New Perspectives on Interactivity

by

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Dedicated to Garrett,

with thanks to my ever-supportive mother,

and of course to Aaron, Becky, and Mike for being my

academic lifeblood
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Even objectively, digital interactivity is a revolution. The idea of giving an audience agency in a constructed reality should have expanded the realms of possibility and offered a platform from which a new wave of artists could speak to a now tech savvy audience. This, along with the internet connecting this audience across a global scale literally opens the world up to the potential of this new medium. What we have instead is a medium couched in its industry, and its presence in academia reflects this.

Consider the current state of videogame culture. The press is obsessed with an increasingly formalist metric for reviewing new entries. Commentary often centers around trivial or cliché components of games, things like the smoothness of RPG elements or the designs of skill trees. Consumers and developers are obsessed with the numbers coming out of review powerhouses like IGN and GameSpot, numbers based on what people do or don't consider fun, driving sales and deciding the next phase of cacophony that happens within the industry. All the while, reviewers and consumers complain incessantly of the lack of innovation. It goes on and on.

Meanwhile, gamers have been aligned to be an evil entity poised to initiate the collapse of normality. Late in 2014, the Gamergate controversy came to light, highlighting the deep rooted otherness assigned to gamers. After becoming victims of a series of misogynistic attacks, game developers Zoe Quinn and Brianna Wu and
feminist critic Anita Sarkeesian came out against gamers and gamer culture, and soon game journalism fell into chaos about the 'death of the gamer' and the misogyny of the 'gamer identity'. Social networks, especially the ones where the attacks originated—4chan and reddit—exploded, and it wasn't long until it spilled over into mainstream outlets, with the Twitter hashtag gamergate putting the controversy into the spotlight.

The outcry against the misogyny in games and its culture begged the question: who are gamers?

Yet, the answer is simple: it doesn't matter. The people making anonymous threats to female video game developers weren't doing so through games; they were doing so through writing, on the internet. They aren't gamers. They are just people. The association between these individuals and an entire medium is at once offensive and harmful. Misogyny on the internet is no surprise, and neither is misogyny in any realm of the world, but leave it to the virality of mainstream media to perpetuate the long running stigma that games are for misogynists who exist in misogynist spaces. Yes, the quintessential gamer is dead, but because it should have never existed. It should sit alongside the reader, the listener, the watcher and any other essentialist ideology.

And the games in question are but the tiniest corner of the potential the medium has to offer. Digital, interactive works offer near complete control of the audience's senses and the ability to react to their actions, but the average entry in this medium, along with the awareness of the average consumer, only extends to leisure, historically the lowest common denominator for all forms of art. Of course, not all games are ignorant of this, and some artists working outside of the influence of
publishers and industry have been able to push the envelope and show the immense potential for the medium.

_Dys4ia_, a game by Anna Anthropy released on the Newgrounds Flash portal in 2012, takes advantage of the medium to explore the mind of an individual undergoing gender reassignment by presenting through the aesthetic of a flash game. _Dys4ia_ writes its metaphor in experience over symbols: where Anthropy writes "I feel weird about my body", the player is offered an oddly shaped avatar and an indication to move through a hole in a wall, but the avatar cannot fit. Similarly, Anthropy writes "Everyone calls me 'sir'" and offers the player a linear path home, but along the way, people will inevitably address the player as sir, while the avatar silently corrects them. _Dys4ia_ fearlessly forgoes the tropes of the industry and finds a way to communicate its feelings to the player by making them feel it rather than telling them about it.

It is about time to push past the stigma, the 'are games art' debates, and the shackles of the industry, and here I will do what I feel anyone passionate about any forms of expressivity should: look at games for what they are.
1: Interactivity through History

In trying to explore the interactive space, I came across many of what were considered to be the important works related to games, the genres of which were disparate. Many came categorized as 'game design' books, something I was appropriately hesitant to accept, but the most recent books seemed to follow a certain canon of thinkers and philosophies that contains the modern academic view of interactivity.

Studies in interactivity began in 1938 with Johan Huizinga's *Homo Ludens*. Huizinga, a Dutch historian and cultural theorist, attempts to find what he calls the *play-element* in culture, claiming that play is a universal element of humanity, and going as far as to say that Homo Ludens, Man the Player, is a fitting name for our species. *Homo Ludens* attempts to marry play with culture in a way that hadn't been before. He draws heavily upon language within *Homo Ludens*, and dichotomizes play and seriousness in order to broach the play-element.

*Homo Ludens* focuses on defining play with the following characterizations:

1. Play is voluntary; it is freedom. Play is never forced or necessary; if an activity that previously was identified as play has become forced or necessary, by physical or cultural means, it is no longer play.
2. Play is outside of 'real' life. Play itself is a separate dimension compared to 'real' or serious life. The phrases *only pretend* or *just a joke* are examples of this: the continuity of play is separate and parallel from that of real life. In this sense, play is 'disinterested' in the ebb and flow of things outside of its realm. Play ignores hunger, desires, and time, and is only concerned with itself.

3. Play has a defined space and time. Huizinga presents the first concept of the *magic circle*, a term used to describe the physical space in which play exists. In concert with the previous characteristic, play requires its own area outside of the real world and real time, and has its own space instead: soccer fields, playgrounds, chess boards, etc.

4. Play creates order and is order. Play proceeds 'seriously' in that players are absolutely absorbed within its world: dissenters that ruin play are 'spoil sports.' The structure of play reveals its delicacy, as play can be ruined by relatively few, simply by invoking one of the other characteristics. Tearing down a game board removes play's defined space, or being unreasonably upset crosses the line of play into real life, etc.

5. Play has no material value, and creates no material value. Play is only necessary in that the fun it generates creates a need for it. Otherwise, there is nothing that can come out of being within play, nor can play be removed from its plane and placed in that of the real world.

   *Fun* is the component of play that signals its otherworldness. “The *fun of* playing, resists all logical interpretation. As a concept, it cannot be reduced to any other
mental category” (Huizinga 3). Huizinga's play is a totality entirely outside of any previous aspect of culture.

A few decades later, in 1961, French sociologist Roger Caillois published *Man, Play, and Games*. Building off of Huizinga's work in *Homo Ludens*, Caillois explores play and games by extending Huizinga's definition and developing from the platform *Homo Ludens* builds. Caillois begins by criticizing Huizinga's definition of play as being “at the same time too broad and too narrow” (Huizinga 4).

Caillois finds notable holes in Huizinga's definition, for example, where Huizinga states that play “is an activity connected with no material interest” (Huizinga 13), Caillois finds that “games of chance played for money have practically no place in Huizinga's work” (Caillois 5). Caillois morphs the characteristic Huizinga proposes, suggesting that “Property is exchanged, but no goods are produced” (Caillois 5). Play is, in this sense, unproductive and wasteful in that nothing new ever comes out of play, as opposed to work or art.

Caillois criticizes Huizinga for not categorizing the types of play he identifies, saying that not doing so was “deliberate” and that the need for categorization was “obvious” (Caillois 4). *Man, Play, and Games* remedies this by creating four categories of play: agon, alea, mimicry, and ilinx. Agon is competition: games that are purely agonistic are like checkers or chess. Alea is chance: a slot machine represents pure aleatory play. Mimicry is mimesis, like role playing or playing pretend. Ilinx is vertigo, in the sense of altered perceptions. Examples include roller-coasters or psychedelics.

