Chess Set Theory:
The Fractal Realism of Bontempelli & Borges

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Jorge Luis Borges' writing is regularly and explicitly concerned with concepts of infinity and it has been recognized, in limited scholarship, for fractal structures, which are associated in turn with postmodern literature as it opens itself up fractally to a sort of contained infinity of interpretations.[1] Scholarship around the themes of infinity and fractal structures focuses on the labyrinth and the mirror, however, and seems to overlook the author's preoccupation with and use of the chess set in certain stories. While the fractal infinity studied in the labyrinthine "El jardín de senderos que se bifurcan" feels highly postmodern in its chaotic openness, and indeed, is compared to postmodern stories like Italo Calvino's 1967 "Il conte di Montecristo,"[2] the fractal geometry presented by the chess set is more stable and can in some ways be more closely associated with Borges' beginnings as a young writer during the scientific discoveries and modernist movements of the early 20th century. I see the use of the chess set by the Italian avant-garde author Massimo Bontempelli in his 1922 *La scacchiera davanti allo specchio* as similar to its use in some of Borges' works, in a tendency I call Fractal Realism.

Massimo Bontempelli's *La scacchiera* is widely considered the first exponent of European

Magical Realism in literature, while Jorge Luis Borges' categorization as a Magical Realist has been contentious and most scholars agree today that he is not, and cannot be, considered a Latin American Magical Realist.[3] It is useful, thus, to reconsider these authors out from under the umbrella of the fraught term, which perhaps is the very thing that has prohibited an examination of this sort to date. I argue here that that which links Bontempelli and Borges is not illustrated by any of the 20th-century definitions of magical realism, but by another sort of imagining that is, nonetheless, partially defined in Franz's Roh's 1925 treatise in which he coined the term *magischer realismus.* Namely, I see a tendency which relies on discoveries in math and science to open up, fantastic but crucially *possible,* realms. It is not 'magical' thinking, per say, but fantastic mathematical imagining.

Two correlated terms that are central to this argument are 'transfinity' and 'fractality'. 'Transfinity' refers to an aspect of 'set theory', which is a branch of mathematical logic that deals with sets. Transfinite numbers in math are larger than all finite numbers and transfinite sets allow propositions about infinite sets. The aleph numbers, which will prove important later on, are a sequence of numbers represented by the Hebrew letter, aleph, and used to represent the size of infinite sets. As I use the concept, a transfinite object in literature is similarly a finite object that represents and allows propositions about the infinite. 'Fractality' refers to the theorized, and partially glimpsed, shape of the universe, in which it is self-similar at infinite magnitudes: the atom resembles the solar system, which resembles the galaxy, and so on, theoretically continuing forever at both increasing and decreasing orders of magnitude. In this article, I will define fractal realism and set up the chess set as a 'transfinite object', or one that represents infinity within a finite space. I will then examine how Massimo Bontempelli and Jorge Luis Borges use the chess set, in a 'fractally real' way. That is, in the fictional works I have chosen, the chess set is not simply a symbol of infinity or of naturally occurring fractal forms, it has agency in the stories as a transfinite access point to infinite realms that exist within our own. The new realms in these stories have been seen by some as 'magical' but I argue that they are, rather, first opened up in mathematical and scientific terms, and introduced by these authors in figurative terms via the chess set. In a fascinating addition to the set of fiction presented, this article discusses a virtually unknown talk given by Bontempelli in 1938. In it, he

makes the same argument about the city of Buenos Aires that I will make about the use of the chess set—that it is a transfinite object that provides an access point to the infinite—suggesting in a new way the effect that landscape may have had on Borges' literary imagination.

Contextualizing Chess and Defining Fractal Realism

Chess is traced back to its earliest form, *chuturanga*, meaning 'four limbs' or 'four parts' that represent a whole, to 6th-century India. Around 1200, the rules take their modern western form in southern Europe. Around the turn of the 20th century, the chess set as an object becomes markedly important to cultural producers, appearing in fantastic and early science-fiction stories like Arrigo Boito's 1863 "L'alfier nero" and Ambrose Bierce's 1893 "Moxon's Master;" then proliferating around the years of WWI, in works of the historical avant-garde: Giorgio De Chirico's metaphysical paintings, many famously reminiscent of the chess set, with an explicit example in his 1911-12 *L'enigma dell'arrivo e del pomeriggio,* "A Game of Chess" in T.S. Eliot's 1922 modernist poem *The Waste Land,* René Clair's 1924 film *Entr'acte,* in which Man Ray and Marcel Duchamp play a game of chess in Paris, the board superimposed on the city itself. For Marcel Duchamp, using chess in art was not sufficient. In 1918, he had renounced art for chess, and left Paris for Buenos Aires, where he remained for nine months to play the game, of which he said: "The chess pieces are the block alphabet which shapes thoughts; and these thoughts, although making a visual design on the chessboard, express their beauty abstractly, like a poem." (D'Harnoncourt 130) The international chess championship followed him to Buenos Aires in 1927, where the world champion, Cuba's José Raul Capablanca, known as the Chess-Machine, lost his title to Russia's Alexandar Alekhine. This intellectual exchange between Latin America and Europe, with important competitors and competitions in the United States, is illustrative of the game's hyper-cosmopolitan nature. Yet, the game's significance is more profound than a simple global battle of the wits, a sporting allegory of men's more dramatic actions. The figure of the chess set, in literature and art, becomes not just trendy thus prevalent, but prevalent because artists sense it is swollen with meaning.

I argue that it swells precisely when it does, in part, as man intuits in it a transfinite signifier, that is, a finite symbol that—as Georg Cantor first demonstrated in the 1870s with his publications

on set theory—can be used to express and theorize about infinity, at the time that the very idea of transfinity, and, similarly, fractality in universal design were theorized. It is a new signifier of various infinites for a new century, when scientific discoveries caused changes in the way man understood his ontological state and metaphysical beyond. At the end of the 19th century Nietzsche had put the last nail in God's coffin and made room for physicists to enter the allegorical metaphysical space He had occupied, to begin in earnest investigations of an empirical beyond. In theoretical physics, the empirical sciences of the Enlightenment increasingly took on aspects of philosophy, as they moved further away from our everyday observations and towards the realm of the infinite, the unknown, the unfathomable. Theoretical physicists, like Albert Einstein, explore our grand antecedent, just as religion and philosophy do, but use a different set of symbols and different syntactic rules to arrive there. While philosophers use phrases and letters, scientists and mathematicians use equations and numbers.

