's and the creature's individual informational selves have begun to share themselves with each other. This information sharing results in a tacit comprehension on the part of the creature that Walton knows everything – “you, who call Frankenstein your friend, seem to have knowledge of my crimes and his misfortunes” (Shelley 160). That is, the creature exhibits a sort of an intuition that accepts Walton as being part of the system. Furthermore, Walton is not rejected by the creature, but is used as a confidant and a recorder. All this is done to properly complete the informational complex of Victor and his creature, of which Walton has now become an integral part.

The creature here is not a passive component. He understands that Walton serves as the observer, but he pushes back and tries to influence observation and documentation, very much like when Victor edits Walton's writings, so as “not a mutilated” record of Victor's story “should go down to posterity” (Shelley 151). The creature then expounds on his internal states to set the record straight, so to speak, and also to feed himself back into the system. But most importantly, the creature informs of his plans of the system's completion, which is almost exactly the same as Victor's – “neither your's nor any man's death is needed to consummate the series of my being, and accomplish that which must be done; but it requires my own” (Shelley 160).

All the processes are in agreement with each other and the end result is already calculated. The observer effect tweaks it just enough to assure that it will happen, as the observer loses himself in the system. Here, the boundaries between Victor, Walton and the creature are blurred even further, which is evident by Walton's continuous verbal

abuse. “Wretch! It is well that you come here to whine over the desolation you have made,” he says to the creature and goes on for more admonishments (Shelley 159). This language is incredibly close to an earlier scene, in which Victor talks to the creature for the very first time – “Wretched devil, you reproach me with your creation” (Shelley 68). In both instances, the delivery is of anger and hateful irony and the speaker intends to induce feelings of shame in his target. Both are examples of psychological abuse and emotional manipulation. It’s as if Victor himself is speaking to the creature while possessing Walton’s body. He truly does “hover near” (Shelley 150).

Walton’s verbal tirade leads to even more feedback and finally to the ultimate conclusion, in which the creature reveals his plans to immolate himself at the North Pole. Although Walton cannot continue his process of polar exploration, the overall system completes it for him. The system of the entire narrative is also completed thusly. Without Walton’s interference as the observer and without his informational feedback, the reader would never know how each process comes to completion. Walton, in turn, completes the creature’s and also Victor’s processes, by directly engaging the creature and so, informing the reader of the creature’s imminent destruction. Thus Walton acts as an ingenious tool of narrative structuring. He acquires information, which is measured against some conventions of morality, his “superior heart,” as Thompson calls it, and the maternal influences of Margaret Saville (Thompson 301). Walton then turns that information back into the system and changes this system enough for it to arrive at its preprogrammed outcome.

Walton’s observational influences in the novel are, in a certain sense, constructive. He allows for the completion of goals. The observer effect’s truly disruptive

properties are most palpable in the epicenter of the novel. They are most evident in Victor's experiments. In the instance when Victor engages in "the horrors of... secret toil," he begins a new process (Shelley 33). When he tells Walton of the conditions during the process of creation, Victor depicts himself as completely alone. Victor lives and works in a "solitary chamber... at the top of the house and separated from all other apartments by a gallery and staircase," and he even stops all contact with his family (Shelley 34). According to Lester Friedman and Allison Kavey, Victor works against desirable conventions of contemporary science. They point out that he "pursues his scientific investigations outside the rules governing acceptable scientific knowledge production" without academic sponsorship and peer review (Friedman 26). Victor's methodology is of archaic Renaissance alchemy and is socially illicit by the early nineteenth-century conventions. What this means is that there is no observer to measure and influence Victor's progress within some communal scientific ethics. And so the tragic consequences unfold precisely as the result of his unobserved and uncalibrated process.

Although a gruesome crime against nature that results in horrible tragedy, can it be denied that the first creature is a technical success? In an incredible achievement, Victor does create life. The creature is a testament to Victor's talent and perseverance as a scientist. In terms of methodology, this astonishing outcome, if it is to be replicated, becomes dependent on certain rules of antecedent. Let's establish the primary rule for this success – the work has to be done in secret, outside any scientific community, and without anyone watching over the creator. We know that when Victor is forced by the creature to build a second creature, he tries to recreate this precise condition. He travels

to “some remote part of Scotland” to work on the second creature in “solitude,” and then works “ungazed at and unmolested” in a solitary cottage by the sea (Shelley 117). Thus, solitude and secrecy, the preconditions established by the first experiment, are also attempted to be met here. Victor’s talent and technical ability didn’t change. But the second creature is a technical failure. Although this failure is the result of Victor’s deliberate self-sabotage, not of any lack of skill, the fact remains that the finished experiment results in a non-working creature. We can see that the system, almost identical to the first experiment, does not come to the same conclusion.