Caillois' play can also exist on a spectrum of ludus to paidia, and can contain any or even all of the categories to varying degrees. Caillois decides that games, in the
traditional sense, are ludum, in that they are ruled play. Paidia stands opposed to ludum and is free and unstructured play that represents “a kind of uncontrolled fantasy” (Caillois 13). Ludum have win states and scores where paidia does not.

After the advent of digital games and computer media, Espen Aarseth set out to push forward the medium in 1997 with *Cybertext: Perspectives on Ergodic Literature*. Cybertext is a work that is the natural product of the assumption held by scholars thus far: interactive works are non-distinct from literary texts. Aarseth works from the perspective of an evangelist of an infantile medium. After all, *Pong* had only released two and a half decades before.

*Cybertext* traces Aarseth’s process behind carving out a place for what he terms *ergodic literature*, essentially interactive works. Aarseth notes many frustrations in attempting to bring interactivity into the academic sphere. Scholars, mainly working from literary or philosophical backgrounds could not be convinced of the importance of allowing interactivity its own place: the multitude of experiences an interactive work has to offer is no less numerous than the multitude of experiences noninteractive works can provide. Interpretations, connotations, and experiences can vary wildly even without a dynamic text. Aarseth complains that an academic pessimism towards evolving technology is to blame for this ignorance: “Where humanistic study used to be genre chauvinistic, it is now medium chauvinistic, organized into empirical fields (literature, art history, theater, mass communication) with not enough concern for general or intermediary perspectives” (Aarseth 16).

Aarseth looks at nonlinearity as the most common pitfall of the traditional method of analyzing interactive works, citing the text-as-a-labyrinth as the abstraction
that confuses analysts. The metaphor is often used to mean that readers explore texts, finding their meaning through consistent interaction with them. However, linearity as a distinction in interactivity is not sound, after all, "a hypertext path with only one (unidirectional) link between text chunks is much more authoritarian and limiting than (say) a detective novel, in which the reader is free to read the ending at any time" (Aarseth 47). Thus, some other criteria must be used to separate interactive works from non-interactive works.

To this end, Aarseth defines the term ergodic to be the quality of interactivity within a text. In an attempt to remove the ambiguity behind the nature of interactivity, Aarseth defines ergodic literature as that which requires non-trivial effort to traverse. Aarseth considers eye movement and page turning trivial, and assigns non-triviality to actions such as typing words or throwing a ball. The former actions are almost entirely noematic, or happen almost entirely within the mind, whereas the latter actions have extranoematic properties. The process of reading affects only thoughts and ideas, whereas interactivity within an ergodic text has physical ramifications.

Aarseth addresses the need to redefine textuality to account for ergodicity. Traditionally the text is taken literally as a chain of symbols or words, Aarseth expands the scope of the text and views it as a sort of meta-text, where the text encompasses a machine that generates symbols, regardless of medium. This new textuality is not radical in its impact on non-ergodic literature: “Just as a film is useless without a projector and a screen, so a text must consist of a material medium as well as a collection of words” (Aarseth 21). The medium, then, is the so-called generator, such as the binary application of a videogame, the pages of a book, or the canvas of a painting.
In essence, Aarseth's text is a combination of what is presented to a reader and what presents it.

This brings out the act of reading a text from simply a 3 party interaction between the reader, the text, and the author to a more complex, multidimensional interaction. The reader interfaces with an entity that generates the text, along with the author that creates it. With this abstraction, Aarseth ensures that his definitions of the ergodic space allows considering ergodic works within the same context as traditional literature: in applying his analysis to the traditional text, nothing has changed, but with computer games, for example, the 'text' accounts for the program, the computer, and the output on the screen.

The dynamism within ergodic texts prompts Aarseth to create the ideas of textons and scriptons, where the former is the generator, and the latter is the work as experienced by a reader, or what is generated. For example, a choose-your-own-adventure texton is simply each page written end to end, whereas a scripton would be the pages a reader sees during their traversal of the book. Ergodic literature only consists of one texton, but can potentially create any number of scriptons, and non-ergodic literature contains one texton and its accompanying scripton. The process of generation is what Aarseth calls a traversal function, which governs the actions and interactions that a reader can utilize to influence the scripton that a work generates.

In Cybertext, Aarseth formalizes interactivity within literary theory, rather than following Cailllois' and Huizinga's focus on the cultural space. Aarseth's ergodic text allows for the study of interactivity outside of the constraints of the cultural play-
element, so to speak, and frees analysts from seeing the qualities of interaction as a function of history.

Contemporary game studies are sparse, but some prolific writers have made great strides in building from the anthropological platform that Caillois and Huizinga have left them. Gonzalo Frasca, a researcher and game designer, maintained Ludology.org, a blog in which Frasca wrote and published works at the forefront of the field. Frasca's work stemmed initially from the surfacing of a debate in which Ludology was brought forth and was shot down as merely a subset of narratology.

Frasca's earliest notable work is *Ludology vs Narratology: Similitude and differences between (video)games and narrative*, a short piece published in 1999. Frasca importantly proposes the term Ludology to be the "discipline that studies game and play activities", something distinct from both narratology, a term devised to study narrative across mediums, and game theory, an economic and mathematical study that idealizes players with infinite skill and foresight. Ludology, while coming from a frustration with the haphazard application of narratology to games, is not limited to the goal of proving the inaccuracy of that application. Ludology is simply a “discipline that studies game and play activities”. Narratology, when applied to games, is unable to describe the characteristics of emergence and interactivity, and as a result generates studies that “[focus] on small characteristics … without looking for the bigger patterns of understanding” (Frasca). Ludology is an isolation of games from any other object of study that aims to discover its unique elements.
Ludology vs Narratology expands upon and fuses *Cybertexts* and *Man, Play, and Games*, focusing heavily on the distinction between paidia and ludus that Caillois puts forth and the idea of the semiotic system that Aarseth promotes. Frasca emphasizes the quality of simulation as opposed to that of representation in traditional media: semiotics vs. 'simiotics'. Frasca puts forth a provisional definition for simulation: “to simulate is to model a (source) system through a different system which maintains to somebody some of the behaviors of the original system” (Frasca). Frasca uses examples such as advergames, advertisements done in an interactive format, and political games to try to formalize the places where simiotics reach where semiotics cannot.

Building upon Caillois' analysis, Frasca discusses ways that both paidia and ludus can be utilized to facilitate communication between a work and a reader. Ludus can be heavy handed: if the win state of a game is dependent on a certain behavior, then players must follow that behavior to succeed. Frasca refers to these as *ludus goals*. Frasca also discusses *manipulation rules*, the more paidiaic alternative to ludus goals: rules that do not contribute to a victory or a loss, instead manipulating the player based on the ways they are allowed to interact with the game. Examples of this are disallowing the use of players’ hands in football, or the dribbling rules in basketball.

Frasca suggests that ludus is great for strict dichotomies, since it sets up structured scenarios. This affinity towards good/bad and winning/losing reflects the game industry's trends even now, but Frasca notes that ultimately, paidia is what will allow games to flourish.

Another prolific contemporary ludology writer, Ian Bogost, questions the lack of understanding of games in *How to Do Things with Videogames*, written in 2011.
Without heavy use of theory or referencing other branches of academia, Bogost attempts to expand the public awareness of the medium, likening himself to a biologist digging into the heart of niche ecosystems. Instead of evangelizing games or attempting to find some meaning in them that has yet to be found, Bogost deeply explores video games throughout culture.

