Stumbling unto Grace: Invention and the Poetics of Imagination

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Douglas Hofstadter shows in his hybrid of fiction and mathematical introduction Gödel, Escher, Bach—An Eternal Golden Braid *(1979), how the paradoxes inherent in Gödel's theorem (that "no fixed system, no matter how complicated, could represent the complexity of the whole numbers" (p. 19).), Escher's complex drawings and Bach's compositional techniques are isomorphic across disciplines. From Latin* in venire*, to come upon something, the word invention already suggests an element of accident: finding something that is already there. This paper shows how Hofstadter's discussions and fictionalisations (via Lewis Carroll) of Bach's two-part and three-part inventions, illuminate complex yet simple processes in aesthetic work: coming upon, stumbling over, and ultimately writing stories out of one's ideas and imagination. Looking at the book's fragmented patterns via Derrida's inventions of the 'other' (such as in his discussion of Leibniz and de Man) the paper argues that the relation between imagination and inventiveness in Hofstadter is mediated by propositions on incompleteness and their paradoxical relation to 'whole' fragments.*

Reviewers and critics of Douglas Hofstadter's much acclaimed book, *Gödel, Escher, Bach* (1979), all agree that the concept of invention runs throughout the book's multiple levels of narration. The book's central concern with the question whether machines can think is seen through the lives and ideas of famous mathematician Kurt Gödel, J.S. Bach, and the Dutch illustrator M.C. Escher. What is most known about these three people is their ability to combine simple thought with the creation of complex patterns which culminate either in a paradox or a puzzle. The subtitle of the book itself, "A metaphorical fugue on minds and machines in the spirit of Lewis Carroll," gives the reader a hint regarding the different ways in which one can approach aspects of complexity through simplicity and vice versa. For example, Hofstadter interprets Gödel's complex incompleteness theorem from 1931 through Escher's illustrations of strange loops. Thus Gödel's theorem which states in Hofstadter's rendition that "all consistent axiomatic formulations of number theory include undecidable propositions" (Hofstadter 1979: 17), is seen through Hofstadter's definition of an Escher loop, which for Hofstadter is "a way of representing an endless process in a finite way" (15). Furthermore Gödel's statement, that it is impossible to design a formal system which would contain all true statements and no false statements, is also seen through Bach's formal compositions which were construed as "relations between separate sections" (28) that create patterns

Janus Head, 9(1), 63-72.

of unity between "true" and "false" beginnings and endings, in other words, strange loops.

What critics have not yet emphasized, however, is the fact that Hofstadter's *Eternal Golden Braid* is a reinvention of invention. Hofstadter engages in inventing reconfigurations based on the imagination of Gödel, Escher, Bach, Carroll, and Hofstadter himself, which the reader is invited both to imagine and discover. Referring to his style employed throughout the book, the use of fables and dialogues, and the theme of tangled hierarchies and strange loops, which, as he says, "sometimes it will be hidden, other times it will be out in the open; sometimes it will be right side up, other times it will be upside down, or backwards" (10), Hofstadter gives a clear indication as to the nature of inventiveness that his book ultimately deals with on all possible levels. As he puts it: "Quaerendo inveniendis" is my advice to the reader" (10), thus implying that by seeking one will discover the place where invention can take place. For Hofstadter the relation between discovery and place is essential insofar as the question of invention falls within the category of its relation to places.

For example, Hofstadter's discussions and fictionalizations via Lewis Carroll of Bach's two-part and three-part inventions, illuminate complex, yet simple, processes in aesthetic work: coming upon, stumbling over, and ultimately writing stories out of one's ideas and imagination have a relational function. The etymology of the word invention is here a good starting point. From Latin *in venire*, to come upon something, the word already suggests an element of accident: finding something that is already there. By 1500 the word has come to designate a made up story, whereas it is not until 1531 that the meaning shifts to defining an original device or method. These etymologies all resonate in Bach's, Carroll's, Gödel's and Hofstadter's various inventions. My aim in this paper is then to suggest that mental and aesthetic representations involve and draw upon a poetic embedding into each other, making invention the matrix of imagination.