The one factor that distinguishes the second experiment from the first is that there is now an observer. This observer is the first creature. The first creature follows Victor to Scotland to make sure Victor keeps his promise to create the creature’s mate. “Depart to your home and commence your labors,” the creature commands, “I shall watch their progress” (Shelley 104). Here, the first creature is fully established as the observer of Victor’s second experiment. As the observer, the first creature has a profound effect on this system, so much that it completes itself in a totally different way from the first one.

Heisenberg describes a crucial characteristic of the observer - his “incomplete knowledge of the system” (90). The observer affects the system because each measurement reintroduces “the element of incomplete knowledge” into it (Heisenberg 91). With this unknown element ever present, or actually, interpolated by the observer, a certain amount of uncertainty and subjectivity is always at play. The blueprint of Victor’s first experiment – its clandestine loneliness – is disrupted by uncertainty. The difference between the two experiments is emphasized in Victor’s recollections – “during my first experiment, a kind of enthusiastic frenzy had blinded me to the horror of my

employment; my mind was intently fixed on the [result] of my labor, and my eyes were shut to the horror of my proceedings” (Shelley 118). Interestingly, the language here establishes him as being blind through the course of his work. Victor is established as only a process of the system, and he is only concerned with completing his process. The lack of his visual prowess in this instance underscores a certain lack of connection to the greater scheme of things, so to speak, to the outside of his system. What’s more, there is no Heisenberg’s uncertainty in Victor; he is consumed by his work. Victor is not measured by any outside instrument that could shake him with doubt, or some ethical conundrum.

In the second attempt, however, the first creature, by the act of watching, connects and opens Victor’s experiment to the outside. The observer effect manifests itself as a series of specific plot developments. Victor is now aware that he is being watched. “I did not doubt but that the monster followed me, and would discover himself to me should I have finished,” he tells Walton (Shelley 117). There is a certain psychological interference and a change in Victor’s mental state, which Shelley reveals in descriptions of mood and behavior. Now the experiment is engulfed in a cloud of perpetual fear, the effect of Heisenberg’s incomplete knowledge. Victor tells Walton, “every moment I feared to meet my persecutor” (Shelley 118). Here, the observer recalibrates the system psychologically by interjecting a new emotion, a new subjective element, a degree of uncertainty.

The immediate cause of Victor’s fear is unclear. It appears that Victor only fears to meet the creature again and especially not knowing when this will happen. The ambiguity of Victor’s fear leads to a hypothesis that this fear is not wholly his, but also

the creature's. The creature establishes the primary mode of his observation – “an unutterable anxiety” (Shelley 104). This anxiety stems directly from the creature and infects the entire system. Furthermore, the creature wrests all agency from Victor. The loss of agency is alluded to by Victor's state of mental disarray and helplessness against his own fate, and specifically, by Victor's loss of visual power. He reports that during his off hours, he “sat with his eyes fixed on the ground, fearing to raise them lest they should encounter the object, which [he] so much dreaded to behold” (Shelley 118). The creature takes control of the system by watching it, as Victor loses his ability to watch. This powerlessness provokes a reaction from Victor to establish a homeostatic equilibrium, which results in the destruction of the second creature and experimental failure.

Because the first creature commissions the second creature to fulfill a sexual purpose, it can be supposed that Victor's and the creature's anxiety is of a sexual nature. Because this is now the predominant mode of the system, Victor's attempted alleviation of this fear also takes on the anxieties of sexuality and reproduction. As Anne Mellor elaborates, Victor “has rationalized his decision to murder the female creature,” because of his “desire to control and... destroy female sexuality” (“Possessing Nature,” 361). Here, if Mellor is correct, Victor's violence manifests from his unconscious unprocessed biological drives and desires for sexual agency. Most importantly, these discomforts introduce a large measure of subjectivity into the process of Victor's work.