Bogost structures this work by putting forth topics that videogames can apply to and analyzing how they exist within that space, essentially making *How to Do Things with Videogames* a collection of micro-essays on a wide array of normally unconsidered topics regarding video games. In Bogost's eyes, doing so is the logical way to push videogames past the only-for-leisure barrier that defines the vast majority of the medium. However, Bogost stays away from asserting that videogames are the end-all medium, and instead spends time finding where videogames can safely carve out their niche within an already media-dense society.

On the other hand, Bogost also considers places where videogames might be missing, where meaningful experiences might be produced by applying the medium to things that would not intuitively be receptive of them. In one chapter, Bogost explores creating the “videogame equivalent of a snapshot” (Bogost), and likens streamlined DIY video game-creation services to the Kodak Brownie, an affordable and simple way to capture photos. Where high-brow and high-budget photography exists opposed to the commonplace group photo, each has a purpose and a meaning, and perhaps video games can exist on both ends of that spectrum as well.

Bogost's analysis is in the name of 'demystification' of the medium: he specifically addresses the divide between gamers and non-gamers, and he writes in the
hopes that by exploring and understanding the role videogames play and can play in our lives, we can expand the scope and recognition of the medium.

These works did not satisfy me in my search for a theoretical foundation upon which to build an ergodic understanding. Earlier writers were concerned with the cultural ramifications of play, a concern that bleeds into any work that exists within the canon of Huizinga-Caillois-Frasca, or anything that exists within ludology. I find that the need for a sound description for interactivity can be modelled after what current academics consider to be a sound description for language, semiotics.

In Course in General Linguistics, Ferdinand de Saussure developed his semiology, what is now referred to as semiotics, a new way to look at language that has widespread use in fields from literary analysis to anthropology. Saussure looks at words in a new light, and develops a theory that hits at the core of language and its relation to meaning. Saussure describes a word as a sign, a combination of the word ("puppy") and its meaning (a baby dog). The former is labelled the signifier, and the latter the signified.

Saussure's most powerful statement is that the relationship between a signifier and its signified is arbitrary, citing a signified's many representations across distinct languages as an intuitive proof. Dog, chien, and hund all have the same signified, but have distinct phonetic and visual formations. In the same way, a word might not have any meaning to an individual until it is specified: perro is a nonsensical sequence of letters or sounds unless you know that it is the Spanish signifier for dog.
Language in practice is strictly linear, as “signals have available to them only the linearity of time. The elements of such signals are presented one after another: they form a chain” (Saussure 70). Signifiers are chained together, as they are in this work, and each in turn adds its meaning to the whole.

This meaning has to come from somewhere, and Saussure identifies the language itself and the community of speakers as the source. If an individual creates a signifier and assigns it to some signified, that does not constitute a valid sign for whatever language they wished to modify. That sign would hold no meaning for anyone else who speaks the language. Language in this sense is inherited, “In fact, no society has ever known its language to be anything other than something inherited from previous generations, which it has no choice but to accept” (Saussure 72).

This is not to say that language is invariable: there are a number of social and otherwise external forces that keep language changing. The most apparent example would be the discovery or development of an indescribable idea or object that requires naming within the language, but the more interesting example would be the change of the language over time. As languages are made up of hundreds of thousands of words and potentially have millions of speakers, the reasons and mechanisms behind their evolution is difficult to explain, but as Saussure puts it, "Evolution is inevitable. There is no known example of a language immune from it" (Saussure 76).

Saussure divorces the evolution of a language from the relationships between the signifiers and the signified through the definition of two axes for which signs can be described to exist: the diachronic and the synchronic axes. The former is an axis of time, where signs and events can be traced through history. Etymological analyses are
strictly diachronic ones. The synchronic axis is an atemporal, semantic one: things that are close on the synchronic axis are similar in meaning or construction at any level. This abstraction is not stuck to describing languages as a whole, and can be applied generally, notably in actual signification chains. On the surface level, a written or spoken sentence exists only on the diachronic axis, with each signifier laid out end to end in time, but the words and meanings related to the words used are also carried by the signifier. The signified, however, does not exist on these axes alongside signifiers. The axes specifically denote how signifiers are related to each other, but the relationship between signifiers and their signifieds remains inaccessible.

These axes are further expounded on by Jakobson in *Aspects of Language and Aphasic Disturbances*, where Jakobson analyzes the construction of linguistic utterances by looking at individuals with neuro-linguistic problems, or an aphasia. Jakobson identifies two types of aphasias, each corresponding to an axis on Saussure's graph. First, he looks at individuals with the 'similarity disorder', in which their ability to begin new sentences is greatly diminished. Instead, they rely on context for their speech: the stronger the context of the conversation is before this type of aphasiac is prompted to speak, the more comfortably and successfully they are able to signify.

The other type is contiguity disorder, wherein an aphasic can only form speech in limited, short sentences. The sentences they generate have simple meaning, and they lack the ability to formulate more complex messages. For Jakobson, what this proves is that when formulating speech, people act within more than simply the temporal space. Choosing words in combination with others represents a sort of metaphorical combination, something contiguity disorder aphasics are unable to accomplish.
Conversely, similarity disordered aphasics are only able to do this, and cannot construct temporal narratives.

The significance of this manifests in the variance of the topology of the Saussurian plane on an individual level. Speech is constructed by exploring the synchronic and diachronic axes and choosing words from each, but the axes themselves are not of distinct language forms, and instead are developed through experiences of an individual. Recall that perro, the Spanish term for dog, is simply that, a signifier that means dog in some sense to those who can understand that. However, to those who don’t, it is nonsense. Even to those who do, differing experiences force a different meaning between each individual: English speakers might attach a sense of exoticness to it, others might find it to be slur passed between children on a playground. The entirety of the relationships between the signifier and signified are arbitrary, but are also necessarily dissimilar between individuals. If it were otherwise, the two individuals could only be the same.

This ground level of semiotics is inspiration for the following work: by adhering to the philosophical rigor that Saussure's work and its descendants have proven to have and addressing the issues of previous thinkers that consider the interactive space, I hope to uncover a sense of meaning in ergodic literature that was unavailable before. Truly, my goal is to develop a way to discuss ergodics within the same context of semiotics in a manner that reflects Saussure's rigor. This approach has a lovely byproduct of being able to fit ergodics into existing semiotic analyses without being intrusive. Simply, I am trying to extend the reach of semiotics into ergodics by building a bridge between the two. However, it is not quite that simple.
A fundamental question remains: what are games? What defines interactivity? This is a question many have asked, and, in my opinion, has yet to be answered. Aarseth's supposedly revolutionary definition is provisional at best: Aarseth’s ergodic is a constraint that relies on an arbitrary distinction between trivial and non-trivial effort, along with a definition of what is noematic and what isn't. Consider a vastly intricate painting in which each section is nearly microscopic. Extreme effort on the part of the viewer must be exerted to even begin to see the painting’s content, but it does not make sense that this painting should be categorized as an ergodic one. Aarseth's definition fails to draw the line between trivial and non-trivial and as a result ultimately fails to draw the line between ergodic and otherwise. Frasca's distinction of games, having a quality of simulation, is neither formal nor intuitive: checkers, football, and other physical or abstract activities are obviously games but it is difficult to account for simulation aspect behind them.

So, let us attempt to find out the answer for ourselves. A simple identification of what games have that non-games do not is 'mechanics'. The simulation that Frasca describes can be reformed by isolating the processes that drive games into mechanics. Simply, interactive works are works that contain mechanics, and a mechanic is a trait of an ergodic text in which a reader must interact and experiment with to understand. A
mechanic can be simple: when a ball hits a paddle, it bounces off. When the ball is suspended in air, it accelerates downwards. When the ball hits the ground, it is reflected upwards at a speed relative to its speed beforehand. In accordance with this definition, the behavior of the ball is unknown to an observer until they move it around themselves. Thus, interactive works include works generally known as games: videogames, board games, and physical sports, but this definition also extends to a wide array of works: hypertexts, physical puzzles, and even doors.

