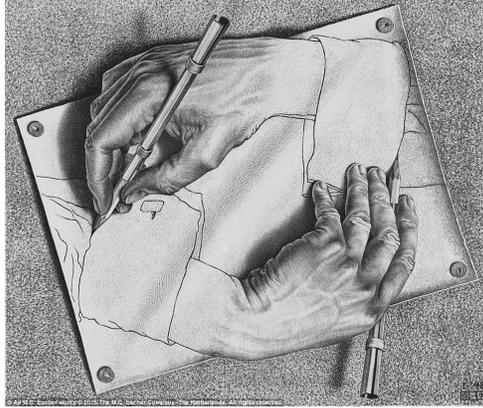


# Math and Literature

15 November 2019

Jim Stevenson



Drawing Hands, 1948, by MC Escher

For a number of years I have collected excerpts that portray mathematical ideas in a literary or philosophical setting. I had occasion to read a few of these on the last day of some math classes I was teaching, since there was no point in introducing a new subject before the final exam.

I thought it might be interesting to present some of these excerpts now. They roughly fall into three categories: logic, infinities (Zeno's Paradoxes, infinite regress), and permutations.

## Logic

One of the richest sources for examples of logic in a fictional setting is the writing of Lewis Carroll (Charles Dodgson), and in particular his second Alice story, *Through the Looking-Glass and What Alice Found There* (1871) ([1]), in which Alice now moves through the tale as a piece on a chessboard. A helpful companion to the story is Martin Gardner's *Annotated Alice* (1960) ([2]) and its later revisions. It is difficult to make just one selection, but one of the exchanges between Alice and the White Knight is particularly memorable ([1] Chapter VIII, pp.174-5):

### “It's My Own Invention”

‘You are sad,’ the Knight said in an anxious tone: ‘let me sing you a song to comfort you.’

‘Is it very long?’ Alice asked, for she had heard a good deal of poetry that day.

‘It's long,’ said the Knight, ‘but very, *very* beautiful. Everybody that hears me sing it—either it brings the *tears* into their eyes, or else—’

‘Or else what?’ said Alice, for the Knight had made a sudden pause.

‘Or else it doesn't, you know. The name of the song is called “*Haddocks' Eyes*.”’

‘Oh, that's the name of the song, is it?’ Alice said, trying to feel interested.

‘No, you don't understand,’ the Knight said, looking a little vexed. ‘That's what the name is *called*. The name really is “*The Aged Aged Man*.”’

‘Then I ought to have said “That's what the *song* is called”?’ Alice corrected herself.

‘No, you oughtn't: that's quite another thing! The *song* is called “*Ways and Means*”: but that's only what it's *called*, you know!’

‘Well, what *is* the song, then?’ said Alice, who was by this time completely bewildered.

‘I was coming to that,’ the Knight said. ‘The song really is “*A-sitting On A Gate*”: and the tune's my own invention.’



Some of the unraveling of this seeming nonsense is provided by Martin Gardner in an annotation in his 1960 book *Annotated Alice* ([2] p.306n):

8. To a student of logic and semantics all this is perfectly sensible. The song *is* ‘A-Sitting on a Gate’; it is *called* “Ways and Means”; the *name* of the song is “The Aged Aged Man”; and the name is *called* “Haddocks’ Eyes.” Carroll is distinguishing here among things, the names of things, and the names of names of things. “Haddocks’ Eyes,” the name of a name, belongs to what logicians now call a “metalanguage.” By adopting the convention of a hierarchy of metalanguages logicians manage to side-step certain paradoxes that have plagued them since the time of the Greeks. For Earnest Nagel’s amusing translation of the White Knight’s remarks into symbolic notation, see his article “Symbolic Notation, Haddocks’ Eyes and the Dog-Walking Ordinance,” in Vol. III of James R. Newman’s anthology, *The World of Mathematics*, 1956.