To achieve a homeostasis, the uncertainty of his sexual anxiety is rationalized by Victor's newly found collective conscience. Suddenly, he becomes aware of the wider consequences of his work. “A train of reflection occurred to me to consider the effects of what I was now doing,” he recollects his meditations, “had I a right, for my own benefit,

to inflict this curse upon everlasting generations” (Shelley 118-119). The creature, by observing Victor’s work, connects Victor’s clandestine system of medieval science to the outside, the novel at large. But through an informational exchange, the information of the novel reaches even further, to the outside of the actual novel, and into the socio-cultural informational structures of what Friedman and Kavey call “ethical boundaries” of legitimate and desirable scientific approaches (Friedman 15).

III. The Bit or, The Whale

It was demonstrated that it is possible for a work of literature to be understood as a series of informationally defined systems, connected to each other and to the outside through reflexivity and feedback loops. The theoretical thread that led up to this idea is articulated by N. Katherine Hayles, who applies this concept to social consciousness. Hayles also stresses the role of the observer, a figure of monumental importance in quantum physics.³ In conjunction with Hayles’s discourse, Werner Heisenberg asserts that a subatomic system, subject to the laws of quantum mechanics, “is in fact a part of a much bigger system, eventually the whole world... of which the observer is a part” (121-122). He also informs that a probability of an event in this system “changes discontinuously when the observer takes cognizance of a result of measurement” (92). It is then, to be understood that the observer affects outcomes of processes through measurement and more specifically, through the conscious realization of the act of measuring. Moreover, it can also be established that the observer can willfully alter probability of an event such that the result is something that the observer wants to occur. That is, the observer, by the act of watching, however long it may take or whatever

methodology is utilized, can theoretically bring an event to a desired conclusion.

Considering literature, this concept of the willful observer, someone who consciously and deliberately tries to alter the system towards a desired goal, is epitomized in Melville's Ahab.

Just like Shelley's Europe, Melville's oceanic and maritime spaces can be understood as homeostatic systems, governed by specific laws and subject to measurements and observation. The ocean in *Moby-Dick* is established as such a phenomenon at the very start of the novel. Its definition is delineated through an underlying dichotomy of water and land. The ocean is fleshed out with respect to New York City, which, in addition to being the pivotal starting point of the book as a futile triumph of rationality, activates the major themes of watching and observation. The entire "insular city of Manhattoes" is designed so that "right and left, the streets take you waterward," where the reader is invited to "look at the crowds of water-gazers" (Melville 4).

Here, the ocean is identified as something to be looked at; and so it takes on all aspects of an observable informational system. Hence, everything that happens in the ocean – weather phenomena, movement of water, actions of a whaling ship, and mereologically, actions of singular sailors can be understood as individual processes. The metaphysics are doubled as Ishmael implores the reader to look at the lookers. Through all of these actions, the oceanic system amalgamates the observer (and his consequential observers, i.e. the readers of the novel) into itself by osmosis, where he becomes a part of the system and subject to its nature and processes. In turn, he also affects it by looking, and thereby himself becomes affected and changed.

Melville treats the city as specifically engineered to not only facilitate but also compel observation. The streets act as behavioral conduits that direct the collective gaze unto the water. The city emerges as a place of looking out, a control booth beside the cleanroom of a laboratory where researchers look through the glass at the hydrogen atoms smashing into each other, or a two way mirror in an interrogation room. In this same sense, Melville's water watchers stare at the sea waves as physicists look at a supercollider in order to learn the behavior of the elements, or as detectives to find some clue in a suspect's body language. The sea gazing of the forlorn New Yorkers, who are longing for some control over the monstrous oceanic expanses of their own selves, are then transposed to the whalers of the *Pequod* to act upon the greater maritime system of the novel.

In the passages of the chapter "The Mast-Head" Melville outlines observation as a vital component in the informational process of a whale-ship. Albeit the magnificent poetry, descriptions carry resemblances to an instruction manual. We are informed that the mast-heads are manned at the same instance the vessel leaves the port, long before the ship would reach the usual hunting grounds. And if there's any empty oil container left on the ship, the "mast-heads are kept manned to the last; and not till her skysail-poles sail in among the spires of the port, does she altogether relinquish the hope of capturing one whale more" (Melville 167). The ship's watch is incessant throughout the journey, even regardless of any possibility of encountering a whale; the watching is done as part of technical protocol.