In addition, mechanics naturally imply nonlinearity: as non-ergodic literature is usually read as a set of signs that occur in order, interactive works have their mechanics discovered over multiple readings, inferred from the varying outcomes of interactions that begin in similar situations. To find the mechanics of the above ball, a reader would have to manipulate the ball over and over again, throwing it around and bouncing it on multiple surfaces. In the same way, a door is nothing more than a wooden panel until its doorknob is fiddled with. Both states of the door exist simultaneously in the nonlinear ergodic construct of the door simply through the implication that at any point, it can be moved from one state to another.

The mechanics of chess can be discovered in a few ways: each piece has its own set of rules, and there are several more illegal moves than there are legal ones. One can say that it requires experimentation to learn which rules are legal or not, to which the player’s opponent is the enforcer behind these mechanics. Each invalid move is caught and corrected by the opponent, and if it isn't, the game that they are playing ceases to be purely chess.
Additionally, only with experimentation do the more emergent characteristics of chess become apparent, such as the strategic values of lining up pawns diagonally, or the ways that knights can pressure pieces that are a few moves away.

Though, with chess, this definition begins to show its shortcomings: the mechanics of chess do not necessarily need experimentation to reveal themselves. With the rules of the game in this case being extremely strict, players can ‘play’ chess in their heads, as is required for playing chess well. Players go through the possible game states mentally, possibly running through hundreds of potential outcomes, before choosing a singular move to enact within the physical space.

The difference between this mental experimentation and 'interpretation' of signs is unclear: nonlinearity as mentioned above that would occur in the physical (or digital) system is no different from the interpretation that would occur in reading even this text. In fact, this definition of a mechanic is invariably similar to that of a sign: A mechanic (sign) is a trait (signifier) of an ergodic text in which one must interact (read) and experiment (interpret) with to understand. This similarity is so strong, in fact, that it convincingly shows that mechanics are reducible to signs.

Again, the wall between interactivity and uninteractivity breaks down. Multiple distinct ‘interactions’ with a game aren’t different from readings of a work with different mental states. The experiences are distinct in both sets of ‘readings’. The original question “what are games?” is also the dialectic question “what separates games from non-games?”, and the latter now has the answer “nothing” that has come from attempting to answer the former.
It is easy to imagine that a distinction between ergodic literature and non-ergodic literature must exist, but uncovering it proves to be challenging: the previous attempt, along with Aarseth's and Frasca's attempts all show the ease of trivializing interactivity. 'Interaction' itself is a term that lends itself to this difficulty, since an interaction between two parties can be as empty as them coming in contact.

Linearity is also a useless tool in this endeavor, as linearity implies a narrative structure, which is not necessarily a component of ergodic works. Since time is one dimensional, an uninteractive narrative in which the story reads through once, begins again and reads through in a different fashion is essentially identical to an interactive narrative in which the reader goes through once, starts over, and follows a different path through the second time. In both cases, the timeline of the experience that the reader follows involves one narrative and then a variation of the narrative directly afterwards.

A more elegant distinction is required, and I have devised a better constraint: extratextuality. Formally, non-ergodic literature is literature in which all interactions between the reader and the work are extratextual, that is, happen outside of the work itself. It follows that the requirement of ergodic literature is that interactions happen intratextually, within the text.

Interaction in this context is akin to the word 'play': 'interacting with' is a rearranging and changing of components: for example, morphing it from something that is alien to something that is yours through interpretation or translation, examining an aspect of the text with scrutiny, or juxtaposing the work with another. Even the simple act of reading words requires them to be transformed from the letters
to the ideas in the mind, and it is inevitable that the resulting ideas will be played with as well. However, playing with an ergodic text is a special case: the text itself is what is being played with, what is being changed, rearranged, and morphed. This is intratextual interaction. The litmus test for ergodicity is this question: Upon interaction, has the work been changed? If yes, then the work is ergodic. If no, then the work is not. The boundaries of the text, is what is left to define. Where is the line between something changing within the text and just outside of it?

A book at first is obviously a non-ergodic work, though that is through the assumption that the text of the book includes only the words inside. The book itself, the physical book, can be interacted with ergodically: tearing off a page or highlighting words are examples of these potential ergodic interactions. The 'text' could be the whole of the experience: perhaps including picking the book up from the library and checking it out, or even including browsing the stacks of a bookstore as part of its content. Thus, the scope of what the 'text' contains is an open problem with each new text.

Fortunately, it is easy to allow the analyst to decide this, since ultimately the decision is arbitrary. An analyst is completely free to 'read' the text of a book as including the bookstore experience, and in doing so the analyst would make the work ergodic. Importantly, however, the analyst is not making the work as the book's words ergodic, but rather, constructing a new work that includes the bookstore experience, one that happens to be ergodic. The work as a book with the bookstore is completely distinct from the work as the words.
Returning to the examples above, the painting that required a microscopic perspective is non-ergodic: digitally zooming in creates a zoomed in copy of the work, and looking in closely does not change the state of the work at all. The choose-your-own adventure book is ergodic in that the text is changed and elongated as the reader chooses sections of the text to append to the current text. It is in this peculiar case that the text of a choose-your-own-adventure book as its words is non-ergodic, but adhering to the rules of the book, utilizing the traversal function, makes the choose-your-own-adventure book ergodic.

This justification of mechanics conflicts with the initial conclusion. So, to try to find the answer to "what are games?" once more, let us return to that definition: a mechanic is a trait of an ergodic text in which one must interact and experiment with to understand. The way this definition led to the conclusion that ergodism was indistinct from non-ergodism was in the point that interaction and experimentation were no different from reading and interpretation. However, what was left unconsidered was the location of each of these components of the definition.

In reducing mechanics to signifiers, the semiotic equivalent of the definition was created, where the terms related to mechanics were replaced with terms related to signification: a sign is a signifier within a text in which one must read and interpret to understand. Here, the sign, signifier, and text all exist within the confines of the text, which is agnostic to reading, interpreting, and understanding, that occur outside of the text. In other words, the text remains unchanged regardless of how many times it is read. My new intratextual constraint, when applied to the previous mechanic definition, removes the interpretation ambiguity entirely: a mechanic is a trait of an
ergodic text in which one must interact and experiment with the work intratextually to understand.

This definition now makes explicit that any experimentation that requires a copy of the work to be made, whether physically or mentally, is not ergodic interaction. Interpretation is the act of creating a mental copy of the text and dissecting and enacting mental processes on the mental copy, but the original text is untouched. With this definition, my new formulation for the term *ergodic literature* is now complete. Ergodic literature contains mechanics, which are defined by interactions that occur within the work, the boundaries of which are decided by the analyst.

Mechanics are the components that decide what intratextual interactions can exist within a work: they are the rules to which the text abides. Where non-ergodic literature has zero mechanics, ergodic literature has mechanics that cannot be enumerated, though they can be recognized. A door, for a simple example, contains the obvious mechanic: when the door is opened, what is behind it is revealed. In addition, it contains infinitely more mechanics: the sounds that the hinges make upon moving, the strength required to turn the knob, etc.