In 1905, Einstein published his treatise on Special Relativity in which he postulated his famous $E=mc^2$. Explicit in this treatise is the idea that matter and energy are mutually convertible, energy equals matter equals energy, which means that the invisible equals the visible equals the invisible. This theorem holds profound implications for the status of the human soul, as it states that pure energy does not exist but is measured by the mass it is associated with and which is an innate property of it. Even more important for the purpose of this article, was Einstein's expansion of Special Relativity to his 1915 theorem on General Relativity. Time as a fourth dimension[4] was implicit in Special Relativity, and in General Relativity it becomes part of the woven experience of reality: spacetime.

In a final advancement that is pertinent here, between 1909 and 1911, nearly the same years as the first postulation of a fourth dimension, Ernest Rutherford proved the already-theorized structure of the atom. It, like the solar system, like the theorized structure of the galaxy, is built of a nucleus with orbiters. For metaphysics and ontology (as well as cosmology), this implies an infinite *mise en abyme*, not just of internal/external conceptions of space and time as experience, but concretely, as the shape of the universe itself. The theorized fractal universe problematizes certain

strains of philosophy which assume the structure of a sort of calculus-philosophy of limits, always arriving closer to the core answer, but never reaching it. However, this idea is not new to philosophy, Zeno of Elea had already broached it in the 400s BCE with his paradoxes of infinity. The development exists not in the idea of an upper limit to our knowledge of the universe, but rather, in the fact that this philosophical hypothesis finds itself sustained by discoveries in the empirical sciences.

The tendency referred to here as fractal realism marks a shift in imagination experienced by western intellectuals, the product of these and other demonstrations, significantly in the empirical sciences, of an objective invisible-real as well as a complicated new conception of scaled infinities. Fractal realism developed in (and developed) certain newly discovered spaces, some of the only uncharted geography remaining in the modern world: the spheres of reality that are empirically verified without any direct ocular observation. As stated at the beginning, fractal realism is partially elucidated in the movement that Franz Roh defined for art in his treatise: "Nach Expressionismus: Magischer Realismus: Probleme der neuesten europäischen Malerei." Yet, fractal realism refers neither to European magical realism, nor to the Latin American magical realism, *real maravilloso* or *realismo mágico,* of Auturo Uslar Pietri, Alejo Carpentier, and Gabriel García Márquez. Rather, it ingests Freud's 1900 conception of the unconscious, which opened the subjective, psychological, dream-sphere that gave man a new means of understanding his subjective experience of reality. At the same time, it is objectively tempered by the creative incorporation of the advances in the empirical sciences and mathematics mentioned above.

The term 'fractal' was first used by Benoit Mandelbrot in 1975 in his *The Fractal Geometry of Nature* to define an abstract object that can be used by mathematicians to describe and simulate naturally occurring objects, both of which exhibit similar patterns at increasingly small scales. While the term was not coined until the 1970s, I chose to use it here because fractal design in the universe was revealing itself by the early 20th century and the scaled infinities suggested by that design are at play via the chessboard in Bontempelli and Borges. Furthermore, the choice of the term 'fractal' makes an important distinction as it differentiates itself from the figurative term that is often used to

describe self-similarity in the modern world: the simulacrum. Literature that proposes 'fractal objects', importantly, proposes abstract objects that describe self-similarity *in nature*, while literature that discusses simulacra proposes abstract objects that describe *man-made* symbols and objects. While simulacra are seen as self-similar but lesser and to various degrees inauthentic, fractal object may exist at lesser magnitudes, but they are not referential imitations of a single true reality, but, rather, central and genuine in their own right.

The distinction is key, particularly in Bontempelli's *La scacchiera davanti allo specchio,* and it is indicated early on, along with other key tendencies, in Franz Roh's *magischer realismus* treatise for art. He says, for example, that in these new representations there is:

- A renewed delight in the real object
- The magic of being against the final frontier of space, of nothingness
- Painting now seems to feel the reality of the object and of space, not like copies of nature, but like another creation
- The *feeling of space* has changed … searches for a secret geometry
- It attempts to locate *infinity* in small things, the extent to which the miniature can express maximum power *all by itself* can be explained by thinking of a sight that contains the smallest units… *the spectacle of the starry sky, through which we experience infinity* [all emphasis his]
- In science the same macro/micro applies: the planetary microcosm of the atom is a mystery in the end, no less than the macrocosm of astronomy

These points do not represent Roh's entire description but those parts useful to describing fractal realism, which are worthwhile to keep in mind across these pages. The 'real object', the chess set, will bring these authors to a 'final frontier of space', particular in Bontempelli's discussion of the chess-land and Buenos Aires. This literature is 'not copies of nature,' but 'another creation', just as the distinction between the fractal object and the simulacrum. It searches for a 'secret geometry', or a new fractal geometry as suggested by the 'macro/micro' in science, that, as will be done with the chess set, 'attempts to locate infinity in small things.' Roh begins his article with this assertion: "The phases of all art can be distinguished quite simply by means of the particular *objects* [emphasis his] that artists perceive." (Roh 16) The object perceived by Bontempelli and Borges is the chess set, which distinguishes fractal realism as it opens an entry point to infinite realms within our own, as the canvas might to the infinite night sky for Roh's *magischer realismus*.

Bontempelli Steps across the Chessboard into a Figurative Fractal

In a sort of negative of Lewis Carroll's *Through the Looking Glass*,[5] Massimo Bontempelli's young protagonist in the 1922 *La scacchiera davanti allo specchio* is transported to a world beyond the mirror via interaction with an animate chess piece. While Carroll's world is full, colorful, marvelous, fascinating, and reminiscent of a nursery rhyme, Bontempelli's is a nonchalant void, without light, without time, populated by arrogant chess pieces and mannequins, and haunting images of people who have looked into the mirror in the 550 odd years since its creation. The tale begins with the narrator, a boy of eight, punished and locked in a blue room with only a dresser, mirror and chess set. Bontempelli immediately sets up the dynamic of his *mise en abyme* as the boy approaches the mirror but is too small to see himself reflected in it. He says: "Io guardavo lo specchio, lo specchio rifletteva la scacchiera." (13) The image of the White King looks away from the White King on the dresser and down on the boy, telling him to close his eyes; with the power of his will, he will be transported to the world beyond the mirror's surface.