Thus it is established that watching is an operational necessity in whaling. Melville attests to the power of this practice when he places mast-standing outside

whaling. “The Egyptians were a nation of mast-head standers... an assertion based upon the general belief among archæologists, that the first pyramids were founded for astronomical purposes,” he muses of the activity (Melville 165). Here the pseudoscientific claim is no doubt quipped facetiously, to anoint the fringe and outcast whalers with the grand dignity of antiquity. At the same time, the scientific allusions attest to Melville’s and the whalers’ comprehension of observation as a routine scientific procedure. Both archeology and astronomy are mentioned, two disciplines driven almost entirely by the act of looking. Even some methodology is described, as the astronomers are said to “mount to the apex [of the pyramid], and sing out for new stars; even as the look-outs of a modern ship sing out for a sail, or a whale just bearing in sight” (Melville 168). The emphasis is on empirical evidence and a trust in the senses to deliver a measured, rational result. Thus, like the intimated scientific practices, watching the ocean becomes an effort to rationalize the irrational. It is a vital technique, used to uncover and grasp nature and its laws, and to control and gain their powers. The whale is the particle inside the subatomic accelerator. He is to be captured, not in theory, but in actuality, by empirical science and a calculating harpoon.

In the informational system of the novel, incessant, methodical observation is no doubt used as a means to summon Moby-Dick into an encounter. The crew of the *Pequod* use watching to affect the informational flow of the novel’s homeostasis. The incessant observation transforms the ship into a wandering eye. *Pequod* consumes all information in its path and then absorbs and processes reality through the will of its occupants. It is an unconscious effort, but based in an innate understanding that the act of looking has a profound power. Constant watching unites the collective identity of the ship into a

coherent, functional unit. It also relieves various anxieties as perpetual vigilance transforms into a sense of safety, which also enables continuous functionality.

In the informational exchange between the observing *Pequod* and its system certain conditions arise to influence other processes, i.e. whales and industry competitors. Only through active observation the relationships between the processes can be established. This administration of visual input enables willful rearrangement of information. Ultimately, it works, and Moby-Dick is found. This impossible event is akin to a scientific discovery. An informational imprint has been programmed into the system again and again, and so the novel's reality is rearranged just enough for the climactic meeting to take place. The entire composition of the novel follows the law of the observer, by which the literary reality of *Moby-Dick* is rendered.

Melville's watchful whalers reach the existential meta-heights of literary representation. Their methodical process shifts the novel's fictional information, mirrored in the real world subatomic principles. How would watching for a whale, in created fiction and in physical reality, both of which are actually physical and indistinguishable phenomena as far as the quantum is concerned, make a whale appear? Quantum physics proposed that the rearrangement of information by the act of watching impacts physical reality, because reality itself is information. In his 1996 paper *The Physical Nature of Information*, Rolf Landauer states that "information is inevitably tied to a physical representation" (Landauer). Because of this connection, information is necessarily subject to "restrictions and possibilities related to the laws of physics and the parts available in the universe" (Landauer). While conducting research for IBM in 1961, Landauer proposed that the act of deleting information from the physical, isolated system of a

digital memory drive releases energy and behaves according to the laws of thermodynamics. What became known as the Landauer Principle, these ideas are now widely accepted by the scientific community and point to the theoretically and experimentally demonstrated conclusion that information is a physical thing.

Landauer's work was based on an already existing idea of the information theory, developed by Claude Elwood Shannon, a mathematician and engineer, who in the 1940s designed communication systems at MIT and later at Bell Labs. Shannon, revered in the engineering circles as the 'father of the digital age,' connected circuit design and mathematics and defined the binary unit of information, the bit.⁴ He formulated the information theory during World War II, while working on encryption.

Shannon's information theory, when looked at from the quantum mechanical point of view, asserts that everything about a quantum particle, its properties and behavior, can be expressed as binary information. The universe then can be seen as a system of subatomic particles and all reality as the result of the multitudinous processes within this system. The information theory, although untestable and highly controversial, gained strong proponents, such as John Archibald Wheeler, the legendary physicist, who worked on the Manhattan Project and collaborated with Albert Einstein on the unified theory of physics. In his famous and fantastically wild essay "Information, Physics, Quantum: The Search for Links," presented at the 1989 Quantum Mechanics Symposium in Tokyo, Wheeler asserts that "every physical quantity, every it, derives its ultimate significance from bits, binary yes-or-no indications" (109).

One of Wheeler's remarkable claims places the observer into the very inner-workings of creation. "No element in the description of physics," he writes, "shows itself

as closer to the primordial than the... device-intermediated act of posing a yes-no physical question and eliciting an answer or, in brief, the elementary act of observer-participancy” (Wheeler 109). The observer is a primal force. “How come ‘one world’ out of many observer-participants?” asks Wheeler as one of his hypothesis (Wheeler 110). To answer this fundamental question, Wheeler proposes an unconditional finite state of all available information (i.e. the universe is a finite thing) and advocates for the dispelling of the illusion of the space-time continuum. For Wheeler, the observer carries the essential role of bringing reality... into reality.