In his seminal article "Psyche: Inventions of the Other" Jacques Derrida emphasizes yet another aspect of the word invention claiming that invention is linked to a self-referential system in which the event of coming upon something is contingent on topos. While the act of invention can take place only once, according to Derrida, placing one's finding in context is a question of method. Taking his point of departure in trying to invent something that is already there, namely the work of Paul de Man—whose work in Derrida's essay is deferred recursively, while still managing to create

a context for Derrida's thoughts on the idea of invention—Derrida points to three meanings of the word invention in French. First, invention is the capacity to invent or the natural genius for inventing, or inventiveness; second, invention is the experience of inventing, or the "first time" of the new event, and third, invention is that which designates the invented thing. Thus we have a tension not only between the container and the contained, form and content, but also between form and function. Here Derrida identifies two competing meanings inherent in each of the three meanings of invention:

> (1) "first time", the event of a *discovery*, the invention of what was already there and came into view as an existence or as a meaning and truth;
>
> (2) the productive invention of a technical apparatus that was not already there as such. In this case the inventor gave it a *place* upon *finding it*, whereas in the former case its place was found there where it was already *located*. (Derrida 1989: 49)

Invention then operates on two levels: on the one hand it points to the act of unveiling discovery, and on the other hand it involves production. Where discovery is concerned, the fact that stumbling upon something takes place accidentally suggests that invention happens in no time, as it were. Invention as production, on the other hand, is dependent on time insofar it requires recognition and hence institutionalization. This leads Derrida to assume that invention is linked to the discovery of a general truth insofar as the object of discovery has to already be there, that is, it has to have a location which everybody can identify. The art of inventing then, or as he puts it, *"ars inveniendi* concerns the *searching* as well as the *finding*" (50). However, as one does not want to merely find a truth that is already there, it is necessary to invent a research program, or a method, "an analytic method that is called the method of invention" (50). Thus Derrida contends that "the truth that we must *find* there where it *is found*, the truth to be invented, is first of all the nature of our *relation* to the thing itself and not the nature of the thing itself" (51).

Derrida's discussion of Leibniz's interpretation of invention as seen in relation to truth, and in fact in relation to relation, as it were, is of relevance here when one considers Hofstadter's repeated insistence that invention is based on the formulation of propositions and that these propositions consist of certain truths. For Hofstadter, our relational relation to truth, or the thing

to be invented, has to have proof, even if proof itself proves the incompleteness of truth, such as we have it in the case of Gödel's criticism of Bertrand Russell's theory of types in *Principia Mathematica* (1910–1913) which was developed as an attempt to get rid of all the paradoxes and strange loops in a formal system. Hofstadter defines proof as "demonstrations within fixed systems of propositions" and points out that the revolutionary aspect in Gödel's theorem consisted not in saying that Russell's statement of number theory was false, but saying that the statement of number theory did not have any proof. What Gödel then did was to find a truth there where it was already found, and therefore *invent* that Russell's fixed system, that of *Principia Mahtematica,* was incomplete. Thus what Gödel demonstrated was, as Hofstadter renders it, the fact that "there are true statements of number theory which its methods of proof are too week to demonstrate," and that "provability is a weaker notion than truth, no matter what axiomatic system is involved (Hofstadter 1979: 18-19).

Gödel is for Hofstadter an inventor of truth. Says Derrida following Leibniz:

> When Leibiniz speaks of the "inventors of truth", we must recall […] that he means the producers of propositions and not just sources of revelation. The truth qualifies the connection of subject and predicate. A person has never invented something, that is, a thing. In short, no one has ever invented anything. Nor has anyone invented an essence of things in this new universe of discourse, but only truth as a proposition. And this logico-discursive mechanism can be called *technè* in the broad sense. Why? For there to be invention, the condition of a certain generality must be met, and the production of a certain objective ideality (or ideal objectivity) must occasion recurrent operations, thus a utilizable apparatus. If the act of invention can take place only once, the invented artifact must be essentially repeatable, transmissible and transposable. The two extreme types of invented things, the mechanical apparatus on the one hand, the fictional or poetic narrative on the other, imply both a first time and every time, the inaugural event and iterability. Once invented, so to speak, invention is invented only if repetition, generality, common availability, and thus publicity are introduced or promised in the structure of the first time. (Derrida 1989: 51)

Derrida thus points to an essential aspect of invention namely its institutional status insofar as producing propositions relies on formal analysis and on procedure. When Derrida refers to repetition, transmission and transposition, he implies that what is inherently characteristic of invention is the tension between form, here the fictional or poetic narrative that scrutinizes the presence of motifs, counter-motifs, sequences, and developments, and method in the sense that what is emphasized in invention is the process whereby the poetic narrative is modified and thus turned into a model of inventiveness. Invention as an elaboration upon simple ideas is inventive when a process of repetition, transmission and transposition of these ideas takes place.