In this case, there is an *actor* behind the mechanic: the door and the hinges are what can be assigned to these mechanics, which then can be referred to as *behaviors*. The behavior 'turn the doorknob and the door is unlocked' is something that is intuitively assigned to the doorknob. There can also be mechanics that are unattachable to the actors. An example of a mechanic that is not a behavior would be a
mechanism to which every other time the door were opened, what is behind the door
would change. The actor can't be the door, nor the content behind the door.

Mechanics are not granular in the sense that when one is identified, it is unique
and distinct from all others, but rather the term mechanic is used to describe the
properties of interaction in a granular sense. Identifying a mechanic is a tool to explain
and describe the ways that an ergodic work functions, and any identified mechanic has
the potential to be described in another fashion, and can contain any number of
mechanics within it. Signifiers, on the other hand, are granular. Each word is a piece of
a sentence, each symbol a part of the whole.

Mechanics exist outside of traditional semiotics since they are indescribable by
language, but they must exist as something within this semiotic structure. Within
semiotics, the signifier and the signified make up the whole, but these are the concepts
of language and what language describes. Mechanics are obviously not language and
thus, within these semiotics, must exist alongside the signified. Mechanics are incapable
of being fully described by language, or, in other words, ergodic literature cannot be
purely made of words. As soon as any ergodic elements are presented, the work begins
to encompass something more than language, since language cannot manipulate itself.
There must be some element of the work that allows for the work to transform on
account of the subject, be it hyperlinks or physical space. Thus, mechanics themselves
can only be reached for in two ways: by interacting with the work they exist in, or
representing them through signifiers.

Mechanics shrug off every attempt at forcing them into the likes of signifiers:

1. A mechanic does not describe anything.
2. A mechanic can only be recognized in specific sections of time.

3. Divorcing the mechanic from its context changes the mechanic.

If mechanics were to reside in semiotics as signifiers, it would require that they are signifying something. Considering only behaviors would make this appear to be true: a simulated ball's mechanics seem to signify the way a physical ball would act, however, divorcing behaviors from signs and isolating them into mechanics makes it clear that the simulation is a new entity that merely has the 'real' ball being projected onto it by a reader. These balls are completely distinct, and similarities are subjective discoveries. Mechanics do not represent even themselves, as 'reading' the mechanic gives you only the mechanic, and also only during the time you are interacting with the work. In other words, mechanics produce experience upon interaction, and do nothing else. Unlike signifiers which can be internalized and utilized outside of the work, the mechanic can never be removed from the work, nor can it exist anywhere besides within the work. There can only be representations (signifiers) of it.

With language, moving signifiers around in any sort of space changes the way that the signifier interacts with its neighbors, and thus changes the meaning represented by the signifiers: a collection of signifiers within context has a certain signified that changes arbitrarily with the changing of either the context or the signifiers. Mechanics, however, are distinct mechanics in other contexts and combinations. It is not that they point to a different meaning; it is that with any changes, the old mechanics have disappeared and have been replaced with new mechanics.
The semiotics of ergodic literature, with the addition of mechanics, is a vastly new entity. Within ergodic literature exist mechanics along with the signs that must exist for the literature to even be perceivable. Semiotics have existed for a very long time, so an intuitive first question is 'how do mechanics affect semiotic structures?'

In a very simple computer simulation of a ball, there might be a red circle that represents the ball, and a few behaviors of the ball that are recognizable, like gravity and bouncing. That red circle only acquires its meaning with these behaviors, as, without the behaviors, the red circle could be anything. If the circle instead had behaviors that were controlled directly by the player, this circle could come to represent the protagonist, an abstract view of a person or otherwise. The fact that signifiers change what they signify when placed in different contexts is no new concept, but that this extends to mechanics is important.

The difficulty in recognizing where behaviors exist within this ergodic semiotics is in that the behaviors change with any change to the actors they are attached to, suggesting that the actors and the behaviors are one entity together, putting behaviors in a bizarre place between mechanics and signifiers. This seems to show that behaviors simply are a name for the ergodic part of an ergodic signifier. This clashes with the above assertion that mechanics are distinct from signifiers and that behaviors are simply mechanics attached to signifiers. However, the assertion takes precedence over this position. There is no way truthfully to tie together signifiers and mechanics, as doing so would make a claim to an intimate knowledge of the meaning behind the signifier.
Attachment of mechanic to signifier above is qualified by identifying signifiers as actors, and claiming that the actors contain two parts, the signifier(s) and the mechanic(s). This qualification is very arbitrary, and from the point of view of an analyst, it is important to note that both authors and readers of ergodic literature will be apt to recognize actors as nondistinct from the mechanics and signifiers that they combine. What this means for the ergodic semiotic structure is that there are three entities: the signifier, the mechanic, and the actor. However, the final element only exists as an abstraction during analysis, and the signifiers and mechanics are the sole components of an ergodic work.

Thus far, ergodic literature has been regarded only as such, but another part of the work exists outside of ergodic literature: the system. Strictly speaking, the work is the part of the literature that exists in reality, the texton, but the system is that along with the whole of all the ergodic paths, theoretical combination of every possible scripton. In most cases, systems, ergodic literature, and the 'work' referring to an ergodic text can all be used interchangeably; however, when calling this entity a 'system', it can be placed in the totality of everything, rather than the totality of itself.

In reading common systems, readers already do this. When reading the ball simulation, readers compare the system to the 'real' ball. A realistic simulation might allow readers to intuit the behaviors of the simulated ball by expecting the behaviors or a real ball. But, this simulation is no less real than the ball in reality. As a system, it exists in the same way the real ball exists, since the real ball exhibits all of the qualities
of ergodic literature. Systems describe a reality separate from the reality, which is a system on its own.

This fact has often been utilized practically: digital simulations of water physics and aerodynamics are used to draw conclusions about the 'real' world. Abacuses are used to mimic mathematical operations on 'real' objects. Whenever readers identify actors within systems, there is inevitably some other system that includes a parallel, be it another ergodic text or the system that is reality. These parallels are merely metaphor: the parallel is not one that is truly grounded in any connection between the two systems.

Other theorists have failed to recognize this, following Frasca's idea that the potential of ergodic literature “is not narrative, but simulation: the ability to represent dynamic systems” (Frasca), where in fact ergodic literature are dynamic systems in their own right. The connection between systems is something that is recognized only by an analyst, and cannot actually exist, since the signifiers between two distinct systems can never be identical, and as such, neither can the mechanics. What this means for ergodics is that phenomena within ergodic works can exist alongside phenomena in the physical world.

This is more difficult to see in ergodic literature that is not digital: for example, the door. The reality that this ergodic text describes is difficult to see, but since the system encompasses all states of the text at once, that system cannot be grounded in the same reality the physical door is in. In considering the system of the door, every possible position and state of the door is included.
When considering works such as Conway's *Game of Life* or abstract puzzles such as *Tetris*, this fact seems obvious. Any sort of interactivity is nowhere near limited to simulation, especially considering that ergodic works are authoritative representations of the systems that they represent. The term simulation implies that there is an attribute of genuinity or validity that the simulation lacks, in which case what the simulation is simulating is the pure form, the signified. However, ergodic works present the pure form of their distinct system, be it within the digital or physical space.
A point of note with regards to the relationship between mechanics and semiotics is that distinguishing between them becomes arduous, and nearly nonsensical, as the layers of abstraction are peeled away. In constructed, hypothetical systems it is easy to separate the two: but as our magnifying glass moves away from the tiny tic-tac-toes, chessboards, and door hinges and into the realm of sports, modern video games, and live, interactive art installments, finding that previously well-defined line becomes nearly hopeless. 'Mechanics-as-metaphor', an oft repeated phrase, epitomizes the resistance of separating mechanics and representation: being the use of aspects of interactivity as symbols for the narrative or meaning behind an ergodic work. Telling the reader that some character has placed a box on the ground is simple, but forcing the player to place the box on the ground exists in a semiotic gray zone. In other words, we can discuss at length what it means for an object to behave a certain way, but what does it mean if the object is acting like another?