The idea is that all physical things exist as encoded binary information, which, to be reified, has to be processed according to whether the underlying bits are on or off, etc., just like in standard operations of a digital computer. This information has to be observed and actively interacted with, to bring forth, what Wheeler calls, the “participatory universe,” in which the observer has to determine the states of the underlying bits (111). In an extraordinary thought-experiment, Wheeler furthers the work of Stephen Hawking, who proposed that the outer edge of a black hole is the measurement of its entropy, or energy loss. But since entropy is also the measurement of the loss of information, which is the process that, according to the Landauer Principle, acts accordingly to the laws of physics, the black hole itself can be revealed to the observer as “information lost,” through the ability of quantum elements to present “physics as information” (Wheeler 112).

While proposing information as the underlying fabric of reality, Wheeler opposes the conceptualization of the universe as some sort of a machine. The laws of physics did not exist before the Big Bang, so there were no architects or blueprints, or pre-engineered

schematics and clockworks. The convenient mythology of the composed and existing physical objects is just that – mythology that displaces and qualifies an absolute truth. Rather, Wheeler states, the world is “self-synthesized,” as “the notes struck out on a piano by the observer-participants of all places and all times, bits though they are, in and by themselves constitute the great wide world of space and time and things” (113).

Wheeler defines an observer-participant as someone who “operates an observing device and participates in the making of meaning” (112). He assigns this agent, in his actions of observation and measurement, a crucial significance. “No elementary quantum phenomenon is a phenomenon” until it’s observed and registered, he writes, and all of “reality is a theory,” he quotes Torgny Segerstedt (Wheeler 112) And so from Wheeler, we get a picture of everything as, what Douglas Adams calls, a “Whole Sort of General Mish Mash” of active looking, questioning, more looking, answering, looking again, more questions, more answers, and so on (Adams 655). All existence becomes a contemplative quest for knowledge and realization, all of it, just an opportunity at meaning creation, to be discovered and communicated through the “primordial entity” of the informational bit (Wheeler 112).

The recorded discussion after Wheeler’s presentation of his work touches on the subject of the observer. “Did you mean to say that the observer influences the observed object?” asks the not-as-poetic Nico van Kampen (Wheeler 113). “The observer does not influence the past,” replies Wheeler, “instead by his choice of question, he decides about what feature of the object he shall have the right to make a clear statement” (Wheeler 113). The observer chooses the questions, and looks to get his answers, and so, constructs reality. There’s only one thing he has to decide – which questions to ask.

Ahab has clearly chosen his questions, or rather, the one and only question. “Hast seen the White Whale?” he bellows at the passing ships (Melville 476). He observes the processes of his universe and processes them in exactly the same way Wheeler describes – by questions that can only be resolved in a binary answer, either a yes, or a no. According to Inger Dalsgaard, Ahab “represents a certain, misdirected scientific mindset” that resembles Victor (249). Dalsgaard asserts that, like Victor, Ahab is a practitioner of illicit science. Tasked by investors with acquiring product for profit and consumption, Ahab tosses this job aside and “sins against a capitalist contract, as much as against nature, God, or family life” (Dalsgaard 251). What Dalsgaard suggests allows Ahab to fully concentrate his will on informational rearrangement. Dalsgaard stops short of assigning Ahab with his informational role, but it can be clearly seen from this analysis. As a willful-observer participant, when you try to change the very fabric of reality you cannot sin against God. You *are* God. You also cannot be distracted by trivial nonsense, like some insipid social contracts or fairy tales. Considering these ideas, a scientific mind emerges as a kind of a struggle between social collective pressures and the individual will.

Wholesale observational interference is not easy and not just anyone can be successful at it. This can be seen in the novel’s fictional simulacrum. Willing Moby-Dick into an appearance takes a lot of energy and certain personality traits, such as Ahab’s characteristic obsessive morbid genius. Not only the observer has to spend energy watching and measuring, he also has to keep himself coherent enough as not to get utterly absorbed by the informational system he is operating upon. These are the stakes for someone who wants to rearrange reality. Keeping a functional, sovereign self is a crucial

predicament for a researcher. This is why Ahab's temperament can be seen in some stereotypical quirks and manias prevalent in historical scientists. His archetypal eccentricity is reminiscent of Nikola Tesla, who "regularly worked from 10:30 in the morning until 5:00 the following morning" and calculated the cubic contents of his meals before eating, or Alexander Graham Bell, who "in the throes of a new idea... pleaded with his wife to be free of family obligations," and then worked "for up to twenty-two hours straight without sleep (Currey 137, 175). What can be seen at play in the scientific temperament of Ahab is rabid individualism.