There are no plants or animals in the land, which the White King, the boy's sort of Virgilian guide, rationalizes by saying that only beings who look at themselves in the mirror are transported. Chess pieces, he claims, are sentient beings, but humans are too arrogant and self-centered to realize it. In fact, he claims, human history is dictated by chess, that is, it resembles a chess game, and not vice versa: "i pezzi degli scacchi sono molto, molto più antichi degli uomini … Tutto quello che accade tra gli uomini, specialmente le cose più importanti che si studiano poi nella storia, non sono altro che imitazioni confuse e variazioni impasticciate di grandi partite a scacchi, giocate da noi." (35) As proof of the superiority of both the chess set and the chess-land, he points out that images last forever, as do chess pieces. They never age or change and thus time for them is unmeasured and infinite.

When the boy wanders away from his guide and the guide's court, he finds himself going up what feels like an incline but what looks like the same flat, endless, horizontal plane. At the top, he finds another sort of board inscribed in the plane, a "paesaggio di oggetti, fondato in una piazza quadrata." (46) The land is lorded over by a headless and armless mannequin, who claims that the

White King is ignorant and arrogant to claim that chess pieces are superior to other objects. He claims that mirrors are made to receive and eternalize the images of objects and that, as everyone knows, they happen to reflect the images of men and women as well, but that it is an unimportant side effect of their existence. As far as the mannequin is concerned, chess pieces are part man and part object, making them lesser than pure objects. The mannequin himself is lord of the objects, he explains, because he is the object *par excellence,* on which men and women are constantly trying to model themselves so as to seem mannequins themselves. The boy finds the White King and mannequin's self-aggrandizing assertions absurd, until at the end of the novella a group of chess-land inhabitants launch an attack against him, throwing chess pieces at him, until the sound of thunder (another mirror breaking and its dimension being destroyed) disperses the attackers. The boy is terrified by the objects and images when he realizes he has little power in their realm. In order to return to his quotidian reality, he decides he must hold on tight to the White King, again the transportation piece between realms. In the meantime, he falls asleep, waking to the door of the blue room opening.

This tale can superficially be read as an analysis of the existential uncertainty about man's place in the universe that is exacerbated by the increasingly objectified and objectifying reality of the 20th century, and further still by WWI. If it had not been for the shattering dimension, one presumes the boy would have been overcome and defeated by images and objects, which is a sensation that increasingly worried cultural scholars as the 20th century progressed. Man becomes lost, overshadowed, and even controlled by the images and objects that surround and assault him. A defining event indicative of the change in relationship between man and man-made object comes with the horrific events of WWI, which saw the devastating effects of chemical warfare, strategic aviation bombers, machine guns, and modern artillery, leading to an unprecedented number of casualties. The human intellect was supposed to deliver utopia, but in the wake of WWI, it was clear that man's own innovations could easily destroy him. Bontempelli's tale might be read as a critique of this proliferation of images and objects, but for a few crucial points made explicit in the tale and in Bontempelli's other writing.

Firstly, the narrator points out at the beginning that it is a specifically prewar story. He is recounting the memory as an adult and remarks: "Ne risulterà che l'età di otto anni l'avevo parecchi anni prima che scoppiasse la guerra europea. E questo è quanto basta. Di qualunque fatto si parli l'importante è sapere se avvenne prima della guerra, oppure dopo. Il più o il meno non conta." (10) These events happen, thus, 'many years before the war', and indeed, nothing in the story is particularly modern, the mirror is made over a half millennium prior, by a Venetian glassmaker whose image the boy meets in the chess-land. The wooden chess set itself could be just as old. Bontempelli, furthermore, was a passionate *interventista,* desirous of Italian intervention in the war, and when Mussolini marched on Rome, the very year *La scacchiera* was published, Bontempelli was in support of the takeover, which Mussolini promoted on the platform of the modernization, industrialization, and mechanization of Italy.[6] Finally, Bontempelli is not a critic in later years of either scientific advances that hedge in on nature's power over man, nor of the idea of man as creator. In a compilation of aphorisms, *Il bianco e il nero,* written in the last decade of his life, Bontempelli writes: "La preghiera è una rinunzia a se stessi … Verrà il giorno della religione dell'uomo, quando si scoprirà creatore dell'universo dal nulla, dico dell'universo anche fisico. E pregherà a se stesso." (133) Thus to read the chess-land as a critique of modernity or man's self-conception as an increasingly dominant force on Earth appears oversimplified.

If, then, it is not a reproach of the man-made aspect the world was acquiring across the 1900s, what can we make of Bontempelli's image-object landscape, bereft of stars, animals, and geographical variation, a world so apparently paltry in comparison to our own? If it is explicitly not a critique of the events of WWI, what can we make of the fact that the boy had no power to stop the chess-land inhabitants from destroying him, though they seem to inhabit a lesser dimension, 2D within our 3D reality?[7] Interpretation of the text becomes instantly less thorny, when one's perspective changes from that of a critique of simulacra, to an investigation of the fractal nature of reality through figurative language. As seen from a fractal perspective, the image-men, chess pieces, and mannequins in the chess-land are not abstract representations of copies of the 'true' realm, but, they are, rather, abstract representations of the form of nature itself. The lack of vibrant splendor and the Earth's variation, can,

from this point of view, be reconceived of. It is not the wasteland of an image-object landscape, or no man's land of WWI trench warfare, it is a highly abstract figurative realm, made to simulate the mathematical, in which only the repeating fractal forms exist. Indeed, it is much more a plane than a plain. That this land is more organically read as natural and fractal, than as a land of simulacra, can be illustrated by a closer look at a few crucial points.