A less technical but equally sound and delightful analysis of this passage is included in Roger W. Holmes’ article, “The philosopher’s Alice in Wonderland,” *Antioch Review*, Summer 1959. Professor Holmes (he is chairman of the philosophy department at Mount Holyoke College) thinks that Carroll was pulling our leg when he has the White Knight say that the song *is* “A-sitting on a Gate.” Clearly this cannot be the song itself, but only another name. “To be consistent,” Holmes concludes, “the White Knight, when he had said that the song *is* ... , could only have burst into the song itself. Whether consistent Or not, the White Knight is Lewis Carroll’s cherished gift to logicians.” ...

For a modern programmer (post 1960) familiar with C or assembly language, an apt analogy would be passing data to a subroutine “by value” versus “by reference” or the idea of indirect addressing or “pointers”. The reference or “address” of where a data value is stored acts like the name for the value. The “name” for the value gets passed and not the actual value. Similarly, the idea is expressed in the distinction between “numeral” and “number”, where a numeral is the “name” of a number. For more fun, read the rest of *Through the Looking Glass* and then the *Annotated Alice*.

The humor and seeming craziness of logic appears elsewhere with powerful effect, none more memorable than Joseph Heller’s 1961 World War II novel, *Catch-22* ([3]), which is of the same genre as the TV show *Mash* set in the Korean War but really addressing the Vietnam War. Here is the part in the novel that explains its title ([3] Chapter 5 p.46):

## Catch-22

Yossarian looked at him soberly and tried another approach. “Is Orr crazy?”

“He sure is,” Doc Daneeka said.

“Can you ground him?”

“I sure can. But first he has to ask me to. That’s part of the rule.”

“Then why doesn’t he ask you to?”

“Because he’s crazy,” Doc Daneeka said. “He has to be crazy to keep flying combat missions after all the close calls he’s had. Sure, I can ground Orr. But first he has to ask me to.”

“That’s all he has to do to be grounded?”

“That’s all. Let him ask me.”

“And then you can ground him?” Yossarian asked.

“No. Then I can’t ground him.”

“You mean there’s a catch?”

“Sure there’s a catch,” Doc Daneeka replied. “Catch-22. Anyone who wants to get out of combat duty isn’t really crazy.”

There was only one catch and that was Catch-22, which specified that a concern for one’s safety in the face of dangers that were real and immediate was the process of a rational mind. Orr was crazy and could be grounded. All he had to do was ask; and as soon as he did, he would no longer be crazy and would have to fly more missions. Orr would be crazy to fly more missions and sane if he didn’t, but if he was sane he had to fly them. If he flew them he was crazy and didn’t have to; but if he didn’t want to he was sane and had to. Yossarian was moved very deeply by the absolute simplicity of this clause of Catch-22 and let out a respectful whistle.

“That’s some catch, that Catch-22,” he observed.

“It’s the best there is,” Doc Daneeka agreed.

A statement  $P$  that is both true and false (in symbolic logic  $P \wedge \sim P$ ) or one that is true if and only if it is false is the definition of a contradiction in logic. And in logic, once you have a contradiction, any statement is derivable, and thus truth and falsity are rendered meaningless.

## **Infinities (Zeno’s Paradoxes, Infinite Regress)**

As we know, a more mysterious and profound mathematical idea is that of infinity and its various guises. A favorite philosophical rendition of this is the idea of infinite regress, such as expressed visually in the infinite reflections in opposing mirrors. Here is an example from the 1922 novel *Jurgen* by James Branch Cabell ([4] pp.317-319):

### **Postures Before A Shadow**

“It may be that there is no meaning anywhere. Could you face that interpretation, Jurgen?”

“No,” said Jurgen: “I have faced god and devil, but that I will not face.”

“No more would I who have so many names face that. You jested with me. So I jest with you. Probably Koshchei jests with all of us. And he, no doubt—even Koshchei who made things as they are,—is in turn the lout of some larger jest.”

“He may be, certainly,” said Jurgen: “yet, on the other hand—”

“About these matters I do not know. How should I? But I think that all of us take part in a moving and a shifting and a reasoned using of the things which are Koshche’s, a using such as we do not comprehend, and are not fit to comprehend.”

“That is possible,” said Jurgen: “but, none the less—!”