Hofstadter's book can be said to operate with all these strategies. His own inventions such as mathematical formulae, theorems, and axioms, while based on the elaboration upon themes, also counter and meta-develop these themes by re-articulating them as new. The technical expositions of set theory, combined with Escher's visual illustrations of Bach's inventive repositions of simple ideas in his two and three part inventions culminate in the creation of 21 dialogues written in the form of fables. The first dialogue occurs in the first chapter and borrows the title of Bach's invention, more precisely the "Three-Part Invention." Here Hofstadter explores Zeno's paradox of motion with its two theorems, namely that "motion is inherently impossible" and "motion unexists." Hofstadter repeats not only Bach's title, which he uses as a motif for his form but also Lewis Carroll's protagonists Achilles and Tortoise, whom Carroll himself borrowed from Zeno. The dialogue between these two unlike figures is shaped in Carroll's "Two-Part Invention" as a process which re-arranges the argument in Euclid's theorem and transforms the theorem into a paradox. While the first dialogue, the "Three-Part Invention" is mainly concerned with form, as Hofstadter's two protagonists plus Zeno himself engage in an elaboration and demonstration of Zeno's paradox, Carroll's "Two-Part Invention" is concerned mainly with process as the two protagonists engage in an elaboration of Euclid's theorem, yet whose final demonstration is postponed. Whereas the first dialogue posits invention as an example of reasoning in syllogistic form, the second dialogue offers an example of inventiveness insofar as it investigates the relation between reasoning, reasoning about reasoning, and reasoning about reasoning about reasoning. This regression *en abyme* of reasoning which is entangled with both invention and inventiveness shows that imagination itself is a relational form whose function is to communicate hypothetical variants of invention.

"The Two-Part Invention", then, functions as an analogue to Zeno's paradox about the impossibility of motion presented in the "Three-Part Invention" and on the possible consequences of imagining that impossibility.

These first two dialogues called invention set the tone for the rest of Hofstadter's dialogues which combine both form and process in an attempt to strike a balance between the two. And the fact that they are all construed as fables is not without significance. Going back to Derrida's rendering of Leibniz's thoughts in *New Essays Concerning Human Understanding*, one of the main tenets in Leibniz's expositions is that invention, insofar as it deals with a high degree of probability, had better be anchored in an examination of "games of chance". What invention, then, produces is for Leibniz a relation between discovery, searching, pure chance, and formal chance. Here, it is interesting to note what Derrida extracts from Leibniz's call for "a new species of logic," and from Leibniz's wish and conviction that "a clever mathematician would produce a substantial work, well detailed and well reasoned, on all sorts of games, as that would be very useful for perfecting the art of invention" (Leibniz in Godzich 1989: 56). Says Derrida, first claiming that what Leibiniz refers to when he says games, is in reality a mirror-game:

> The game here occupies the place of a psyche that would send back to man's inventiveness the best image of his truth. As through a fable in images, the game states or reveals a truth. That does not contradict the principle of programmatic rationality or of the *ars inveniendi* as the enactment of the principle of reason, but illustrates its "new species of logic", the one that integrates the calculation of probabilities.
>
> One of the paradoxes of this new *ars inveniendi* is that it both liberates the imagination and liberates *from* it. It passes beyond the imagination and passes through it. (57)

Hofstadter's fables construed in the didactic spirit of Bach's inventions counter in counterpoint the idea of invention as form and inventiveness as process. Discussions on inventiveness center on reasoning and method whereas invention is seen through the imagination of mathematical geniuses. The book's 21 fables are metaphorical dialogues which counterpoint the book's 20 chapters. What is interesting about these dialogues, which all have the names of Bach's musical works, is the way in which they reinforce the various paradoxes Hofstadter is interested in, including variants thereof,

such as, for example, infinite regress in Lewis Carroll's paradox. The longest of these dialogues, which otherwise do not fill more then two, three pages, is "Little Harmonic Labyrinth." This dialogue acts as Derrida's *ars inveniendi* and shows how infinite regress both liberates imagination and liberates from imagination.

Achilles and the Tortoise find themselves on a trip to Coney Island and decide to take a ride on the Ferris Wheel. The Tortoise had a prediction of good fortune from a fortune teller and is filled with anticipation when they are invited to go for an "Unexpected surprise." At the end of the ride, as they encounter a monster-like creature named Goodfortune ready to cook the Tortoise and eat it, they ponder over what chance and good fortune they might have in order to escape. Awaiting their fate in the monster's living room who had invited them to eat popcorn while himself preparing the sauce in which to cook the Tortoise, they stumble over a book entitled *Provocative Adventures of Achilles and the Tortoise taking place in Sundry Spots of the Globe*. While aware of their status as inventions of Zeno, Carroll, and Hofstadter in the first two dialogues, the "Three- and Two-Part Inventions", in the "Little Harmonic Labyrinth" the two protagonists are completely ignorant of the isomorphism between their story and the story they are about to read. Thus, when reading the book featuring an adventure called Djinn and Tonic, the Tortoise and Achilles decide to take on the roles of the Tortoise and Achilles in the book. In the Djinn and Tonic story, Achilles had invited the Tortoise to see his collection of Escher drawings. Upon seeing Escher's illustration entitled *Convex and Concave* (1955), the Tortoise tells the story about his own adventures every time he would drink a potion that would transport him in one of Escher's worlds. Offering Achilles a guided tour in Escher's two internally consistent worlds, which, "when juxtaposed make a completely inconsistent composite world" (105), the Tortoise explains how by drinking a tonic they can return back to where they started. Soon thereafter they both find themselves sailing down a canal in a gondola. Not being so sure of whether it is a good idea to continue, they decide to jump out and exit through one of Escher's frames. As the Tortoise explains, once in one of Escher's drawings, one can always change the picture by going through one of the regressive and recurrent frame exits. Thus, once in *Convex and Concave*, and tempted to steal the lamp guarded by the lizards, Achilles finds himself holding the lamp in his hands after having fallen through a hole which turns out to be a groove in a record with Bach's *Little Harmonic Labyrinth*. The two protagonists are thus entangled recursively in the Labyrinth. From the