It would certainly be easy to acquiesce and admit that mechanics-as-metaphor is the finishing blow to my insistence of mechanics as something other than representation. At least, it seems that the majority of video game artists and analysts today have been convinced of this. Besides mechanics-as-metaphor, concepts such as ludonarrative dissonance, where a game's mechanics disagree with the game's narrative,
and immersion, where a player is convinced of the validity of the narrative through the plausibility of the mechanics, are prevalent notions in 'game design'. Concepts such as the magic circle and the rules of play that Huizinga and Caillois so laboriously construct cement mechanics alongside signifiers.

But something even I have failed to remember is that this thesis is not specifically about games: the subject of this thesis is ergodic literature, a superset of games. Writers like Frasca have skirted around this distinction, developing terms like serious games and art games to try to broach the idea of games that can escape the firm grip that 'play' has on a medium. Their definitions of what they had written about relied on the idea of play, and limited their analyses accordingly. Frasca's ludus vs paidia as ruled vs free form play is a restriction more than an explanation of what can happen in the interactive space.

'Ruled' play in games is an abstraction on the way that we interact with games. It seems easy to see in the more practical space, where directions and rules in games can be subjectively assigned as ludus 'mechanics', but the subjectivity of this attribute becomes apparent within a more theoretical space. Similarly, freeform play does not hold up. Where chess would be hastily labeled as a nearly ludus game and Conway's *Game of Life* as a paidia game, they are fundamentally similar. Simple rules govern what pieces can do within a grid space, and the number of possible game states grow exponentially and can vary wildly with even slight perturbances. Victory is merely a game state, and chess could, similarly to how constructions with 'interesting' results in *Game of Life* are studied, be subjected to a more exploratory lens, and within the more
competitive space in chess, it has. Readers and players alike always have the ability to freely explore the works they interact with, and their goals aren't always victory.

This distinction between the more general ergodic work and the game subset should be the intuition that leads back to how mechanics, and interactivity as a whole, is distinct from representation. Tying mechanics into narrative, into play, or into representation is betraying what the mechanics are in the first place. As I said before, mechanics change in other contexts, but what that means in the more practical sense is the answer to the question above, 'what does it mean if the object is acting like another?' Simply, nothing. When analyzing a system, it is normal and generally easy to relate it to similar systems. Genres exist in all mediums. However, when relating to another system, this does not follow a process of signification. In other words, the two systems being compared are both as much systems as any other system; they each have a set of mechanics and symbols and are distinct.

For example, let us return to the computer program that depicts a bouncing circle. We can dig into our past experience and intuitively recognize this as a simulation of a ball, and subsequently begin identifying ways that this simulation poorly simulates the ball. The circle on the screen refuses to stretch when it hits the ground and is unaffected by the wind, unlike the behavior of a 'real' ball. However, the ball in real life and the circle in the program are both distinct systems that share some subjective similarities. A normal person might view these similarities as self-evident and not subjective, but consider again chess and the *Game of Life*. When each is represented by a mathematical graph with numbers, they seem to contain the same seemingly self
evident similarities, showing that a true similarity in structure is undercut by a subjective lens.

Perhaps saying that this similarity means nothing is drastic, after all, symbolism is subjective in the same way these similarities are subjective. A system's similarity on to another can be described, in the same way it is done for signs, by their proximity on the synchronic axis, at least, it must be: certainly, the similarities between mechanics are atemporal. In this same way, then, mechanics are related to one another upon construction and upon interpretation, alluding to the concept of mechanics-as-metaphor described above. However, unlike signs, mechanics and systems as a whole even cannot be 'moved' in the same way that signs can. Where a sign has its place on the metaphorical axis and can be combined with another sign, 'combining' mechanics is not an operation that leaves the original mechanics intact. The resulting mechanic(s) or system is wholly distinct at a fundamental level, though it could be placed somewhere nearby each of the other mechanics. These mechanical allusions are an inexplicable component of ergodics, and are the difference between a set of symbols being reminiscent of an idea and a system behaving like an idea.

An odd quality of mechanical allusions is that the interactive space is not well developed yet, and that there are very well defined expectations for mechanics and symbols that appear within the interactive space. Games like *Gravity Bone* and *The Stanley Parable* explore these expectations and subvert them, in somewhat the same fashion that music has a tendency to play off of listeners expectations for upcoming chords and notes. In music, a term is set aside for these constructions: the cadence.
When listening to a musical phrase, generally within the context of a bigger work, listeners are apt to predict the musically 'correct' notes to come next. Cadences are ways to either follow or utilize these expectations to transition into the next section of music.

*Gravity Bone*, for example, utilizes a trick where the 3 collectible items within the game are assigned to the inventory slots 1, 2, and 4. Generally, and even intuitively, this means that there is either more content within the game left to be discovered and put into slot 3, or there was something the player passed over that belongs in slot 3 but is now missing. However, the deceptive cadence that *Gravity Bone* employs is that it is neither, and in fact the game used this mechanical allusion to lull the player into believing that there was a much bigger and grander experience to *Gravity Bone*, only to cut it short by killing them shortly into the experience.

*The Stanley Parable* is built around a different type of cadence, wherein it presents itself as an exploration type game where the player wanders about an empty office while a narrator dictates both what the player is doing and what the player's character is thinking. Quickly, however, the narrator moves more and more towards addressing the player himself while the gameplay becomes more and more mysterious: each path becomes a battle with the narrator and attempting to find the greater narrative to *The Stanley Parable*. What was once the player in control and the narrator tagging along morphs slowly to the narrator 'encouraging' the player's actions.

Late in 2014, I developed a game titled *Marshmallo* where I attempted to explore these sort of interactive cadences, the mechanical similarities between systems that (jaded) players now have come to expect from ergodic works. It hides its intentions by presenting itself as a game in a sea of quirky indie games with cutesy graphics and

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1 Available online here: http://sepharoth213.itch.io/marshmallo
novel gameplay, but takes all of the mechanics it seems to borrow from the industry and distorts them in a way that tries to show players how what they have come to expect is dissonant from what they say they have come to expect.

Marshmallow greets players with a title screen where the text playfully bounces onto the screen, prompting for input to continue, and proceeds by introducing the narrator, who speaks to the player through text bubbles that pop up at the top of the screen. Marshmallow then introduces the first actual marshmallow, a thoroughly roasted one. "It's delicious. I promise." the narrator says, prodding gleefully at the player to try for themselves. Marshmallow puts a lot of effort into convincing the player that the game itself is a whimsical experience, and gets them to expect the traditional intro, tutorial, gameplay sequence that is common. However, once the intro plays out and the tutorial begins, it never seems to end. The narrator drones on and on about how to approach roasting the marshmallow, and the player quickly finds that the game is incredibly difficult, bordering on impossible.

However, Marshmallow shows no signs of rewarding the player for performance in any tangible way. The narrator will either drop a snarky quip at the player if they fail to substantially roast the marshmallow or passively congratulate them for doing well. Players will of course expect some sort of goal and play on until they can perfectly roast the entire marshmallow, except, before long, the narrator begins to switch topics. Where the tutorial text used to be, the narrator begins telling the player about why they are outdoors by themselves, telling a dark tale of their family and thanking the player for spending time with them. Within minutes, the narrator ends the experience, telling the
player that there are no marshmallows left and expressing the gratefulness the narrator
has for the player's company.