To begin with, the land beyond the mirror is accessed at two levels, firstly in the unconscious dream-state, as the boy must close his eyes to both enter and exit the land, and secondly, via the chess piece. Bontempelli, in the moment he accesses the chess-land, does not set up a traditional *mise en abyme.* Rather, the boy cannot see himself in the mirror and sees, instead, the White King reflected. Then the image of the White King turns to look back at him, creating a triangulation in which the boy looks at himself and sees the image of the chess piece actively looking back. This reflection is not a mere image-copy, nor is it even a reflection, it is a window into a figurative fractal. In a structure that is analogous to that of the Droste effect, the boy is framed in the room, the boy's image is framed in the mirror, the White King is framed within the mirror in the chessboard, the mannequin is framed within the chess-land in a smaller square plane. While the boy may view the beings beyond the mirror as lesser than himself, they, crucially, disagree. The White King argues that chess pieces are the truest form, while the mannequin, who seems removed once more by an order of magnitude, as he is circumscribed by a squared plane within the squared plane of the chess landscape, equally sees his own form as the most authentic. Their self-conception as central to universal design is conceived of by the boy, and by the reader, as ridiculous, until the mirror inhabitants prove themselves ultimately more powerful than the boy. At that point, the realm begins to carry within it implications of existing as an equal or somehow higher dimension, problematizing man's place as he sees himself situated in *the* unique realm to be once removed from the supreme realm of the godhead.

In fact, the chess-land suggests a complicated hierarchy of realms. Just as man is at the center of his universe, the White King is at the center of his own universe, and the mannequin at the center of his, introducing a multi-directionality in which all fractal realms are at the point closest to the Godhead, or ultimate realm. These beings' self-conception as central is, indeed, reminiscent of the

shape of the infinite universe, in which all points are said to exist at the center, and of a potentially fractal universe, which is self-similar at each order of magnitude, and which, extending infinitely, can have no objective center. This complication of the power structure of existence and this questioning of man's view of omnipotence descending down to him from an infinite outer space, is an element at play in Borges as well. For example, in his "Ajedrez" sonnets, which imagine a man playing the 'infinite' game of chess and a higher being playing man, Nancy Mandlove points out "a search for forms, for forms which reveal a superior order, the order of the universe itself." (175) However, in Bontempelli's story and in Borges' "El milagro secreto", the chess set does more than symbolize fractal design as in Borges' "Ajedrez" sonnets. The chess set in *La scacchiera* is an active agent, it is the transfinite object, able to hold the concept of infinity in a finite space, and thus able to transport the storyteller across it, from the finite to the infinite. This idea of a transfinite space can be more clearly illustrated by a talk that Bontempelli gave 16 years after publishing *La scacchiera,* in which he describes Jorge Luis Borges' native Buenos Aires as a sort of chessboard that opens an access point to the infinite realm of the Pampas.

Buenos Aires as a Transfinite Chessboard

On October 12, 1938, Bontempelli spoke at a conference in Rome on the life and culture of Argentina that was part of "El acto inaugural de la exposición del libro argentino" at the Italian Center for American Studies. His talk was titled, in its Spanish translation, "La pampa y la cuadra," and in it he strikingly parallels imagery of Argentina, which he had recently visited, with imagery of the chess-land in *La scacchiera.* Viewed on its own, Bontempelli's "La pampa" could be seen as an essay that recycles language and imagery from the author's own novella. However, between 1922 when Bontempelli describes the chess-land and 1938 when he describes the Pampas, there are other similar descriptions of the Pampas—by such authors as Jules Supervielle, the young Borges, José Ortega y Gasset, Archibald MacLeish[8]—which demonstrate a coincidence of description that straddles country, language, ocean, and genre. Essential to these depictions is a reliance on mathematical, rather than figurative terms, and a sense that the Pampas are infinite in space and

uncounted by time. Bontempelli adds Buenos Aires to his conception of the Pampas, making of it a space like that of the chessboard in *La scacchiera,* a finite access point to the infinite.

"La impresion que se recibe," he says of the Pampas, is "de haber llegado a una parte de la corteza terrestre donde el protagonista ya no es más el tiempo ne la historia, sino el espacio." ("La pampa" 18) His description of the chess-land, in *La scacchiera* was that of a place where "non c'è che spazio." (22) They are both timeless and infinite:

> "La pampa, cuanto más se recorre más grande resulta. Caminas y caminas, de aquí para allá, utilizando cualquier medio, hasta el automovil, y te parecerá estar siempre en el centro del espacio. Tal cual, como uno siempre está siempre [sic] en el centro del espacio. Porque, en efecto, la pampa es infinita, como el espacio, y está destinada al Juicio Universal de una humanidad en la cual el tiempo terminará solamente con el final de la Eternidad." ("La pampa" 19)

Of the land beyond the mirror the narrator recounts:

> "Correvo senza sapere dove … a un certo punto mi fermai. Tutto intorno a me era identico al luogo donde m'ero mosso. La pianura si stendeva infinitamente uguale. Mi rimisi a correre, poi mi fermai di nuovo. Due o tre volte a quel modo fin che mi sentii spossato. L'orizzonte era sempre altrettanto lontano da me, nulla di nuovo mi appariva intorno." (*La scacchiera* 69)

The White King explains the land to the boy saying: "A ogni specchio corrisponde uno spazio infinito … e mentre [una persona] un giorno o altro muore e il suo corpo, fino al giorno del Giudizio Universale, scompare, invece nello spazio dietro lo specchio la sua immagine dura." (24)

The Pampas, furthermore, "siendo infinita, nada tiene de primordial o de salvaje;" much like the chess-land, "es abstracta, metafisica, e quíza apolinea. La pampa probablemente está de puro espíritu. Yo no me maravillaría si un matemático escribiese un tratado para demostrar que la pampa es la cuarta dimensión." He goes on to explain that Buenos Aires, like the chessboard, is made up of perfect squares: "está construída no por casas sino por CUADRAS [emphasis his]," and "repitiendo hasta el infinito las cuadras, se forma una ciudad, sin los límites necesarios impuestos por la geografía. Todas estas cuadras son iguales." (21) The chessboard, overlaid on Buenos Aires acts as a finite entry point to the infinite that exists behind or beyond it. Buenos Aires achieves infinity because it is made of perfect squares, which Bontempelli claims will eventually serve as our entry point to the Pampas as the fourth and ultimate dimension. He describes the Pampas as being a tangential, perfectly-flat

plane (19) that meets the curved sphere of the Earth at none other than the chessboard of Buenos Aires, which is a piece of the Pampas, translated into a city:[9] "Os he dicho que la pampa está pronta para el gran Tribunal del Juicio Universal," a supplement to the "pequeño Valle de Josafat." (18) He says, "Pues bien, cuando se celebre el Juicio Universal, la ciudad - cuadras multiplicadas por cuadras - servirá probablemente como lugar de espera para las almas que deberán pasar a la pampa."[10] (22) In his statement that Buenos Aires is a piece of the infinite translated into a city, and in another claim that "como todas las cosas infinitas - el Tiempo, El Espacio - cada punto de la pampa es igual a los otros puntos, y a la pampa toda," (19) he invokes the complex idea of *transfinity*. This mathematical concept is present in Borges, most explicitly in his "El aleph," which utilizes its creator, Georg Cantor's, character for transfinite numbers, the aleph, as its titular symbol. It is implicitly present, as we will see, in other of his texts, including some descriptions of Buenos Aires.