“It is as a chessboard whereon the pieces move diversely: the knights leaping sidewise, and the bishops darting obliquely, and the rooks charging straightforward, and the pawns laboriously hobbling from square to square, each at the player’s will. There is no discernible order, all to the onlooker is manifestly in confusion: but to the player there is a meaning in the disposition of the pieces.”

“I do not deny it: still, one must grant—”

“And I think it is as though each of the pieces, even the pawns, had a chessboard of his own which moves as he is moved, and whereupon he moves the pieces to suit his will, in the very moment wherein he is moved willy-nilly.”

“You may be right: yet, even so—”

“And Koshchei who directs this infinite moving of puppets may well be the futile harried king in some yet larger game.”

“Now, certainly I cannot contradict you: but, at the same time—!”

“So goes this criss-cross multitudinous moving as far as thought can reach: and beyond that the moving goes. All moves. All moves uncomprehendingly, and to the sound of laughter. For all moves in consonance with a higher power that understands the meaning of the movement. And each moves the pieces before him in consonance with his ability. So the game is endless and ruthless: and there is merriment overhead, but it is very far away.”

“Nobody is more willing to concede that these are handsome fancies, Mother Sereda. But they make my head ache. Moreover, two people are needed to play chess, and your hypothesis does not provide anybody with an antagonist. Lastly, and above all, how do I know there is a word of truth in your high-sounding fancies?”

“How can any of us know anything? And what is Jurgen, that his knowing or his not knowing should matter to anybody?”

The dreaming or imagining metaphor appears elsewhere and is a central motif of the Argentine writer Jorge Luis Borges (see the quote from the “Avatars of the Tortoise” in my posting “Physical, Mathematical, Personal Reality”<sup>1</sup>). An especially moving example is Borges’s story “The Circular Ruins”, which is excerpted here ([5] pp.45-50):

## The Circular Ruins

No one saw him disembark in the unanimous night, no one saw the bamboo canoe sinking into the sacred mud, ... The truth is that the obscure man kissed the mud, came up the bank without pushing aside (probably without feeling) the brambles which dilacerated his flesh, and dragged himself, nauseous and bloodstained, to the circular enclosure crowned by a stone tiger or horse, which once was the color of fire and now was that of ashes. This circle was a temple, long ago devoured by fire, which the malarial jungle had profaned and whose god no longer received the homage of men. ...

The purpose which guided him was not impossible, though it was supernatural. He wanted to dream a man: he wanted to dream him with minute integrity and insert him into reality. ... He dreamt a complete man, a youth, but this youth could not rise nor did he speak nor could he open his eyes. Night after night, the man dreamt him as asleep. ... In the dreamer’s dream, the dreamed one awoke. ... In general, his days were happy; when he closed his eyes, he would think: *Now I shall be with my son.* Or, less often: *The child I have engendered awaits me and will not exist if I do not go to him.* ...

---

<sup>1</sup> <http://josmfs.net/2019/09/24/physical-mathematical-and-personal-reality/>

The magician suddenly remembered the words of the god. He recalled that, of all the creatures of the world, fire was the only one that knew his son was a phantom. This recollection, at first soothing, finally tormented him. He feared his son might meditate on his abnormal privilege and discover in some way that his condition was that of a mere image. Not to be a man, to be the projection of another man's dream, what a feeling of humiliation, of vertigo! All fathers are interested in the children they have procreated (they have permitted to exist) in mere confusion or pleasure; it was natural that the magician should fear for the future of that son, created in thought, limb by limb and feature by feature, in a thousand and one secret nights.

The end of his meditations was sudden, though it was foretold in certain signs. First (after a long drought) a faraway cloud on a hill, light and rapid as a bird; then, toward the south, the sky which had the rose color of the leopard's mouth; then the smoke which corroded the metallic nights; finally, the panicky flight of the animals. For what was happening had happened many centuries ago. The ruins of the fire god's sanctuary were destroyed by fire. In a birdless dawn the magician saw the concentric blaze close round the walls. For a moment, he thought of taking refuge in the river, but then he knew that death was coming to crown his old age and absolve him of his labors. He walked into the shreds of flame. But they did not bite into his flesh, they caressed him and engulfed him without heat or combustion. With relief, with humiliation, with terror, he understood that he too was a mere appearance, dreamt by another.