There's also Ahab's mechanical, machine-like quality, also noticed by Dalsgaard, who brings up hints of the railroad in Ahab's language.⁵ Ishmael describes the pivot holes, strategically drilled into the ship's deck, and into which Ahab inserts his prosthetic leg to keep himself steady. Once his prosthesis is connected into the ship, Ahab stands "erect, looking straight out beyond the ship's ever-pitching prow" (Melville 135). By this invention, Ahab becomes one with the ship, his primary instrument of agency and his immediate informational super-process. Ahab and the ship combine to form a sort of a mechanical apparatus, designed for observation and research based in that observation. The essence of this man/machine contraption is concentrated in Ahab's gaze. "There was an infinity of firmest fortitude, a determinate, unsunderable willfulness, in the fixed and fearless, forward dedication of that glance," Ishmael described his first impressions of the captain (Melville 135). From this, it becomes clear that Ahab is the primary observer of the novel. All is governed by the actions of his watchfulness. He is the supreme eye that materializes Moby-Dick into the novel's narrative.

Ahab becomes absorbed into his observation. The act of watching overtakes his identity and he almost loses himself. He watches the sea for “hours and hours... gazing dead to windward, while an occasional squall of sleet and snow would all but congeal his very eyelashes together” (Melville 256). He is so integrated that he becomes unaffected by environmental conditions. An image of a biologist late night at a microscope comes to mind, looking and looking. Although being a “living instrument” himself, Ahab, as a good scientist, does not rely on chance alone, but consults data and uses tools (Melville 201). He “intently” studies charts and adjusts them according to his calculations, methodically, “with a slow but steady pencil,” adding “courses over spaces that before were blank” (Melville 215). While doing his research, he “would refer to piles of old log-books” that list times and places “in which, on various former voyages of various ships, sperm whales had been captured or seen” (Melville 215). Ahab is a diligent data analyst – “almost every night [the charts] were brought out; almost every night some pencil marks were effaced, and others were substituted” (Melville 215). Although below the deck, Ahab still observes the system of the ocean. The ocean is abstracted into charts and whaling data to facilitate its informational processing.

The reader learns that even Ahab’s maps, informational significations of *Moby-Dick*’s oceanic system, integrate its mad researcher. As Ahab studies the sea charts, the lamp in his cabin, rocked by the motion of the ship, casts “lines upon his wrinkled brow,” so that “while he himself was marking out lines and courses on the... charts, some invisible pencil was also tracing lines and courses upon the deeply marked chart of his forehead” (Melville 215). The themes of absorption and integration of an agent by a larger unknown structure are returned to over and over in the novel. It is clear that,

somehow, Melville comprehends these phenomena, but perhaps has no scientific language to reify them. So he simulates them and displays them through deep poetics, in the minute details of intense literary imagery. The subatomic is paralleled and at the same time extended metaphorically. Melville doesn't use mathematical formulas, but the theoretical concepts he argues for are illustrated in his characters. Ahab is the x and his whale is the y . What is the mass and energy needed for them to collide? Which electromagnetic and gravitational forces are produced in the oceanic currents? The novel expresses and calculates the same fateful laws as how an algebraic formula calculates a trajectory of a quark.

As discussed above, Ahab's fevered solipsism and apathy for any competing ideology, his diligent scientific methodology, and his physical-mechanical nature, establish him as the novel's main observer-participant. When compared with Ahab's monstrous will, Ishmael appears as an incidental observer, without much energy to change any course of events, except maybe his own little process. As a matter of fact, most of the whale-watchers available on the *Pequod* are not very reliable. "I kept a sorry guard," Ishmael confesses rather nonchalantly (Melville 171). "In the serene weather of the tropics," the reader is informed, "it is exceedingly pleasant – the mast-head; nay, to a dreamy meditative man it is delightful" (Melville 169). It is safe to assume that on top of a mast-head there is barely any participation taking place, and what seems like even less observation – "There you stand... lost in the infinite series of the sea... the tranced ship indolently rolls... everything resolves you into languor" (Melville 169).