The young Borges' Buenos Aires, indeed, evokes the same squareness and flatness of the city, a transfinite piece of the pampas, copied from it and containing its infinity. In his 1925 "Buenos Aires," it is "un trasunto de la planicie que la ciñe, cuya derechura rendida tiene contuación en la rectitud de calles y casas. Las líneas horizontales vencen las verticales. … Atraviesan cada encrucijada cuatro infinitos." (80-1) While in "Fundación mítica de Buenos Aires," the city is born in the Palermo neighborhood, with the spontaneous creation of "una manzana entera pero en mitá del campo / expuesta a las auroras y lluvias y suestadas / La manzana pareja que persiste en mi barrio … Sólo faltó una cosa: la vereda de enfrente." (87) The mature Borges takes this conception of the timeless square, which represents and includes the entire, infinite city and its history, and which is born out of a piece of the Pampas, and abstracts it once more. In his 1952 "La biblioteca de Babel,"[11] Borges turns the *cuadra* where he was born into a *hexagon* where he was born,[12] the city into the entire universe,[13] and our single consistent history into all possible histories. Like Bontempelli's Buenos Aires, "repitiendo hasta el infinito," Borges' library "es ilimitada y periódica. Si un eterno viajero la atravesara en cualquier dirección, comprobaría al cabo de los siglos que los mismos volúmenes se repiten en el mismo desorden (que, repetido, sería un orden: el Orden)." (462) A map of the Buenos Aires city center, as is spreads out from the Casa Rosada, reveals that it is quite literally a square-blocked

metropolis, more so even than Manhattan's seemingly perfect rectangular grid. Perhaps these repeating squares and their proximity to the Pampas, which to Bontempelli immediately evoke the chessboard as an ordered access point to the infinite, also informed Borges' literary imagination as across his career he worked and reworked ideas about the city, chess, uniform repetition, and infinity.

Time as the 4th Dimension in Borges

Chess is prevalent throughout Borges' writing, but, while always applied with purpose, it does not always have agency, as an element that opens an unseen dimension in the narration. In the poem "Los justos," for example, the chess player is one of the unrecognized saviors of the world, and in "El jardín de senderos que se bifurcan," chess, *ajedrez*, is the unspeakable answer to the ultimate riddle. This study is confined to one short story, "El milagro secreto"—in which the chess set is not just a symbol or metaphor but an active portal—with limited but illustrative references to "El aleph," his "Prefaces" to *El oro de los tigres* and *El otro, el mismo,* and "Tlön, Uqbar, Orbis Tertius." This set of writings throws into sharp relief Borges' use of the chess set in a highly complex and disorienting fashion as the entry point to invisible but possible realities within our own. Unlike Bontempelli's story, Borges' protagonists do not simply step into other realms. Rather, the fractal realism of Borges comes when a seemingly subordinate dimension somehow acts upon the frame world, creating a labyrinthine narrative path, similar to the paths Floyd Merrell cites as non-linear and 'hypertextual' in his reading of "El jardín de senderos que se bifurcan." (57) Merrell says the paths reveal their postmodernity as they fork infinitely and thus lead to infinite conclusions or interpretations. Unlike the garden's paths, however, the paths in "El milagro secreto" are not fully fledged postmodern and one may still use the author's historical and philosophical references to navigate them.

"El milagro secreto" was published in 1944, but like Bontempelli, Borges chooses to tell a pre-war (if barely) story. One of the last pre-war events before WWII's official eruption in September of 1939 was Slovakia's proclamation of independence on 14 March 1939 and the remainder of Czech lands accepting German occupation the following day. On 15 March 1939, Hitler marched to Prague Castle and declared the region annexed to the Nazi regime. Borges' story begins the night before the march, with a dream: "La noche de catorce de Marzo de 1939, en un departamento de la Zeltnergasse

de Praga, Jaromir Hladík, autor de la inconclusa tragedia *Los enemigos,* de una *Vindicación de la eternidad* … soñó con un largo ajedrez." (545) The game he dreamed had been played for centuries in a secret tower, not by two individuals but by two families, for a prize that had been forgotten but that was said to be "enorme y quizás infinito." In his dream, Jaromir cannot remember the game's rules or pieces. So he runs desperately across a rainy desert as the clock continues to strike the hour of his move.[14] Chess here could be said to refigure the tense political maneuvers that were going on in Eastern Europe in an attempt to avoid war. But, when in a second dream the sleeping world acts upon the waking world, the spheres of influence and reality are jumbled, and it becomes clear that the dream-space is not simply a space for unconscious refigurings of waking life. Four days after the march on Prague, authorities arrest Jaromir because he is Jewish and because of his literary translations and productions; they sentence him to death by firing squad. Among other Jewish literature, he was known for having translated the *Sefer Yetzirah (The Book of Creation*), which is considered one of the first works of Jewish esotericism as well as a treatise on mathematics and linguistic theory. As mentioned above, historical references can act as guides in Borges and the *Sefer Yetzirah* does just this, correlating the chess set in the first dream and the symbol/letter/Godhead to come in the second dream.