I came across the following in Clifton Fadiman's 1958 collection *Fantasia Mathematics*. It is an imaginative riff on Zeno's Paradox by the Austrian author Arthur Schnitzler ([6] p.291):

### **Leinbach's Proof**

The streets were almost deserted. A steeple clock struck two. It was good, he reflected, that he did not yet have to keep office hours, and that he could sleep late tomorrow. He walked rapidly, surely, humming to himself. Finally he began to sing in a low rich voice that seemed strange to him. Perhaps, indeed, this is not I. Perhaps I am dreaming. Perhaps this is my last dream, the death-bed dream! He remembered an idea that Leinbach once, years ago, had expounded to a large gathering, quite seriously, in fact with a certain impressiveness. Leinbach had discovered a proof that there really is no death. It is beyond question, he had declared, that not only at the moment of drowning, but at all the moments of death of any nature, one lives over again his whole past life with a rapidity inconceivable to others. This remembered life must also have a last moment, and this last moment its own last moment, and so on, and hence, dying is itself Eternity, and hence, in accordance with the theory of limits, one may approach death but can never reach it.

Now for a more typical example of infinite regress. This sort of corresponds to the Droste Effect, to be discussed more below, named after a 1904 package of Droste brand cocoa whose label shows a picture of the label inside the label itself—a type of visual recursion. This version is from the 1965 play *Tiny Alice* by Edward Albee ([7] pp.17-19):

### **Tiny Alice**

#### **Scene 2**

*The library of a mansion — a castle. Pillared walls, floor-to-ceiling leather-bound books. A great arched doorway, U.C. A huge reading table to L. — practical. A phrenological head on it. To R., jutting out of the wings a huge dolls-house model of the building of which the present room is a part. It is as tall as a man, and a good deal of it must be visible from all parts of the audience. An alternative — and perhaps more practical — would be for the arched doorway to be either L. or R., with bookshelves to both sides of the set, coming toward C., and to have the entire doll's house in the rear wall, in which case it could be smaller — say, twelve feet long and proportionately high. At any rate, it is essential. At rise, Julian, carrying briefcase, crosses in arch from R., stops, then*

*crosses D.L., steps to D.L.*

JULIAN. Extraordinary ... (*Crosses U. to R.C. of model: After a few moments of head-shaking concentration.*) extraordinary;

BUTLER (*Crosses in from L. with chamois and three spoons. After entering, observing Julian not having heard him, he leans on banister*) Extraordinary, isn't it?

JULIAN. (*Mildly startled.*) Uh ... yes, unbelievable ... (*Agreeing.*) Extraordinary.

BUTLER. (*Crosses to top of L. steps. He moves about with a kind of unbutlerlike ease.*) I never cease to wonder at the ... the fact of it, I suppose.

JULIAN. The workmanship ...

BUTLER. (*A mild correction.*) That someone would do it.

JULIAN. (*Seeing.*) Yes, yes.

BUTLER. (*Crosses down L. steps to U.L.C.*) That someone would ... well, for heaven's sake, that someone would build (*Refers to the set.*) ... *this* ... castle? ... and then ... duplicate it in such precise miniature, so exactly. Have you looked through the windows?

JULIAN. No, I ...

BUTLER. It is exact. Look and see.

JULIAN. (*Moves even closer to the model; peers through a tiny window at R.C.*) Why ... why, YES. I ... there's a great ... baronial dining room, even with tiny candlesticks on the tables!

BUTLER. (*Nodding his head, a thumb back over his shoulder*) It's down the hall, off the hallway to the right.

JULIAN. (*The proper words won't come.*) It's ... it's ...

BUTLER. (*Sits L.C. ledge of model*) Look over here. There; right there.

JULIAN. (*Peers at model L. of C.*) It's ... it's this room! This room we're in!