What actually happens on the mast is best described by Jennifer Baker, who writes that such "empirical investigation produces a pleasurable stimulation of

imagination” to actually undermine strict empiricism and to favor subjective idealism (Baker 93). As Heisenberg shows, a certain degree of subjectivity from the observer affects the system outcome. The problem is that this subjectivity of idealism does not allow for an independent system needed for the existing informational content. It already assumes that the system depends wholly on the observer’s perception. This necessarily produces total uncertainty, something that is uncontrollable and something that can only be existed in, not affected, because there is nothing to affect, except the observer himself. This state of material absence can be witnessed in Ishmael’s melancholy sea-gazing.

Unfortunately, or perhaps fortunately for Ahab, the entire whaling industry is experiencing a scarceness of competent observers. The type of observer available is proposed very sonorously in Ishmael’s address to the ship-owners – “nowadays, the whale-fishery furnishes an asylum for many romantic, melancholy, and absent-minded young men... seeking sentiment in tar and blubber” (Melville 172). The whale industry attracts philosophers, not empiricists. Most of the *Pequod*’s hires do not care about catching whales; their interests lie with contemplation of the mysteries and existential theorizing “over Cartesian vortices,” for which the sea provides them with the proper psychological state (Melville 173). What happens, with respect to Wheeler, is that the observer in this case cannot make any impact. It’s clearly seen that the observer is not a participant, because he is only observing internally; he is only concerned with his own individual informational process. So in adjusting the system’s overall information for the purpose of an encounter with Moby-Dick, the rest of the *Pequod* crew is pretty much useless.

And so, Ahab absorbs the entire ship. “As the unsettling polar star, which... six months’ night sustains its piercing... central gaze; so Ahab’s purpose now fixedly gleamed down upon the constant midnight of the gloomy crew... It domineered above them... Like machines, they dumbly moved about the deck, ever conscious that the old man’s despot eye was on them” (Melville 582). Although Victor also shows a powerful charisma, here his path with Ahab swerves. Unlike Victor, who gains a semblance of a social awareness, Ahab never achieves a higher consciousness. He remains in himself. And also unlike Victor, Ahab gains total command over his ship’s crew and their wills.⁶ This is why he exemplifies an observer-participant *par excellence*. Ahab becomes the sole observer-participant on the *Pequod* – “his whole life was now become one watch on deck” (Melville 584). And so, his intense participation in the overall system famously pays off – “Fate reserved the doubloon for me. *I* only; none of ye could have raised the White Whale first. There she blows!” (Melville 595). The whale is finally discovered, through measurement, proper observational tools, and Wheeler’s informational binary switching. The process was repeated over and over until the fateful desired result of the novel’s ironically successful, disastrous quest.

IV. Conclusion

It is unfortunate that information, as it’s used in the contemporary sense, projects impressions of what Jean-François Lyotard calls “Mephistophelian functionalism,” an object to be manipulated and commoditized (Lyotard 416). What’s worse, it has connotations of something purely utilitarian, something to be consumed, discarded, or stored in an electronic device, a technological pedestrian banality. It also raises problems

in its dialectic with knowledge. I share Donna Haraway's lament that in such approaches to literature "the certainty of what counts as nature – a source of insight and promise of innocence – is undermined, probably fatally" (Haraway 294). But as Haraway also points out, "the alternative is not cynicism, or faithlessness, or abstract existence," but a connection and a blending of boundaries of the highest order (294). Because John Wheeler's information is neither utilitarian nor banal, in any sense. It is rather that which Spinoza saw as a "substance prior to its modifications... something of which the conception requires not the conception of anything else" (*Propositions*). It is the sublime material that composes a crystalline structure, a poem, and a DNA molecule, the stuff that puts it all *in a formation*.

N. Katherine Hayles approaches it in a similar understanding, as a sort of an æther that human social constructions arrange themselves with, something that ebbs and flows and coalesces into material things, even human bodies, an animating, shaping force, a sense which is closer to its original meaning.⁷ I believe information as a concept can transcend its gross inhumanity and become accepted as a vital cultural keyword. And I truly believe that an informational understanding can enrich aesthetic sensibilities. While I understand that some connotations of prosaic artificiality may never be fully relinquished, this conceptualization can provide a structuralist analytical alternative, and even democratize consciousness.