The *Sefer Yetzirah,* while differing in many ways from Kabbalah, is the first known rendition of the system described by the latter. The *Sefer* states that the physical as well as the moral world is made up of a series of warring contrasts that are equalized by God, the overarching unity. It describes how the universe was created by God through 32 wondrous ways of wisdom: the ten numbers and 22 letters of the Hebrew alphabet. Thirty-two is the number of human teeth, as pointed out by Bontempelli's narrator in *La scacchiera*,[15] it is also the total number of chess pieces and white and black chessboard squares. Furthermore, the black and white of chess exhibit the dialectical allotment of turns, the contrasting universal powers enunciated in the *Sefer,* all of which lends to chess, considered through the lens of the *Sefer,* a certain ancient spirituality and inherent gravity. Of the 22 letters of creation, there are three mother letters, and supreme among them is the *aleph,* (א in Hebrew, 𐤀 in Phoenician, from which the Latin A is derived). In his short story "El aleph," Borges

describes the aleph in Kabbalist terms:

> "Para la Cábala esa letra significa el En Soph, la ilimitada y pura divinidad; también se dijo que tiene la forma de un hombre que señala el cielo y la tierra, para indicar que el mundo inferior es el espejo y es el mapa del superior; para la *Mengenlehre*,[16] es el símbolo de los números transfinitos, en los que el todo no es mayor que alguna de las partes." (169)

The aleph numbers Borges mentions are the symbols that represent transfinity, the transfinite numbers, of Cantor's set theory. Borges uses the chess piece in "El milagro secreto" as a figurative stand-in the first dream for the aleph in the second dream, intuiting its capacity like the aleph to hold a sense of the infinite, just as Bontempelli did before.

This intuition is elucidated to a certain degree by the mathematician Claude Shannon's 1950 study of the number of possible chess games. In an attempt to write a logarithm for computer chess games, Shannon famously calculated the game-tree complexity of chess (or the number of positions one would have to evaluate in order to determine the initial position) at 10^{120}, which corresponds to more atoms than there are in the seeable universe, which are estimated at 10^{81}. Furthermore, working from the endgame of any given game, according to set-theory practices of backwards induction, Shannon states that "a machine operating at the rate of one variation per micro-second would require over 10^{90} years to calculate the first move!" (260) So, just as the aleph can represent infinity in math, so can a chess game evoke infinity in the human imagination: less fathomable, indeed, than the cosmos itself. As Borges says, the aleph symbol points up and down, signaling that which is above and below, that which is more and less, it is a connector symbol, between the infinite and the finite, the fathomable and unfathomable. Chess, similarly, points up and down, to man as Godhead and, conversely, to man as a pawn.

In "El milagro secreto," the dream of the chessboard is reminiscent of the powerless feeling of WWII for many Europeans, but it replays, as well, symbolisms seen in other subtexts of the story, hinting at a more complex significance. Jaromir, the night before his execution, prays to God for more time, time enough to finish his play, *Los enemigos*. It is a tragicomedy of errors, itself like a chess game, the entirety of which plays out in an enclosed space, the protagonist's library, where a group of secret enemies silently plot against the protagonist. He evades and outwits them, finally is forced to kill one,

until the plot unravels and the protagonist himself is revealed to simply be a raving lunatic repeating the same scenario endlessly in a timeless existence. Like the clock that strikes the same hour in Jaromir's chess dream, the clock is continually striking 7:00pm in the play. Like the chess game, in which Jaromir does not remember the rules or pieces, the game of life played by his protagonist is enacted without any memory of how to play, for in fact, he is revealed as mad, having forgotten the rules and pieces of life. The halted time in both subtexts is a motif that continues across the story, climaxing in the secret miracle.

The second dream of the short story occurs subsequently to Jaromir's prayer for a postponement of his death. In it Jaromir is in a library, where he is looking for God. The librarian tells him that God can, in fact, be found in one letter of one page of one of the 400,000 library volumes, but that it is a useless search. Just then, a patron comes in to return an atlas. Jaromir picks it up, opens to a map of India and, with a sense of assuredness, "tocó una de las mínimas letras." (548) In that letter, he finds God, who tells him that the time of his work has been granted. In this moment, Borges opens the fractal portal in the story; for within a tiny letter,[17] in a map, in a library, in a dream, Jaromir accesses God, who grants him time in the reality of the frame story. The chess figure is the first entry point into the frame text, and the aleph (as the supreme and therefore representative letter) the second entry point, into a near-timeless dimension within the frame text.

The chess players are explicitly playing for an infinite prize, while the tiny symbol in the atlas, found on a map of India, birthplace of chess (maybe an accidental association by Borges, but, then, nothing in Borges ever seems accidental and his poem "Ajedrez" he proves knowledge of its origin: "En el Oriente se encendió esta guerra" (191, l. 12)), is a more subtle infinity, the infinite Godhead. But what is this omnipotent force in Borges? What exactly does the symbol in the map represent? The time of Jaromir's labor is granted, but it does not change objective knowledge or history; he is still introduced in the first lines of the story as the author of the *incomplete* play, *Los enemigos*; the time granted is subjective time, experienced by the protagonist alone. The event is not a typical religious miracle, it is not even a guaranteed event, for Borges' Jaromir gives three explanations for the event: "Pensó *estoy en el infierno, estoy muerto.* Pensó *estoy loco.* Pensó *el tiempo se ha detenido.*" (549) Borges is

purposefully enigmatic, perhaps because his secret miracle is not a truth, but a possible truth, an imagining of time as changed. By suggesting various explanations, he gives his reader alternatively possible propositions and thus more assiduously and objectively describes the phenomenon. The explanation Borges chooses, however, is that of the existence of relative time, which Einstein had proven some decades before.

Einstein's definition of relative time describes time as the fourth dimension and an integral part of the fabric of the universe, spacetime. The mention of Charles Howard Hinton[18] in "El milagro secreto" is an allusion to the fourth dimension, while Borges deals explicitly with it in his "La cuarta dimensión," where he says "Queda un hecho innegable. Rehusar la cuarta dimensión es limitar el mundo; afirmarla es enriquecerlo." (97) Hinton anticipated Einstein's Theory of Relativity and, furthermore, anticipated the concept of spacetime itself, and the world lines that populate it. Spacetime is often conceived of as a white graph of equally-sized squares on a black field. A world line is the unique, sequential path in time and space drawn by any body's progress during a lifetime, be it a world or a man. This flat-plane rendering of spacetime evokes the image of abstract bodies tracing lines across a black and white squared field, but world lines, because they move through time as well as space, are in movement even when physically still, and this time-movement is charted vertically. The Earth's orbit never returns to the same place, for example, but rather marks a sort of ascending loop. The common, chessboard-like rendering of spacetime and world lines moving along a plane is actually the portrayal of what is known as a 'world sheet,' or spacetime's analogous two-dimensional surface. This simplified presentation allows a part to represent the whole, and thus enables an intuitive conception of a highly complex idea.