BUTLER. Yes.

JULIAN. Extraordinary.

BUTLER. Is there anyone there? Are we there?

JULIAN. (*Briefly startled; then laughs, looks back at the model*) Uh ... no. It seems to be quite ... empty.

BUTLER. (*A quiet smile.*) One feels one should see one's self ... almost.

JULIAN. (*Looks back to him. after a brief, thoughtful pause.*) Yes. That would be rather a shock, wouldn't it?

BUTLER. Did you notice ... did you notice that there is a model within that room in the castle? A model of the model?

JULIAN. I ... I did. But ... I didn't register it, it seemed so ... continual.

BUTLER (*A shy smile.*) You don't suppose that within that tiny model in the model there, there is ... another room like this, with yet a tinier room within it, and within ...

JULIAN. (*Laughs.*) ... and within and within and within and ... ? No, I ... rather doubt it. It's remarkable craftsmanship, though. Remarkable.

Figure 1 shows the label of the Droste chocolate that has a picture of the label inside. More examples of Droste-effect labels can be found at <https://beachpackagingdesign.com/boxvox/droste->

effect-p and <http://beachpackagingdesign.com/boxvox/category/droste-effect>.

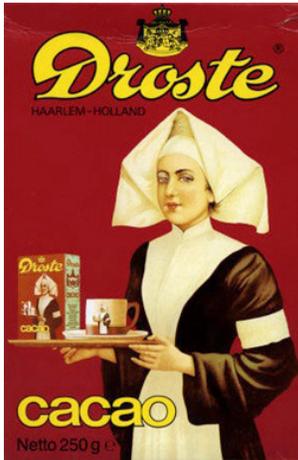


Figure 1 Droste Label



Figure 2 One-ninth scale replica of Bourton-on-the-water, Cotswolds, UK

An example closer to the *Tiny Alice* doll house is the village of Bourton-on-the-water in the Cotswolds. It contains a one-ninth scale replica of the village down to a replica of the replica (Figure 2)—in fact, down to a replica of the replica of the replica of the replica of the village (Figure 3). (See <http://twistedstifter.com/2015/05/model-model-model-model-village-bourton-on-the-water-cotswolds-engand/>)



Figure 3 Model inside Model inside Model inside Model of Village

Matt Parker produces an animated Droste effect at his standupmaths Youtube site: “Infinite DVD unboxing video: Festival of the Spoken Nerd” (<https://www.youtube.com/watch?v=BnmA2klBN8>)

## Permutations

Then there are the amazing things that can be done with something as prosaic as permutations. Both my examples come from Borges. The first is from his essay “The Doctrine of the Cycles.” ([8] p.75 (my translation) ):

## The Doctrine of the Cycles

... The number of all the atoms which compose the universe is, although immeasurable, finite, and is only capable of a finite number of permutations (although again immeasurable). In an infinite time the number of possible permutations should be reached, and the universe must repeat itself. Again you will be born from a womb, again you will grow a skeleton, again this same page will arrive in your identical hands, again you will pass through all the hours up to the time of your incredible death....

The essay continues and expands on this theme. Another extended Borges essay of a similar nature is “Circular Time”([10]).

The following is a precursor to one of Borges’s masterpieces, “The Library of Babel” ([11]). It takes the idea of permutations to dizzying heights. I have included an excerpt from it instead of “The Library of Babel” because it conveys the basic idea more succinctly. The excerpt focuses on that part of the essay where Borges explains Lasswitz’s Universal Library ([12]). Again the excerpt is my translation ([9] p.16):

## The Total Library

... The basic idea of Lasswitz is that of Carroll, but the elements of his game are the universal orthographic symbols, not the words of a language. The number of such elements—letters, spaces, braces, ellipses, numerals—is small and can be reduced further. The alphabet can relinquish *q* (which is wholly superfluous) and *x* (which is an abbreviation) and all the capital letters. The numerals of the decimal system of numeration can be eliminated or reduced to two, as in the binary notation of Leibniz. Punctuation can be limited to the comma and the period. It is possible not to have accents, as in Latin. By dint of analogous simplifications Kurt Lasswitz arrives at twenty-five sufficient symbols (twenty-two letters, the space, the period, the comma) whose variations with repetition achieve all that is possible to express: in all languages. The entirety of such variations would be integrated in a Total Library of astronomical size. Lasswitz urged men to produce mechanically this inhuman Library which chance would organize and which would eliminate intelligence. (*The Footrace with the Tortoise* of Theodore Wolff explains the construction and dimensions of this impossible work.)