Marshmallo's focus was to show players what expectations they have been
conditioned to have of 'games' in the industry today, and how that has held back the
development of ergodic literature as a whole. The narrator's text was built to emulate
tutorial text at first, but was also written to be something that someone could feasibly
say as advice for roasting real marshmallows in a similar setting. "Heat rises, right?" the
narrator explains. "You've gotta keep the fire at the bottom of the marshmallow." A
player would nearly unconsciously parse this as saying 'Hey, there is a mechanic in this
game that dictates fire spreading and it is optimal to move the burning sections to the
bottom of the marshmallow', but what Marshmallo attempts to do with the narrator is
develop a personality that the player interacts with in a way that is outside of the game:
whether or not the player stays and plays the game. This sort of essential 'input' for
ergodic literature is something that is perhaps the most basic mechanic there is: stay
and be with the work, and it exists, leave and it ceases to.

Mechanically, Marshmallo stresses this by making the narrator seem more and
more human as the player sticks around, and even follows a common pattern found in
traditional game design and tests the player's proficiency at this mechanic at the end of
the game. Throughout, the narrator gets darker and darker, and at the end of the game,
the narrator utters "Would you stay with me here for a while? Please?", two depressing
text bubbles on an equally depressing blank background. Then Marshmallo goes blank.
Players here have two choices, they can either see this blankness and recognize the
game has ended and close the window, satisfied with the way they have discovered this
hidden narrative within this guise of jaunt that *Marshmallow* presents, but if they choose the alternative and literally stay with the narrator for ten more seconds, the narrator utters a final "Thanks." and the game reverts to the title screen.

*Marshmallow* manages to ask the player, through its mechanics, whether they can acknowledge the narrator as someone who is present in the moment that they are playing the game, rather than when the game itself was developed. *Marshmallow* looks at immersion and points out that within this game, players might not consider their effect on the world in the same intuitive sense that they ask from the genre: leaving as soon as someone asks you to stay and silently awaits your response is not only rude, but cruel. By being a character that reacts to both the player's presence and the player's activity within the game, the narrator takes on a form that can only be reached ergodically. The narrator refuses to speak or continue his story unless the player continues roasting marshmallows, continues socializing with the narrator on the narrator's terms, something extremely reminiscent of the way interaction works within face to face socialization.

The themes and mechanical cadences I presented in *Marshmallow* can be powerful, but I feel that *Marshmallow* is a product of the youth of the medium. The reason *Marshmallow* can work the way it does is because of the way it is seated in the time it was made: in the current industry and in the current mindset of anyone who approaches video games. Mechanical cadences, like any form of trope subversion, is bound to change wildly as the collective experience shifts and the medium matures, but specifically, once the interactive space is more widely recognized as a valid place for
artists to express themselves at a deeper level than the norms of today, Marshmallo will be a relic of the past, a naive work that will have no one left to speak to. However, there is one aspect of Marshmallo that transcends this mortality, and that is that it consciously recognizes the presence of the reader.

Early this year, Diego Andrès Barnes, a senior at Bard College, showed off an installation along with a few other seniors in what was essentially a warehouse hidden away in the corner of campus. Barnes, alongside paintings and sculpture of an average undergraduate art show stood alongside a disparate collection of office relics. In the entrance, there stood a small table with a bowl of candy and a business card holder containing cards that read "Diego A. Barnes, Art maker - Gemini - ENFP - Millenial". Peering into the room that Barnes had set up, visitors would easily see and hear something being projected onto the wall opposite the entrance, and, upon further investigation, they would find that it was a karaoke screen, where words swam across the bottom of the screen while a video of Barnes dancing and singing green-screened on top of beach landscapes.

A set of four chairs were placed facing each other atop a cheesy office carpet, graced by the shade of a fake office plant, where someone sat with their head buried in a clipboard that they furiously wrote into, occasionally looking up to trade confused glances with the passersby. On the wall behind the chairs hung various pictures of Barnes along with certificates he had earned. And nearby, Barnes himself, dressed in a suit and tie that didn't quite match each other, sat behind a desk laden with the common desk supplies: a mug filled with pens, a fake potted plant, a nametag on the
desk. Behind him on the wall were laid out degrees of varying colors, each prominently displaying Barnes' name.

Perhaps the most powerful part of the space was the platform that sat in front of the karaoke projection. It stood by itself in the middle of the installation and held a microphone facing the projection, inviting anyone to take the time to sing a bit with the virtual Barnes. As I was looking at the platform and the accompanying projection, I noticed something key that held the entire space together: the virtual Barnes wasn’t singing the lyrics that appeared at the bottom of the screen. Instead, virtual Barnes was singing backup to the karaoke that could have been sung by anyone who went up to the microphone.

This open intent for people to participate in the space that Barnes' has constructed was everywhere. People would occasionally sit down in one of the chairs on the side of the room, but no one lasted long. Barnes’ presence imposed an uneasiness that prevented anyone from actually interacting with anything in the space. Barnes had created a space that implied interactivity and put it in a place where no one could enact upon that possibility, instead evoking feelings of stress and anxiety. Everything in the space is screaming at its visitors to join its ranks and play around with its components, but, quite simply, nobody wanted to be a part of it. The space effectively offered each of its visitors a choice to either become a part of the work or to leave it alone, forever a stranger to the strange persona that Barnes had created for himself, and brilliantly, everyone chose the latter.

_Marshmallow_ and Barnes' office share an awkward sense of expectancy: where _Marshmallow_ presents a dejected narrator that approaches the reader playfully and
kindly hoping for a similar return, Barnes' kitchy aesthetic and pseudo-interactive elements beg for acknowledgment through the lack of previous acknowledgment, a sentiment that only compounds as more and more people filter through the space. Barnes' office is able to implement what *Marshmallow* can imply: when the reader leaves the space, the karaoke platform and the potted plants are still there, waiting to be dignified. *Marshmallow* tries to have the narrator exist in that same way after the player leaves, again rejected and awaiting for another kind soul to solicit for comfort. There is an emphasis on communication through explicit non-interaction, where these works place pressure on the reader by asking them if they want to be a part of the space. The possibility for the reader to give in to the pressure and choose to be a part of the work is something unique to ergodics: a non-interactive version of either would fail to back up the invitation to join the work, to join the world that the work has created, and similarly fail to react to the player's choice to leave it.

These works show the impact of ergodics on its audience. Since ergodics are the possibility of readers to enact change within a work, when the reader steps in and enacts that change, they become a part of the work, both immediately as an active being within the system, but semiotically as the reader brings the motivations and experience that inform their actions and fuses that into the narrative of the work. Ergodics opens up a second channel of communication between a work and its audience. Without interactivity, the audience could only react internally to narratives or ideas, and the power is entirely within the work to enact upon them. With interactivity, the audience can permanently alter the work, and because of that, they are
responsible for the way they interface with it, a responsibility they are not only bound to by the work, but by any future members of the audience.

In 2011, Vlambeer developed *Glitchhiker*, a game that pits players against a frenzy of obstacles, but instead of giving the players a set amount of lives before the game ends, the game itself had a set number of lives that could be replenished by scoring well enough. As the number of lives decreased, the game would become increasingly 'glitchy' or non-functional, until it ran out of lives completely and ceased playability. Where the game was installed, passersby were offered a chance to recuperate some lost lives for the game's sake, at the risk of killing it further. The game was also available online, allowing any viewer to participate in the death of *Glitchhiker* or attempt to save it.