The theory of relativity uses world lines to recalculate the positions of apparently straight paths in space in order to reveal their four-dimensional curves. It predicts and ultimately proves that the speed of an object in space slows its progression through time. Theoretically, if an object moves at near the speed of light, it could experience a moment as the length of a year, as if its world line had completed one year's spatial orbit but returned in such a minimally ascended helical increment that it virtually overlays the previous spiral. In the light of this scientific discovery, Borges' secret miracle can

be seen as the miracle of a mind that has accelerated to the point of virtually stopping time relative to the speed of light. Jaromir does not move, nothing moves, yet his world line continues to ascend, if barely: "Minucioso, inmóvil, secreto, urdió en el tiempo su alto laberinto invisible." (550) Graphs are most often used to chart world lines, but one may also use a sort of log, that is, chart a world line with words. It requires only that each event, or position, is accompanied by a time measurement. "El milagro secreto," begins and ends with such tags: Dawn of 15 March 1939, on the Zelternergasse in Prague and 9:02am on 29 March 1939, in the courtyard of the barracks on the opposite side of the Moldau.

While Borges allows the space for the reader to define the Godhead touched in his dream of the Clementine Library—seeming to define it himself as an actual occurrence accorded by the new laws of physics—the most relevant fact for the story is another: that somehow the events of a dream affect the events of Borges' frame reality, that a man-made symbol in a dream furnishes contact with God, that the finite is representative of the infinite. With this unlikely event, Borges introduces a realm within a realm, which like Bontempelli's, is rendered infinite by its relationship to time, rather than space. He, furthermore, introduces a confusion of hierarchies as was found in Bontempelli. He confuses them even further, however, by making the sub and frame texts mutually reminiscent and referential. Which reality is truest then? The dream reality where God is found, the literary reality that Jaromir lives and fights for, or the absurd reality of WWII in the frame story? Perhaps Borges means for us to see them as all equally true, in as far as they are all—even the frame text—two-dimensional, partial renderings, black and white like chess: words on pages.

Chess Sets and Set Theory: Structures for Reconsidering Infinity

As Borges struggles with concepts of infinity, he is not simply dealing with propositions about time and space, but with propositions about language itself: words on pages. Like the chessboard is superimposed on Buenos Aires in Bontempelli's imagination, so it is superimposed on poetry in Borges'; in both cases, the superimposition seems to communicate the infinite. In his prologue to *El otro, el mismo,* Borges concludes: "Ajedrez misterioso la poesía, cuyo tablero y cuyas piezas cambian como en sueño y sobre el cual me inclinaré después de haber muerto," (148) an overlaying of two

games with a specificity of rules and positions: chess and poetry. Then in his prologue to *El oro de los tigres*, he states: "Mi lector notará en algunas páginas la preocupación filosófica. Fue mía desde niño, cuando mi padre me reveló, con ayuda del tablero del ajedrez (que era, lo recuerdo, de cedro) la carrera de Aquiles y la tortuga," (304) a representation of a paradox of infinity via chess. As recounted by Aristotle, Zeno of Elea's paradox of Achilles and the Tortoise is this: "In a race, the quickest runner can never overtake the slowest, since the pursuer must first reach the point whence the pursued started, so that the slower must always hold a lead." (VI: 9, 239 b15) This very paradox held immense implications for Bernard Bolzano, the mathematician and philosopher who coined the term 'set' of set theory and did great work on infinity paradoxes.

In his *Paradoxes of the Infinite,* published in 1851, Bolzano reworked Aristotle's theory, which had held for 2000 years that there is no actual infinite, but only a potential infinite, in so far as one cannot conceive of an infinity of natural numbers but one can conceive of any given, finite set of natural numbers having a set that is greater than it. Bolzano was the first mathematician to deal explicitly with infinity as actual, as a mathematical object. He determined that 'sets' are abstracted aggregates, which allow for the discussion of infinity via actual infinite sets that can be defined by finite sets. Unlike Aristotle, Bolzano's definition of an infinite set, through extrapolation from a finite set, does not negate the existence of infinity, but, rather, founds it. In this set theory was born, to be followed by the transfinite numbers which were later coined by Georg Cantor and introduced in the aleph number.

"Tlön, Uqbar, Orbis Tertius," one of Borges' most well-known stories, leans on Bolzano's advances in math and science in both its conception and its final determination, and it is, in fact, another example of chess as a fractally real agent in Borges.[19] There was not enough space in this article to discuss two of Borges' stories in depth, and I chose "El milagro secreto" over "Tlön, Uqbar" as it has some interesting affinities with Bontempelli's story: its initiation via dream, its relationship with 20th-century European wars, and the design of the realm accessed via chess, which in *La scacchiera* and "El milagro secreto" both appear inherent to natural design, while in "Tlön, Uqbar," the world is conceived of by men. However, it is worth mentioning "Tlön, Uqbar" here, firstly, because it

demonstrates a trend in Borges' use of the chess set and, secondly, because it connects that trend directly back to set theory and transfinity. Bolzano's influence in the story can be traced, once again, through Borges' historical and philosophical references. While he is never mentioned, there is a negative mention of George Berkeley and his Subjective Idealism or Immaterialism, which opposed Bolzano's arguments in the field of logic, and a positive mention of Georg Cantor, a follower of Bolzano.

Just as Bolzano and Cantor, via set theory and the transfinite numbers, gave mathematicians the structure in which to theorize about an actual infinite, so the chess set seems to give authors the structure in which to imagine it in figurative language. Chess is a finite board and ruled game that, nonetheless, as these authors as well as the mathematician Claude Shannon demonstrate, contains a sense of boundlessness. It invokes an image of man as creator and at the same time of man as pawn; of man occupying a relative point on a fractal continuum. It is an ideal figurative transfinite symbol and it is recognized as such by Bontempelli and Borges, who utilize it not to imagine magical realms, but to bring into figurative form some of the fantastic theories about infinity already suggested in mathematical and scientific languages.