All will be in its blind volumes. All: the minute history of the future, *The Egyptians* of Aeschylus, the precise number of times the waters of the Ganges have reflected the flight of a falcon, the secret and true name of Rome, the encyclopedia which Novalis will have edited, my dreams and dozings in the dawn of the fourteenth of August 1934, the proof of the theorem of Pierre Fermat, the unwritten chapters of *Edwin Drood*, these same chapters translated into all the languages which the tribes speak, the paradoxes concerning time which Berkeley will conceive but will not publish, the iron books of Urizen, the premature epiphanies of Stephen Dedalus which before a cycle of one thousand years no one would want to say, the gnostic gospel of Basilides, the song which the sirens sang, the faithful catalogue of the Library, the proof of the fallacy of this catalogue. All, except for a reasonable line or a contest notice, will be millions of nonsensical cacophonies, verbal farragos and incoherences. And generations of men can pass away without the vertiginous shelves—the shelves which obliterate the day and in which resides chaos—having granted them a tolerable page.

One of the habits of the mind is the invention of horrible fantasies. It has invented Hell, has invented predestination toward Hell, has imagined the Platonic ideals, the chimera, the sphinx, the abnormal transfinite numbers (where the part is not less than the whole), masks, mirrors, operas, and the monstrous Trinity: the Father, the Son, and the insoluble Spirit, articulated in a single organism .... I have managed to redeem from oblivion a subordinate horror: the vast contradictory Library, whose deserted stacks of books venture incessantly in combinations with one another and which all affirm it, negate it, and confound it like some delirious divinity.



The preponderance of examples taken from Borges is an indication that his writings are filled with echoes of mathematical and philosophical ideas. One of his clever tropes is to go back through intellectual history and collect real statements by a multiplicity of thinkers all on the same theme, even though these thinkers may not be aware of one another. This establishes one of Borges's primary ideas that "every writer creates his own precursors." Some of his concatenations are delightful and provocative, such as his story of Philip Gosse's theory against evolution as told by his son Edmond ([13]):

### The Creation and P. H. Gosse

... How can one reconcile God with the fossils ... ? ... Gosse, fortified by prayer, proposed an astonishing answer. ... Gosse imagines a rigorously causal, infinite time that has been interrupted by a past act: the Creation. ... The principle of reason requires that no result be without a cause, and those causes require other causes, which are multiplied regressively; there are concrete vestiges of them all, but only those that are posterior to the Creation have really existed. There are glyptodont skeletons in the gorge of Lujan, but glyptodonts never existed. That is the ingenious (and, above all, incredible) thesis that Philip Henry Gosse proposed to religion and to science.

But both rejected it. To newspaper reporters it became simply the doctrine that God had hidden fossils underground to test the faith of geologists; Charles Kingsley denied that the Lord had carved a superfluous and vast lie on the rocks. ...

I should like to emphasize two virtues in Gosse's forgotten thesis. First: its rather monstrous elegance. Second: its involuntary reduction of a creatio ex nihilo to absurdity, its indirect demonstration that the universe is eternal, as the Vedanta, Heraclitus, Spinoza, and the atomists thought. Bertrand Russell has brought the thesis up to date. In the ninth chapter of *The Analysis of Mind* (London, 1921) he theorizes that the planet was created a few minutes ago, with a humanity that "remembers" an illusory past.

This essay and numerous others come from Borges's *Other Inquisitions*, which I heartily recommend. All of his stories and essays are blessedly short, but very dense and thought-provoking, so they can only be savored in small doses. It is most gratifying to see some of the most stimulating ideas from mathematics find a creative expression in literature and the arts.