As the game slowly became less and less playable, the effects that any one player could have were exacerbated. Once *Glitchhiker* was standing on its last legs, the loss of a life cleaved a chunk off of *Glitchhiker*'s lifeline, but gaining one back meant a huge gain in playability. Like the works above, *Glitchhiker* ended up communicating to its audience via explicit non-interaction, but in a different way. Where *Marshmallo* and Barnes' office intentionally drove its audience away while begging them to participate, *Glitchhiker* offered itself to its audience as a show of faith. It would die in the wrong hands, and *Glitchhiker* made no attempt to discriminate between the participants. As a result, onlookers and participants would refuse to participate out of respect for *Glitchhiker*. The audience recognized the value of the game and self-selected the people that would end up taking up the burden of *Glitchhiker*'s well-being, those who felt they were up to the task would play *Glitchhiker* in a valiant effort to, essentially, allow other
people to play the game. People who shied away from the game understood that if they failed to perform well enough, regardless of the quality of their experience, they would have robbed someone else of the opportunity to experience \textit{Glitchhiker}. 
Conclusion

My motivations for exploring the interactive space are not obvious. If, as early as 1997, Aarseth can complain about the medium bias within academia, I cannot reasonably cry the same foul nearly two decades later: it is not simply because I wish to legitimize games within academia. If I truly believed that the theory contained within these pages was so ground breaking that it would shake critical theory at its roots, forcing thinkers to retreat back to Saussurian days and rebuild the field with interactivity in mind, then I would either be wrong or ignored, without a doubt: it is not that I feel that interactivity must be recognized as a valid component of semiotics for the medium to move forward. What I will confess is my faith in the potential for this medium to break barriers, to become some part of history that irreparably changes humanity, not 'for the better', but fundamentally, in a way that would render the humanity of today nothing like this hypothetical post-ergodic-humanity. What ergodics have to offer that nothing before has ever been able to claim is a controlled way to generate experiences. 'Actions speak louder than words' is an oft-repeated saying, but instead of communication via an artists actions, ergodics allows for the possibility to communicate through the audience's actions, their thoughts.

Ergodic literature exists in a creative limbo that makes this potential difficult to tap into, in part due to the technological limitations. The interactive space is at a point
in its development reminiscent to the birth of film, where the technology behind any
ergodic work is a heavily deciding factor in the content. In the same way jump cuts
were introduced when the technique was implemented for the physical film, things like
the introduction of 3D rendering had extreme implications on the abilities of creators
in the medium, allowing them to move past abstract puzzle games and side-scrolling
platformers into the realm of immersive worlds and first person games. Technological
improvement in this field has an end goal of eventually being able to purely reproduce
experiences, and where we are now is not quite as far from this as it might seem. We
already can produce video that our perception cannot distinguish from real life images,
along with audio that can produce nearly any sound that can feasibly exist. As the gap
between now and then closes, it becomes more and more the responsibility of artists
and creators to develop and explore the creative space that ergodic literature offers.

There is another side of technology that stands in the way of the ergodic ideal.
The relationship between an artist and his work in the interactive space is mediated
through a layer of abstraction that is unlike what exists in most other mediums. In my
case, what is between my creative impulse and the video games I create is the layer of
programming that needs to be done before anything can be made. Current
implementations of ergodic literature require abstract rules to be specified: the
mechanics of soccer, most analysts would say, involve the ways that the ball is handled
with relation to both a single player and the positioning of his teammates and
opponents, but the rules concern themselves mostly with the restrictions on where the
ball can be. One rule, for example, is that when the ball goes out of bounds, the last
team who touched the ball is the one who 'loses' possession. This rule, however,
generates an unstated mechanic: when the ball touches a person, it gives their team possession. If the creator of soccer wanted players to juggle the ball in the air in a hackeysack-like fashion, they could not do so explicitly. Instead, they would need to create a set of restrictions that made this the only way to play, for example, creating a rule wherein the ball touching the ground counted as an out-of-bounds.

Similarly, when programming, I cannot produce mechanics in the same manner an artist or writer would produce their works. Where a visible line means to a painter a stroke of a brush, that line to me must be translated into a machine friendly format, and becomes `drawLine(x, y, x2, y2)`. Drawing a curved line means that I all of a sudden have to concern myself with the mathematical implications of whatever curve I would like, where a painter would have no more trouble than drawing a straight line. Handling the bouncing of a ball in the ball simulation I have referenced so many times within this thesis requires a surprising amount of work. First I must define a vertical velocity 'variable' and ensure that it increases positively over time. Then, I must take the position of the ball and move it by the velocity for every timestep in the simulation. Then, utilizing some collision detection algorithm, I must check for collisions between the ball and any other objects in the simulation, and if there are any collisions, I must change the velocity of the ball accordingly, based on the angle that it is bouncing and the surface that it hits. All in all, developing any video game is a vast technical undertaking.

That is not to say that other mediums do not have the same amount of difficulty behind them, but what is distinct about the development of ergodic works is that there is a multiplicity of work-states that all are developed at once, and instead of developing
the experience directly, current ergodic works are generators in some sense. Where a filmmaker edits the film that the audience sees, I manipulate the rules that govern the system that governs what the audience sees, in a format that is almost completely unlike the result.

As the technology develops, this abstraction becomes less and less an obstacle, as it already has. Experimental frameworks like Scratch and Unity work to bring development down to the level of experience, where mechanics and interactions can be developed directly rather than through an obfuscated set of rules. These are not anywhere near the point where entire experiences can be generated intuitively, and with the current set of technology, it seems that there is no way to tap into the experience of the audience in the ergodic space the same way that other mediums have direct access to.

In 2010, Jason Rohrer developed Sleep is Death, a title that attempts to bridge the gap between the ergodic system and the creator by removing the middleman. In Sleep is Death, a player interacts with the world through an avatar, but every action they take is submitted to a 'controller', who then changes the game state accordingly. The avatar can move around on screen and can either speak or interact with the environment, but what is core to the Sleep is Death experience is that what they can say and how they can interact with the environment is completely unbounded. The player can put an interaction bubble pointing at any space on the screen and type whatever they want. The controller, a live person who takes the place of a rulebook or a program, takes the player's input and has a set amount of time to change the environment or the player's avatar according to the input. For example, a player might point at a door and
type 'kick down', and the controller could draw the broken shards of the door and scatter them about the floor. The entire experience proceeds in this fashion, with the player exploring an ergodic work in which each mechanic is created on the fly by the controller. *Sleep is Death* is a step towards the ergodic paintbrush, but shows just how far away technology is from being able to do this in more than a controlled setting like the *Sleep is Death* interface.

Ergodics, then, has to battle technology on two fronts, where before it can reach its perfection, it must first deliver experience to its audience that is unhindered by technology, and it must also allow developers to abandon abstractions and find a way for them to interface with the audience in a way that is in the same way unhindered by technology. Of course, this is most likely not possible, but this fact is what I feel leaves people uneasy as to the nature of ergodic literature in the grand scheme of artistic expression. Nevertheless, I believe that the potential to bridge the unfathomable distance between my mind and yours exists somewhere within this medium, somewhere within the rapidly changing technology and ever expanding industry of game development. Perhaps it is idyllic and naive to believe this. Perhaps consciousnesses are so fundamentally different that this endeavor will forever be fruitless. Perhaps it is too selfish to think that my medium is the one that will finally do it, the one that will connect human experience and uncover perfect empathy.
Bibliography


Gameography