[1] For example: "Scaling features, self-similarities, and fractal topologies are the backbone of Borges writing, particularly in "The Garden of the Forking Paths." (Schrieber and Umansky, 77)

[2] Floyd Merrell affords us another look at the fractal structure of "El jardín de senderos que se bifurcan," pointing out that it has been argued that Borges hit upon the Many Worlds interpretation of quantum mechanics before science did and likening his literary structure to that of Calvino in "Il conte di Montecristo." He argues that both are fractal structures that work to open the stories up to infinite possible paths-as-interpretations. Merrell's discussion deals with labyrinths and mirrors, not chess sets, while Lázló Scholz deals specifically with the chess set in Borges and Calvino, but does not mention a fractal dimension. Scholz states: "La metafora del ajedrez según al trata Borges no sólo niega las latentes posibilidades jerárquicas che colocaron al Hombre o al Dios al punto más alto, sino concientiza que el universo es un sistema de elementos igualmente insignificantes." (124) And thus he deals with chess as metaphor in Borges two "Ajedrez" sonnets, much as Martin Johnston does in "Games with Infinity" (191) and Nancy Mandlove does in her chapter on those poems cited below.

[3] Borges, for example, was cited by Ángel Flores in his 1955 "Magical Realism in Spanish American Fiction" as the first magical realist of those whose writing is "bound for an infinite, timeless perspective." However, scholars today, like Mariano Siskind, argue that Flores' definition of magical realism, devoid as it is "of the specific historical context and cultural" makes of magical realism "an empty signifier that fits practically every single text that manifested a critique about the stability of the referential world and the possibility to access it in a transparent and direct manner." (849) Siskind, rather, couples magical realism and post-colonialism, together with most Latin American scholars today, to define it as "an aesthetic that belongs organically to non-Western, or rather marginal, cultures." (834) In this definition, Jorge Luis Borges does not fit within the paradigm created by the likes of Auturo Uslar Pietri, Alejo Carpentier, and Gabriel García Márquez. My definition of Fractal Realism, as I will show, allows Bontempelli and Borges to escape the 'empty signification' of non-historical magical realism by defining these works as imagined within and inextricably tied to *the scientific discoveries of the early 20th century.*

[4] First posited by Henri Poincaré in 1905.

[5] Carroll's *Through the Looking Glass* is not dealt with here but has been in scholarship on Borges, primarily, his 1940 "The Circular Ruins," which evokes Carroll's imagery and includes a quote from the tale in its epigraph. See, for example, Irwin (443) and Soud (747).

[6] He supports Fascism, at least to some extent, until at least 1938 when Mussolini introduces the racial laws against Jews.

[7] Bontempelli states in his *Il bianco e il nero:* "Considerando che l'ombra è lo stato bidimensionale d'un corpo, che noi conosciamo a tre dimensioni - c'è da sospettare che … siamo le ombre di creature (e di un loro mondo) tetradimensionali. E … che le ombre da noi prodotte hanno anch'esse una vita propria … a due dimensioni." (117)

[8] v. Jules Supervielle's 1923 *L'homme de la pampa*, poetry and prose by the young Borges (c1929), José Ortega y Gasset's 1929 "La pampa … Promesas, and Archibald MacLeish's 1938 "The Argentina of the Plate: The Argentina of the Pampas".

[9] "Buenos Aires es verdaderamente un tronzo de Pampa traducido en ciudad." (21)

[10] Similarly, Borges in "La muerte y la brújula," published four years later, turns Buenos Aires into a Valley of Josaphat, as the detective, Erik Lönnrot, chases the *cuatro letras del Nombre* that describe a rhombus around the city. The Valley of Josaphat (meaning 'YHVH judges') is the biblical site of the Last Judgment and the *Nombre* circumscribing Buenos Aires at the end of "La muerte y la brújula" is the Tetragrammaton, YHVH. Valley of Josaphat, an access point at the edge of town to the Tetragrammaton, cum Aleph, cum Pampas, cum infinity of space and knowledge, which Lönnrot experiences first superficially, fractally, with the reader, when he arrives to the site of the final letter and "infinitamente se multiplicó en espejos opuestos" in a "casa [que] le pareció infinita y creciente." Then fully, without the reader, as Red Scharlach performs his final judgment in "el punto que determina un rombo perfecto, el punto que prefija el lugar donde una exacta muerte lo espera." (502, 505)

[11] Sarmiento refers to Buenos Aires as the "Babilonia americana" in *Facundo: Civilización y Barbarie.* (27)

[12] The narrator is old in the story and treats these hexagons as Borges earlier treated the *manzanas* of Palermo: "me preparo a morir a unas pocas leguas del hexágono en que nací." (456)

[13] The space is introduced as the universe, which can be translated in some languages as 'library': "El universo, (que otros llaman la Biblioteca) se compone de un número indefinido, y tal vez infinito, de galerías hexagonales." (455)

[14] Svend Østergaard, in his treatise on the use of mathematical objects in literature, makes this fascinating statement about the introduction of time to chess play in modernity: "Normally chess is regarded as a metaphysical image for a nonpoliticizible feudal social order. Conversely, one might say that chess plus time is an image of a thoroughly politicized modern social order." (116) While he deals with chess, infinity, and Borges in parts of the book, he surprisingly never deals with them together.

[15] "C'era una scacchiera con su tutti i suoi pezzi, i bianchi e i neri, disposti nelle relative caselle: trentadue pezzi, perché, per chi non lo sapesse, i pezzi degli scacchi sono trentadue, come i denti dell'uomo." (11)

[16] The German term for 'set theory'.

[17] We can reasonably presume that the tiny letter is the aleph or its equivalent, as it is the word used to define the ineffable core, the limitless, infinite existing in one point without overlapping, in Borges' short story, "El aleph." In truth, however, any symbol can represent the transfinite symbol, the aleph being only the agreed upon symbol for representation in mathematic problems.

[18] Hinton was also the inventor of the tesseract, or hypercube, which is a four-dimensional cube, or n-dimensional analog of a square that has eight cubic surfaces instead of the three-dimensional cube's six plane surfaces. It is an elegant shape for mysticism of the *Sefer,* as it is a single shape made up 32 edges, as the God created the world through 32 wondrous ways.

[19] The invisible realm opened within the frame world is one imagined by men in the story, created by the "rigor de ajedrecistas, no de ángeles," and as Borges-narrator states, "el contacto y el hábito de Tlön han desintegrado este mundo. Encantada por su rigor." (15)