We saw that the observer of a closed informational system, as it is understood in physics, behaves exactly the same in literature. He measures and affects creative choices through the limits and pressures of characterization and plot-devices, and adjusts probabilities of events according to his desires, motivations, and even according to the

absence of these things. In their very essence, the texts themselves exist in a purely informational way, that is, they are systems that are, at the fundamental quantum level, collections of switches that point either this way, or that, thereby creating and governing their own processes. On the higher planes they tell stories, convey and evoke emotions, thoughts, images, process personal and collective anxieties, open connections, document and express human conditions. But at the very bottom of all creation, they are avatars of supreme communication and of the underlying mode of all things. They also change from being observed, from edition to edition and from one reader to the next. Once the information of a book is observed, the informational system of reader/book is forever changed, because the informational process of the reader is changed from the act of reading.

The laws of nature are immutable, even though a lot of them have not been discovered. “Does the Sun fail to exist, because we have seen nothing like it?” asks Montaigne (Montaigne 330). The stars follow certain laws and so does the human imagination. The creative forces that ignite all genius operate by the tools and materials available. They acted the same way since the inception of representative consciousness, and they act the same now – through informational alchemy. It is not a mistake to conjecture that because these books were created without the knowledge of the laws that governed their creation does not mean that those laws do not govern them. All things are composed in very specific ways. What makes literature exempt from full theoretical treatment? A literary work is only as complex as the mind that produced it, and according to Joseph Conrad, “the mind is capable of everything – because everything is in it, all the past as well as all the future” (Conrad, II).

The quantum theory's connective faculties were not lost on Heisenberg. For him it was the key to the great secrets not only of primordial particles of reality, but also of human nature. He understood, as did all of the physicists of the golden age of physics, that there was a divine thread that united everything, and that this thread was not a myth, but a reality. Things could be learned from it, things far more reaching than any ideology. Science now could be, as mythology, a source of "the old wisdom," the one that reminds, "when searching for harmony in life one must never forget that in the drama of existence we are ourselves both players and spectators" (Heisenberg 26). And where is this drama best represented than in literature? As the laws of the quantum theory become revealed in a short story, or a poem, or a novel, the principle laws that govern nature are also revealed to govern its human-created reflections. From this revelation we can see that there is no separation between reality in literature and reality outside of it. Rather the representative/expressive realities are only modes of tangible reality. The information between these modes is shared in a fundamental, underlying informational structure, which functions according to the laws of quantum mechanics. By taking on these laws, these reflective modes themselves become part of nature, part of its vast informational field, in which little informational processes reflect and in turn, give birth to their reality, so they themselves could be observed and brought into existence.

Notes

- ¹ Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. University of Chicago Press, 1999, p.8.
- ² Claridge, Laura P. "Parent-Child Tensions in Frankenstein: The Search for Communion," *Studies in the Novel*, vol. 17, no.1, North Texas State University, 1985, p. 16. *JSTOR*: www.jstor.org/stable/29532322. Accessed 19 Mar. 2020. It can be understood that the older sibling Margaret Saville had raised Robert Walton, since nothing of their mother is mentioned in any of his letters, while an uncle is mentioned as the sole caregiver.
- ³ Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. University of Chicago Press, 1999, p.9. This is where the observer is acknowledged as being part of the overall system by the means of a feedback loop.
- ⁴ Markowsky, George. "Claude Shannon." *Encyclopædia Britannica*, www.britannica.com/biography/Claude-Shannon. Accessed 22 Mar 2020.
- ⁵ Dalsgaard, Inger Hunnerup. "'The Leyden Jar' and 'The Iron Way' Conjoined: Moby-Dick, the Classical and the Modern Schism of Science and Technology," edited by Sanford E. Marovitz and A. C. Christodoulou, *Melville 'Among the Nations': Proceedings of an International Conference, Voios, Greece, July 2-6, 1997*, Kent State UP, 2001, p. 245.
- ⁶ Shelley, Mary. *Frankenstein*, edited by J. Paul Hunter, Norton, 2012, p. 155. In another remarkable similarity with Ahab, Victor tries to rally Walton's crew after they mutiny, but fails to persuade them to continue with the dangerous and selfish

voyage. It is hinted that perhaps if Victor was in a better shape the sailors may have obeyed him.

⁷ “inform.” *Webster’s Ninth New Collegiate Dictionary*. Merriam-Webster, 1985, p. 620.

Partial entry: from Latin “(14c) **1.** *obs.* to give material form to **2.** *b* : to be the characteristic quality of: ANIMATE <the compassion that informs his work>”

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