tertiary level of the labyrinth the Tortoise explains that the lamp has a genie in it, and that this genie is able to grant three wishes to whoever holds the lamp. The following initial exchange takes place:

> *Tortoise*: […] Go ahead Achilles, take the first wish.
>
> *Achilles*: Wow! But what should I wish? Oh I know! It's what I thought of the first time I read the Arabian Nights (that collection of silly (and nested) tales)—I wish that I had a HUNDRED wishes, instead of just three. Pretty clever, eh, Mr. T? I bet YOU never would have thought of that trick. I always wondered why those dopey people in the stories never tried it themselves.
>
> *Tortoise*: Maybe now you'll find out the answer.
>
> *Genie*: I am sorry Achilles, but I don't grant meta-wishes.
>
> *Achilles*: I wish you'd tell me what a "meta-wish" is!
>
> *Genie*: But THAT is a meta-meta-wish, Achilles—and I don't grant them either. (110)

The story goes on to explain the notion of recursive and nested structures, and modulations in music, which leaves both the reader and the listener "dangling" as Hofstadter puts it, without resolution. As Hofstadter explains, modulation is a setting up of a temporary goal without resolution. Paradoxically however, although the genie manages to grant Achilles a meta-wish by making recourse to a meta-lamp and a meta-genie, resolution is impossible to achieve, insofar as Achilles's wish gets to be formulated as a "Typeless wish" which reads: "I wish my wish would not be granted." As a consequence of Achilles's wish the two protagonists get thrown out of the story, or the story's contextual system. Achilles's wish thus created a paradox, which crashed the story. As the Tortoise explains: "for that Typeless wish to be granted, it had to be denied—yet not to grant it would be to grant it" (115-116).

What we can infer from this story is that, for Hofstadter, invention functions as a Typeless wish while inventiveness functions as an incomplete system. The recursions in the dialogue are analogues of invention as form and inventiveness as process. Invention as form is based on formulating definitions that may be recursive, while inventiveness as process points to incompleteness insofar as imagination is able to create alternative variations of what is invented. Of recursive definitions says Hofstadter:

> Sometimes recursion seems to brush paradox very closely. For example there are recursive definitions. Such a definition may give the casual viewer the impression that something is being defined in terms of *itself*. That would be circular and lead to infinite regress, if not to paradox proper. Actually a recursive definition never defines something in terms of itself but always in terms of *simpler versions* of itself. (127)

The implication of the assumption that invention can also be elaborated as a typeless fragment is that in a recursive system one can prove the unknowability of truth. The fact that invention denotes stumbling upon something, finding something that is already there, furthermore leads to the assumption that invention perpetuates itself in fragments. What is remarkable about Hofstadter's book is the fact that he creates a form that locates the book within random fragments which further create patterns for the relation between imagination and inventiveness. Invention itself thus becomes the matrix of imagination insofar as invention is intertwined with the fictional world of the fables and occupies the place between imagination and invention by inhabiting them both. The fictions that Hofstadter writes are thus based on creating a relation of sameness between formulating incompleteness and demonstrating it. The fact that we can formally have inventions in two parts, three parts, or an infinite number of parts demonstrates that we can formulate performative approaches to discourse by fragments. On invention, one can only write in fragments as did Hofstadter and Derrida, by making recourse to the foremost characteristic of the fragment, which is to open itself unto potential. It is for this reason that invention as form almost always comes in dialogue and searching questions. As when Hofstadter's last word "Ricercar" is given back to Bach, and Derrida asks in dialogue with his imaginary reader:

> What am I able to invent again, you wondered at the beginning, when it was a fable.
>
> And to be sure you have seen nothing come.
>
> The other, that's no longer inventable.
>
> "What do you mean by that? That the other will have been only an invention, the invention of the other?"
>
> "No, that the other is what is never inventable and will never have waited for your invention. The call of the other is a call to come, and that happens only in multiple voices." (Derrida, 1989: 62)

We can perhaps appropriately say that invention is a fugue on inventiveness, that invention is a form of sameness in its difference which gives stumbling a status of grace.

References

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