## References

- [1] Carroll, Lewis, *Through the Looking Glass And what Alice Found There*, Illustrations by John Tenniel, 1872, (Originally published: December 27, 1871). Project Gutenberg EBook of Through the Looking-Glass (without illustrations), The Millennium Fulcrum Edition 1.7, 2016. (<https://www.gutenberg.org/files/12/12-h/12-h.htm#link2HCH0009>). Illustrations from MacMillan 1872 edition, digitized by Google Books, ([https://www.google.com/books/edition/Through\\_the\\_Looking\\_Glass/aOKruPEWBqEC](https://www.google.com/books/edition/Through_the_Looking_Glass/aOKruPEWBqEC))
- [2] Carroll, Lewis, *The Annotated Alice*, Introduction and Notes by Martin Gardner, World Publishing Co., New York, 1960.
- [3] Heller, Joseph, *Catch-22*, Simon & Schuster, 1961
- [4] Cabell, James Branch, *Jurgen: A Comedy of Justice*, (1919), 7<sup>th</sup> ed., Robert M. McBride & Company, New York, 1922
- [5] Borges, Jorge Luis, "The Circular Ruins," *Ficciones* (1945, Sp. 1956), in *Labyrinths, Selected Stories & Other Writings*, Donald A. Yates and James E. Irby, editors, Preface by Andre

Maurois, A New Directions Book, New York, 1964. I like James E. Irby's translations the best, and the collection of Borges writings in *Labyrinths* is my favorite.

- [6] Schnitzler, Arthur, "Leinbach's Proof," in *Flight into Darkness* (1931), in Clifton Fadiman, *Fantasia Mathematica*, 1958
- [7] Albee, Edward, *Tiny Alice*, 1965, Revised 2001
- [8] Borges, Jorge Luis, "La doctrina de los ciclos" (1936), *Historia de la eternidad* (1953). I have used my own translations here and in the next reference with corroboration from other existing translations, since I often found the literary translators were not always familiar with mathematical idiom. I also tended to be a bit more literal in order to capture some of the peculiarities of Borges's writing. A native Spanish-speaking friend indicated that his syntax was a bit unusual. An alternative, professional translation is given by Esther Allen in, Borges, Jorge Luis, "The Doctrine of Cycles" (1936), *History of Eternity* (1957) in *Selected Non-Fictions*, edited by Eliot Weinberger; translated by Esther Allen, Suzanne Jill Levine, and Eliot Weinberger (New York: Viking, 1999)
- [9] Borges, Jorge Luis, "The Total Library" (La Biblioteca Total), *Sur*, **59**, August 1939, 13-16. An alternative, professional translation is given by Esther Allen in, Borges, Jorge Luis, "The Total Library," (1939), in *Selected Non-Fictions*, edited by Eliot Weinberger; translated by Esther Allen, Suzanne Jill Levine, and Eliot Weinberger (New York: Viking, 1999)
- [10] Borges, Jorge Luis, "Circular Time," (1939), in *Selected Non-Fictions*, edited by Eliot Weinberger; translated by Esther Allen, Suzanne Jill Levine, and Eliot Weinberger (New York: Viking, 1999)
- [11] Borges, Jorge Luis, "The Library of Babel," *Ficciones* (1941), in *Labyrinths, Selected Stories & Other Writings*, Donald A. Yates and James E. Irby, editors, Preface by Andre Maurois, A New Directions Book, New York, 1964.
- [12] Lasswitz, Kurd, "The Universal Library," Willy Ley tr., in Clifton Fadiman, *Fantasia Mathematica*, 1958
- [13] Borges, Jorge Luis, "The Creation and P. H. Gosse," *Other Inquisitions 1937-1952*, translated by Ruth L. C. Simms, Introduction by James E. Irby, 2<sup>nd</sup> printing: Clarion Book, Simon and Schuster, New York, 1965, 1<sup>st</sup> printing: University of Texas Press, 1964. *Other Inquisitions* is my second favorite collection of Borges writings.

© 2019 James Stevenson

---